ADDIS COLLEGE SCHOOL OF GRADUATE STUDIES

Department of Construction Technology and Management

Investigating Causes of Delay in Ethiopian Dry Port Construction Projects

(A Case Study on Ethiopian shipping & Logistics Dry Port Construction Projects)

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Thesis Approval Form

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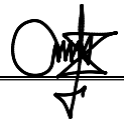
Advisor: - Dr. Messeret Gtenet Signature : -  Date: - _____

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Declaration

This thesis represents my own original research and has not been previously submitted in any other academic institution. It is hereby affirmed that all references and sources utilized in the thesis have been appropriately cited.

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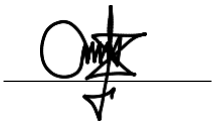
Signature: 

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Abstract

The Ethiopian government is currently engaged in an extensive effort to improve dry port infrastructure throughout the country. In pursuit of this goal, Ethiopian Shipping and Logistics (ESL) emerge as the primary entity involved in nationwide dry port development. Challenges encountered in the process of constructing dry ports encompass issues such as delays, which have persisted as a recurring challenge for Ethiopian Shipping and Logistics (ESL). Over the past three decades, a multitude of dry port infrastructure projects have been executed in alignment with the government's national development agendas. A central concern related to these undertakings revolves around the frequent and extended delays encountered. This study is chiefly centered on exploring the factors contributing to delays in Ethiopian shipping and logistics (ESL) Dry Port infrastructure construction endeavors. The examination identifies the principal stakeholders (client, contractor, and consultant) directly associated with the issue of delays. A variety of literature sources have been leveraged to identify 49 potential causes of delays in construction projects. In order to scrutinize these factors, questionnaires and interviews have been employed to collect pertinent data and responses to research inquiries. The data collection encompasses both quantitative and qualitative dimensions. A total of 43 respondents, including contractors, consultants, and client personnel involved in project implementation, were targeted in the questionnaire. The respondents were evaluated using a 5-point Likert scale to capture their perspectives on the causes of delays, while a 4-point Likert scale was utilized to evaluate the frequency of these delays. In the data analysis process, Severity Index (SI), Frequency Index (FI), and Importance Index (II) were utilized to rank the responses of stakeholders and assess the overall implications of delay causes on the construction projects. The results suggest that project delays are predominantly linked to client-related issues like sluggish decision-making and impractical contract timelines, consultant-related challenges such as delayed design modifications and approvals, as well as planning and scoping issues. Furthermore, contractor-related factors contributing to delays include inadequate scheduling, underestimation of activity costs and durations, deficient resource planning, and ineffective time management. Recommendations have been put forth to key project participants, including clients, consultants, and contractors, emphasizing the necessity of focusing efforts on project design, planning, and scope definition within the allocated budget and timeframe.

Key words: Causes of Delays, Construction Industry, Stakeholders, Dry port and ESL

List of Abbreviations

ESL = Ethiopian Shipping and Logistics

PM = Project Management

PMI = Project Management Institute

CCECC= China Civil Engineering Construction Corporation

PFDD=Port and Facility Development Department

PMBOK = Project Management Book of Knowledge

SI = Severity index

FI = Frequency index

II = Importance Index

CHAPTER ONE – INTRODUCTION

1.1 Research Background

The Dry Port infrastructure Construction Project is the initiative in the country designed to address the challenges of physical isolation (landlocked conditions) and logistical barriers in both local and international trade. The establishment of Dry Ports was developed to reduce the additional expenses associated with importing and exporting goods in domestic and global markets, particularly in relation to sea port services like demurrage, storage, and parking.

In our nation, Ethiopian Shipping and Logistics (ESL) were established as a result of the Regulation issued by the Council of Ministers (Regulation No. 255/2011). It is entrusted with the significant duty of providing sea transportation and logistics services to the nation's traders and manufacturers, as well as developing dry ports and terminals in various regions of the country to minimize demurrage, sea port services, and storage expenses.

Various dry port infrastructures are currently being developed by Ethiopian Shipping and Logistics (ESL). These infrastructures consist of a Full Container Terminal, Empty Container Terminal, General Cargo Container Terminal, RoRo Terminals, various Warehouses, Truck Parking facilities, Access Roads, railway access, and Office Buildings.

However, this construction has been significantly delayed. Nevertheless, none of the construction undertakings were finalized by the stipulated deadline. In the nation of Ethiopia, research has highlighted that projects often experience delays due to various factors. As per Karlsson (2011), the reasons behind project postponement include issues in the initial planning stages and project management. Furthermore, Werku and Jha (2016) have contended that challenges faced by contractors in securing project finances, fluctuations in materials prices, inadequate project planning, subpar scheduling or resource management, and a shortage of proficient professionals in the realm of construction management within the organization, are the primary causes of delays in construction projects.

Delays incur expenses, hazards, and adverse results on the achievement of a project in relation to the aspects of time, expenses, quality, and safety (Sunjka and Jacob, 2013). The impact of a delay is not solely limited to the construction project; instead, it impacts the broader economy of a nation (Divya and Ramya, 2015), thus attracting significant focuses in the economic progress of a country.

To reduce adverse consequences of delay in the construction, the root causes must be known. This vital and practical problem has overwhelmed my mind, investigating the Causes of construction delay in Ethiopian Dry Port construction projects (A Case Study on Ethiopian shipping &Logistics Dry Port infrastructure construction projects).As a consequence, the focus of this study is to identify the causes of delay of the construction projects under Ethiopian shipping & Logistics in order to minimize further adverse effects of delay could be happened to the dry port development.

1.2 Statement of the Problem

Many Construction projects in both developing and developed countries often experience significant delays and cost overruns, leading to a failure to fully realize their intended benefits or even abandonment before or after completion(Oawale,2010). The impacts of construction project delays extend beyond the industry itself to affect the overall Import Export related economy of the country. Arditi et al., (1985)

Delays in infrastructure construction projects are a prevalent challenge in Ethiopia. Werku and Jha (2016) found that approximately 91.75% of construction projects in Ethiopia experienced delays averaging 352% of the original contractual timeline. Abdissa (2003) conducted a study on 15 completed construction projects in various regions of Ethiopia, revealing delays ranging from 20.66% to 500% of the initial contract duration.

The documents from Ethiopian Shipping and Logistics (ESL) indicated that 9(Nine) Dry Port infrastructure Construction Projects under Ethiopian Shipping and Logistics (ESL) has delayed, on average 231.9% of its agreed contractual time. No study has conducted to investigate the root causes of Construction delay of these projects. As a result the purpose of this study is to investigate the causes of construction delay of Dry Port infrastructure Construction Projects under Ethiopian Shipping and Logistics (ESL).

1.3 Objective of the Study

1.3.1 General Objective

The main objective of this study is to investigate the main causes of construction delay in Ethiopian Dry Port infrastructure construction projects.

1.3.2 Specific Objectives

The specific objectives are:

- To investigate Causes of construction delay to the construction projects from the viewpoints of client, contractor and consultant;
- To examination level of severity, frequency occurrence and importance indices of the causes of construction delay;
- To show of the degree of agreement among client, the contractor and the consultant regarding the prioritization of causes of construction delays.

1.4 Research Questions

- What are the causes of construction delay in Ethiopian Dry Port infrastructure construction projects? According to perceptions of client, contract and consultant?
- How the causes of construction 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 construction delay?

1.5 Significance of the Study

This work has significant contribution to, provides information to project Stakeholders (client, contractor and consultant) on the major causes of delay and help avoid time overruns. Ethiopian Shipping and Logistics (ESL) 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. Finally, it assists in avoiding unnecessary disputes while assuring project success and better relationship among the Stakeholders.

1.6 Scope of the study

The study was limited only to Ethiopian Shipping and Logistics (ESL) Dry Port Construction Projects. The study only focused in identifying the causes of construction delay of the projects and ranking the causes of construction 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 four major groups of causes.

1.7 Limitation of the Study

The study should be comprehended within the context of certain constraints. The extent of the inquiry pertains solely to the Dry Port Construction Projects of Ethiopian Shipping and Logistics (ESL). Moreover, the primary challenges encountered by the investigator during the course of this research included the absence of sufficiently documented information on each project by the by the organization.

1.8 Organization of the paper

This project work comprises five chapters. The initial chapter of the research encompasses the introduction, statement of the problem, research objectives, research questions, significance of the study, scope of the study, and limitation of the study. The subsequent chapter delves into the review of related literature. Moving on, the third chapter is dedicated to the research design and methodology, sources of data, target population and sampling technique, as well as tools of data collection and method of analysis. The fourth chapter is focused on data analysis and interpretation of the results. Finally, the last chapter encapsulates the summary of the findings, conclusions, and recommendations of the study.

1.9 Definition of Terms

Construction Industry

- The construction includes three sectors buildings (includes residential and non-residential), infrastructure (ports & terminals, dams, bridges, highways, railways) 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 slowdown 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, project management techniques to oversee the planning, design, and construction of 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 have to be achieved and the work that must be done to deliver project.

CHAPTER TWO– LITRATURE REVIEW

2.1 Introduction

The construction industry is a fundamental sector that contributes significantly to the economic development of a nation. A country's prosperity is often determined by its ability to provide adequate infrastructure through the construction industry. This sector is characterized by its vast size, volatility, and the substantial financial investments required. Infrastructure development is a key element of the construction industry in emerging economies, leading to a significant portion of the national budget being allocated to construction projects. (G.C. Temesgen and A. N. Denamo, 2020.)

The success of a construction project is commonly defined by its timely completion, adherence to budget constraints, high quality standards, and safety measures, all of which must meet stakeholders' expectations. Project success is also evaluated based on its functionality, profitability to contractors, absence of disputes, and suitability for the intended purpose. (Takim, R., & Akintoye, A.,2002)

Inflation has been identified as a major factor contributing to cost overruns in construction projects in Ethiopia. Additionally, delayed payments, financial challenges, contract modifications, and various other issues have been recognized as causes of schedule delays. Effective construction management practices are essential to mitigate cost escalations and schedule delays in construction projects, which are universal challenges faced not only in Ethiopia but in many countries around the world. (N. O. Negalign, 2020.)

Numerous studies have been conducted over the years to identify the root causes of delays in construction projects across different countries and regions. While some research focuses on delays in building projects or highways, others examine delays in construction projects holistically. However, it has been noted that analyzing delays in construction projects is a complex task, as highlighted in various well-established studies conducted in specific locations. .(Adebayo F.& Mustefa A.,2021)Therefore, this review of literature will delve into the factors contributing to delays that are deemed relevant to the current study.

2.2 Construction Delay

Construction comprises a variety of tasks with defined start and end times established during the planning phase. Failure to execute each task according to the plan can lead to project delays, which is a concern for project owners who seek timely completion within budget and with the expected quality standards. Despite efforts, construction delays are a prevalent issue globally.

This scenario has garnered the attention of researchers, prompting numerous scholars to offer varying definitions of project delays. For instance, Pickavance (2005) describes project delay as an occurrence where activities take place later than planned, expected, or indicated in a contract, surpassing the agreed delivery date. Similarly, Kikwasi (2012) defines it as an extended construction period, while Lo, Fung, and Tung (2006) characterize it as a deceleration of work without a complete halt, potentially leading to time overruns beyond contractual or agreed project completion dates.

Moreover, Abdullah et al. (2010) further elaborates on project delay as exceeding the contract End date or extending the project timeline to finish outstanding tasks. On a different note, Tawil et al. (2014) and Afshari et al. (2011) view project delay as a situation where both the client and contractor are accountable for impeding project progress, risking incomplete delivery within agreed-upon timelines or contract terms.

Construction delays defined as the tardy conclusion of work compared to the pre specified end date or contractual schedule, with their mitigation dependent on identifying their underlying causes (Kang sikwei (2010)).

Keith Pickavance (2005) provided a definition of "delay" as an occurrence that occurs later than the planned, expected, or contractually specified time, or beyond the agreed-upon delivery date of a project by the involved parties.

In Fung I. W. H. and L. T.'s study (2006), delay is characterized as the deceleration of work without a complete halt in construction, resulting in time overruns past the contractually agreed date or the delivery date set by the parties involved.

(Syed M. Ahmed, S. A., Pragnya Kappagantula, and Dharam Gollapudi (2003)) categorize delays into non-excusable, excusable with compensable, excusable without compensable, and concurrent delays. Non-excusable delays are those for which the contractor is at fault or assumes the risk. Excusable without compensable delays are unforeseeable factors beyond the contractor's control and not attributable to their fault. Excusable with compensable delays involve compensable interruptions caused by the owner's actions or inactions due to breaches of contract obligations, while concurrent delays arise from shared responsibility between owner and contractor. The contractor may incur damages if work completion exceeds the agreed date, unless an extension of time is justified and the contractor complies with contract requirements (Syed M. Ahmed, S. A., Pragnya Kappagantula, and Dharam Gollapudi (2003)).

Moreover delays are the consequence of unforeseen actions or events that dictate the necessary time to finalize the tasks within a contract (activity delayed even within the contract) or surpass the agreed-upon date by the involved parties for project delivery (Ramanathan et al., 2012). Hence, project delays can manifest as either additional work days for an activity or a delayed commencement of an activity (Yang et al., 2013).

In essence, the definitions suggest that project delays pertain to circumstances in which the genuine progress of project operations is hindered, either by one or both parties involved and external factors, compared to the initially established plan for completion. Consequently, a delay is a scenario in which the agreed-upon project schedule deadline must be postponed. Nonetheless, any delay invariably results in increased project costs.

Factors contributing to project delays can be categorized in various manners, with different delays impacting project activities in distinct ways. Williams (2003) outlined two fundamental categories for project delays in his research: Excusable Delay and Non-Excusable Delay. Excusable delays can be further subcategorized into compensable and non-compensable excusable delays. A compensable excusable delay arises from actions or inactions of the client..

In situations where the contractor faces such delays (e.g., denial of site access by the owner after issuance of the notice to proceed), they are eligible for a time extension and compensation for the delay. This type of delay may be unexpected but is not due to any fault on the part of the contractor. Conversely, a non-compensable excusable delay occurs when neither the client nor the contractor is deemed responsible. In such cases, only a time extension is granted, as there are no grounds for compensation. Additionally, non-excusable delays are attributed to the contractor.

The client can seek remedies for losses as per the terms of the contract. Factors contributing to this type of delay include failure to adhere to the work schedule, inability to meet owner specifications, insufficient labor, financial constraints, delays caused by subcontractors, and ineffective contractor management.

On the other hand, Scott (1993) classified delays into three categories: employer's responsible delays, contractor's responsible delays, and delays for which neither party is accountable. He explained that an employer's responsible delay would lead to variations and the failure to provide site information.

Meanwhile, a contractor's responsible delay arises from the contractor's inability to diligently and efficiently proceed with the project due to variations and lack of site information. Lastly, a delay for which neither party is responsible occurs due to circumstances beyond the control of either the contractor or the client, such as strikes, riots, extreme adverse weather conditions, force majeure events, acts of God, losses and damages from fires and storms, and situations beyond the contractor's control.

Moreover, Enshassi et al. (2010) and Alaghbari et al. (2007) categorized project delays into compensable and non-compensable delays, excusable and non-excusable delays, and concurrent delays. Compensable and non-compensable delays are typically attributed to the owner or its agents, absolving the contractor of responsibility for the delays. Common instances of compensable delays include issues like inadequate drawings, delayed responses from the owner/agent, alterations in design or materials, and changes in activity sequences. In cases of compensable delays, the contractor is entitled to both additional time and compensation (Alaghbari et al., 2007). On the other hand, non-excusable delays arise from the actions of the contractor, subcontractor, or suppliers, rather than the owner. Excusable delays, as described by Levy (2006) and Kelleher (2005), are events such as illnesses or deaths among contractors, transportation delays beyond the contractor's control, epidemics, and quarantine measures. In such situations, the contractor either causes the delay or assumes the associated risks.

The responsibility for compensating delays often falls on the contractor (Alaghbari et al., 2007). In contrast, excusable delays, also known as force majeure events, are not attributable to any specific party.

According to Trauner et al. (2009), an excusable delay results from unforeseeable events beyond the control of the contractor or subcontractor. Examples of excusable delays encompass war, natural disasters, labor strikes, fires, floods, owner-initiated changes, errors and omissions, hidden or differing site conditions, severe weather, and external agency interventions. Contractors experiencing excusable delays are eligible for time extensions but not additional financial compensation. The determination of excusable delays varies depending on the contractual agreements, as noted by Enshassi et al. (2010).

Lastly, concurrent delays are often simpler to manage despite being a significant cause of project delays. These situations involve multiple factors contributing to project delays simultaneously. Referred to as concurrent delays (Enshassi et al., 2010, Alaghbari et al., 2007), they are particularly impactful as they stem from various involved parties.

2.3 Causes of Construction Delay

The construction industry is characterized by its vast size, intricate nature, and substantial requirements for capital investment. The occurrence of delays in construction projects is a prevalent issue that poses significant challenges within the industry, often resulting in costly disputes and strained relationships among project participants.

Research has shown that delays in construction projects vary in significance from one project to another, with numerous studies focusing on identifying the root causes of these delays within the public construction sector. These findings have been thoroughly examined and synthesized for the purpose of this particular investigation.

In Nigeria, a study pinpointed 16 key factors responsible for delays and cost overruns in construction projects. Through a detailed questionnaire survey involving contractors, consultants, and client organizations in the country, it was revealed that issues such as financial constraints, inadequate contract management, material shortages, inaccurate estimations, and price fluctuations were among the primary contributors to project delays (Mansfield, N. R., Ugwu, O. O. and Doran, T. (1994)).

Similarly, a comprehensive analysis conducted in Saudi Arabia highlighted 56 main causes of delays in large building construction projects, shedding light on factors such as delays in the approval of shop drawings, slow progress by contractors, payment delays by owners, design alterations, financial constraints during construction, subcontractor relations, and the decision-making process of project owners. These findings underscore the multifaceted nature of delays within the construction sector (Assaf, S. A. and S. Al-Hejji, 2006).

A research endeavor in Lebanon aimed to identify the causes of delays in the construction industry, revealing a total of 64 factors contributing to project setbacks. The study involved clients, contractors, and consultants, each emphasizing different aspects such as financial concerns, contractual relationships, and project management issues. These causes were categorized into distinct groups, encompassing elements like materials, labor, equipment, financing, changes, governmental relations, and environmental factors (Kikawasi, G. (2012)).

Examining construction projects with traditional contracts, a survey conducted by Abdalla, M. Odeh, and Hussien T. Battaineh (2000) unveiled the most significant factors leading to delays. Owner interference, contractor inexperience, financial challenges, labor productivity, decision-making pace, planning deficiencies, and subcontractor issues emerged as predominant concerns among contractors and consultants

Furthermore, a study focusing on construction projects in the Eastern Province of Saudi Arabia assessed the causes of delays and their impact on project timelines. The research involved contractors, consultants, and owners, who collectively identified 73 causes of delays classified into nine distinct categories. Notably, the issue of change orders emerged as a common cause of delay, with labor-related factors, contractor issues, and project management challenges ranking high among contributors to project delays (Assaf, S. A. and S. Al-Hejji, 2006).

An investigation into delays and cost overruns during the construction phase highlighted poor site management, inadequate project supervision, limited project management support, financial constraints for both owners and contractors, as well as design modifications as the primary causes of such setbacks. These factors were identified as the most frequent, severe, and critical issues affecting construction project timelines (Le-Hoai, L., Lee, Y. D., & Lee, J. D. (2008)).

A thorough analysis of construction delays was conducted by examining records of 130 public building projects in Jordan from 1990 to 1997. The study presented regression models illustrating the relationship between the actual and planned project durations for various building facilities, along with reported frequencies of time extensions due to different causes of delays. It was concluded that key causes of construction project delays include issues related to designers, user changes, weather, site conditions, late deliveries, economic conditions, and quantity variations (Al-Momani, A. H., 2000).

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 timely delivery of the project with a stipulated budget and expected quality of the project.

However, the project is delayed due to various reasons. Several studies have identified different causes of project delays in different 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 1:- Causes of construction Delays

Main Group	Sub Group	Main Reason of Delay
Internal	1.Consultant Related	**Project Management Team**
		Inadequate site inspection by the consultant.
		Unclear and inadequate details in drawings
		Late in approving major change in scope of work
		Lack of timely and at the spot decision
		Change in type and spec during construction
		Lack of effective communication and coordination
		Unrealistic project cost and
		Conflict between the main parties to the contract
		Lack of complete definition of project scope.
		Unrealistic project duration
		Delay in approving sample materials
		Lack of proper planning & scoping of the project,
		Designer
		Defective in design quality such as mistakes, errors, incomplete…
		Inadequate communication between owner and designer during the design phase
		Design team experience deficiency/ Lack full investigations
		Repeated design change
		Late in revising and approving design document
	2. Client Related	Delay in site handover to the contractor
		Changes issued by client (Variation orders)
		Lack of detailed Master plan of the project
		Inappropriate owner representative management

Cont…..

Main Group	Sub Group	Main Reason of Delay
Internal	2. Client Related	Lack of contractual agreement enforcement, i.e., inability to Manage & administer the project on contractual basis.
		Selection of the lowest bidder contractor
		Lack of experienced manpower that manage contract administration
		Discrepancies and/or deficiencies in contract agreement document
		Changes in scope of the project
		Unrealistic contract duration imposition to contractor by the Client.
		Owner's poor communication with construction parties
		Delay in decision making process by owner
		Delay in progress payments by the client
		Inefficient equipment or construction tools
	3. Contractor Related	Contractor financial problems
		Poor site management competence
		Improper construction methodology implementation
		Lack of foreign Currency
		Lack of skilled manpower of contractor(hiring inexperienced technical staff)
		Lack of proper planning and scheduling by
		Inaccurate cost estimation (pricing) of the project activity.
		Problems due to construction resources management
		Reworks required due to poor work or the wrong materials used.
		Poor schedule management
		slow supply of materials
		Shortage of Materials in the Market
		Lack of experience of dry port construction by the contractor
External	4. External Factors Related	Price escalation
		Letter of Credit(LC) problem(foreign procurement)
		Shortage of construction materials in the market
		Facing Unforeseen conditions (such as hard rock,..)
		Force major

Source: - from different literatures

2.4 Challenges of Construction Project in Ethiopia

The construction industry is a vital economic sector that permeates various other sectors as it converts different resources into physical economic and social infrastructure essential for socio-economic progress. It encompasses the process through which physical infrastructure is planned, designed, procured, constructed, altered, repaired, maintained, and demolished. Thus, the construction industry in developing nations holds significant importance due to its substantial contribution to their economic advancement. All infrastructure required for development, such as roads, telecommunications, electricity, power projects, as well as socio-economic facilities like schools, hospitals, and factories, are managed by the construction industry, playing a crucial role in the economic development of developing countries. The Ethiopian government has allocated a significant portion of its budget to hydroelectric power development, roads, railways, airports, dry ports, housing, waterworks, and social infrastructure development, with approximately 51.4% of the total budget in 2007/08 dedicated to capital projects (MoFED, 2008).

While the construction industry is pivotal for the economic progress of developing countries, it encounters numerous challenges. According to Wubishet (2004), the construction industry in many developing nations is described as excessively fragmented and compartmentalized, dominated by the public sector, subject to substantial government interventions, heavily reliant on foreign finance (especially for public construction), and lacking in the development of indigenous technology. Adams (1997) also points out in his research that developing countries' construction industries heavily rely on imported inputs such as construction materials, machinery, and skilled labor. Moreover, foreign construction firms dominate the industry, taking charge of most major construction projects.

Furthermore, Ofori (2012) concluded in his study that construction industries worldwide face various problems and challenges. Nevertheless, these obstacles and difficulties in developing countries are associated with socio-economic pressures, chronic resource scarcities, institutional deficiencies, and a general incapacity to address crucial issues. Construction projects in developing countries are typically overseen by the government through contractors and consultants, a setup that hinders the growth of the private construction sector. Inadequate and unfair contract conditions could impede the industry's advancement.

On the contrary, the key challenges to the development of the domestic construction industry include potential contract issues and financial provisions, unequal risk distribution between public employers and local contractors, unpredictable material shortages, complexities in claim substantiation and dispute resolution procedures, and deficiencies in contract administration practices.

Moreover, Solomon (2015) notes in his study that management and execution problems in the industry involve a fragmented approach to project delivery, inadequate alignment of project delivery with project specifics, insufficient project quality assurance measures, self-serving performance monitoring and evaluation practices, weaknesses in the supply chain, lack of consolidated knowledge base, and negligent practices within 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 in Tadesse,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, and budget overrun are common problem in Ethiopia. Some of causes of these problems are summarized as follows:

I. Lack of conducive environment in promoting competitiveness,
II. Unethical and rent-seeking behavior coupled with weak regulation system.
III. Lack of a transparent, accountable, effective and efficient construction management system.
IV. Absence of a strong construction industry development. The sector is considered technologically traditional

2.5 Causes of Construction Delay in Ethiopia

In Ethiopia, the factors contributing to delays in construction projects include financial challenges faced by contractors, material cost escalations, inadequate planning and scheduling by contractors, delays in receiving progress payments for completed work, and a shortage of skilled professionals in construction project management within contractor organizations (Werku and Jha, 2016). Conversely, Zinabu (2016) highlights internal causes of delays such as deficient planning, cash flow issues during construction, slow decision-making processes, mismanagement by contractors, and late delivery of materials and equipment.

The causes of delays in construction projects are influenced by various factors such as complexity, environmental conditions, project size, and scope (Hampton et al., 2012). Additionally, changing weather patterns, unforeseen circumstances, resource availability, and incomplete design information play significant roles (Lowsley and Linnett, 2006). Major reasons for project overrun include delays in obtaining council permits, inaccurate project cost estimates, underestimation of project complexities, banking challenges, fluctuations in material prices, and inadequate on-site supervision in Ghana (Fugar and Agyakwah-Baah, 2010). Conversely, Sweis et al. (2008) found that financial difficulties faced by contractors and indecisiveness on the part of clients are the primary causes of delays in construction projects in Jordan.

Ayman (2000) identified several reasons for construction delays, including issues related to design engineers, changes in building use, adverse weather conditions, logistics, financial constraints, and fluctuations in material requirements. In India, project delays are often attributed to factors such as lack of commitment, incompetence of site managers, poor coordination, inadequate understanding of project scope, and communication challenges.

Moreover, Odeh and Battaineh (2002) pinpointed key reasons for construction delays, such as owner interventions, contractor inexperience, financial issues, labor productivity, slow decision-making processes, inadequate planning, and subcontractor-related project specifics that vary from project to project. Additionally, Hanna et al. (2007) noted that any alterations to the original project scope, timeline, or budget could lead to design errors, scope changes, or unforeseen consequences. Song et al. (2005) further explained that poor project scope definition disrupts project flow, increases rework, extends project duration and costs, and diminishes workforce productivity and morale.

Conversely, Iyer and Jha (2005) attributed construction delays to conflicts among project participants, lack of knowledge or awareness, poor project-specific attributes, lack of cooperation, challenging socioeconomic and climatic conditions, delays in decision-making, aggressive bidding processes, and insufficient bid preparation time.

2.6 Delay Factors in Construction

Numerous research endeavors have been undertaken over the course of many years pertaining to the issue of delays in construction projects, with scholars putting forth a variety of factors and categories of factors that contribute to the occurrence of such delays. Various rationales or justifications for project delays have been identified by researchers. The study results, as presented by Alaghbari et al. (2007), have been subjected to scrutiny utilizing factors related to the schedule from different perspectives such as Client-based Schedule factors, contractor-related Schedule factors, Consultant-related Schedule factors, and other external factors.

Furthermore, a scholarly investigation conducted by Shibani and Dr. Abdussalam (2015) focused on the topic of "Time and Cost Overrun in Construction Projects in Egypt." The findings of this study recommend that stakeholders, including owners, contractors, and consultants, should exhibit a higher level of accountability towards their respective tasks and roles in order to proactively prevent any occurrences of schedule delays or cost escalations.

2.6.1 Client-Related Factors of Delay

Gardezi et al. (2014); Long et al. (2004); Abd El-Razek et al. (2008); Ahmed et al. (2003) and Alaghbari et al. (2007) have identified a number of client-related factors contributing to delays in construction projects. These factors include financial issues, lack of expertise, work suspension by the owner, slow decision-making processes, delays in selecting material designs, poor coordination with contractors, and modifications to the contract. Furthermore, Odeh and Battaineh (2002) have highlighted challenges faced by clients such as difficulties in settling project debts, slow decision-making, and unfeasible contract timelines imposed by clients.

Numerous studies have pointed out that delays related to clients can be attributed to various factors including changes in project requirements, sluggish decision-making processes, financial constraints, delayed site handovers to contractors, tardy approvals, financial challenges, responsibilities in contract administration, change orders, and external interferences.

2.6.2 Contractor-Related Factors of Delay

Ali et al. (2010) highlighted that delays attributed to contractors stem from issues such as material shortages on-site due to inadequate arrangements, poor communication, unreliable suppliers, and delayed material supply. Mochal (2003) emphasized that insufficient planning stands out as the primary error in project management, leading to unsatisfactory project outcomes, especially when causing material scarcity at construction sites. Conversely, Enshassi et al. (2009) contended that significant delays are often linked to cash flow during construction and substandard site management practices.

In general, contractors commonly encounter delays due to financial constraints, challenges in material handling, difficulties in planning and scheduling, inadequate site supervision, problems with equipment management, manpower shortages, failure to assess site conditions and designs, construction flaws, ineffective contractor management, and insufficient allocation of resources.

2.6.3 Consultant-Related Factors of Delay

Consultants play a crucial role in overseeing project execution in adherence to agreements, schedules, and client expectations. Their functions in project agreements are typically well-defined and essential for project success.

Studies by Gardezi et al. (2014) and Alaghbari et al. (2007) have identified consultant-related delays arising from factors like the absence of site engineers, lack of consultant expertise, inexperienced site staff, delayed decision-making, insufficient documentation, and sluggish information dissemination. Conversely, Odeh (2002) emphasized that delays associated with consultants are often related to contract management, planning, structural drawing approvals, and quality control.

Common consultant-related causes of delay include incomplete drawings, slow responses, variation orders, delayed issuance of instructions and information, communication breakdowns, design flaws, sluggish design error rectifications, and tardy review of shop drawings.

2.6.4 External Factors Related Delay

Numerous studies have sought to pinpoint external factors contributing to project delays that neither stem from contractors, clients, nor consultants. These external factors can significantly impede construction projects. Aibinu and Odeyinka (2006) highlighted critical external factors such as price hikes, adverse weather conditions, labor disputes, governmental regulations, delayed permits, civil unrest, and unforeseeable events.

Additionally, Assaf and Al-Hejji (2006) categorized external delay factors as project site conditions (e.g., soil composition, high water tables), delayed municipal responses, weather disruptions, lack of utilities on-site, and shifts in regulations. Moreover, factors like material and equipment unavailability, unfavorable weather, poor site conditions, economic instability, regulatory changes, transport delays, and external public works projects hindering material transportation to sites have been recognized as causes of delay (Ahmed et al. 2003; Alaghbari et al. 2007).

2.7 Effects of Construction Delays

The phenomenon of project delay is commonly referred to as the impact or repercussions of delayed project completion. The effect of project delay can be defined as a modification or influence resulting from a delay (Sunjka and Jacob, 2013).

A research conducted by Aibinu and Jagboro (2002) highlights six consequences of project delay in the Nigerian construction sector, including time overrun, cost overrun, disputes, arbitration, total abandonment, and litigation. Similar effects of delay in project delivery were observed in the Malaysian construction industry by Hamzah et al. (2011). Furthermore, Yahya et al. (2013) pinpointed effects of delays in the Pakistan construction industry such as clashes, claims, total desertion, and impeding the growth of the construction sector. The mutual objective of all involved parties, including the owner, contractor, and consultant, is to complete a project on schedule, within the predetermined budget, and with the highest quality standards. Delays typically lead to some form of losses for all parties involved (Murali, Sambasivan, and Yau, 2007). The six identified effects of delay encompass time overruns, cost overruns, disputes, arbitration, litigation, and abandonment.

In addition to the aforementioned effects, Aibinu and Jagboro (2002) also noted that poor quality of completed projects and negative public relations are outcomes of delays in construction projects.

Ahmed et al. (2002) assert that project delays are a global occurrence and are frequently accompanied by cost overruns, strained relationships, distrust, legal actions, arbitration, and financial difficulties. The success of a project is often determined by its ability to meet the cost, time, and quality constraints imposed on it.

In Ethiopia, the significant consequences of delays investigated include cost overruns, time overruns, contract terminations, arbitration, and litigation in sequence (Endale, 2016; Tsegay and Hanbin, 2017).

Shaikh Asif (2009) pointed out that the impacts of construction delays extend beyond the construction sector and affect the overall economy of countries like the UAE, where construction is a key driver of development contributing 14% to the GDP. Therefore, it is crucial to identify the primary causes of delays to mitigate their effects on construction projects.

Delays have a detrimental effect on the performance of contractors and lead to adverse outcomes in construction projects such as contractual disputes, reduced efficiency, increased construction costs, as well as exerting pressure on the achievement of project objectives (Ahmed et al., 2002).

2.8 Minimizing Adverse Consequences of Delay

The mitigation of adverse effects resulting from project delays has been a subject of various studies, which offer recommendations for stakeholders such as clients, contractors, consultants, and designers to adopt suitable strategies. These strategies aim to prevent or alleviate the negative impacts of delays that pose threats to project objectives concerning time, cost, and quality.

Abdelnaser et al. (2005) emphasized the significance of effective project planning to reduce delays. Similarly, Nguyen et al. (2004) identified five critical success factors in large construction projects in Vietnam to minimize delays, including resource availability, a competent project team, a skilled project manager, accurate cost and time estimates. Moreover, Aibinu and Jagboro (2002) highlighted two methods for minimizing project delays: accelerating site activities and incorporating contingency allowances. Conversely, Odeh and Battaineh (2002) suggested enforcing liquidated damage clauses and providing incentives for early project completion as ways to reduce delays. Koushki et al. (2005) found that ensuring sufficient financial resources, selecting competent consultants and contractors, are essential in minimizing project delays.

In Ethiopia, Zinabu (2016) proposed measures to minimize delays, such as ensuring the availability of funds in the client's account in advance, receiving late payments with interest, employing skilled professionals for financial management, scheduling, and claims compilation, and anticipating cash flow issues.

Contractors are advised to submit project schedules for operational purposes, outsource scheduling by experienced professionals, integrate subcontracted schedules with the master schedule, ensure proper licensing, availability of materials and equipment, and focus on documentation during project initiation. Werku and Jha (2016) recommended integrated design verification, detailed site investigations, clear and error-free drawings, accurate Bill of Quantities (BoQ), appropriate risk and escalation factors in cost estimation, realistic project timelines, well-defined scopes of work, prompt approval of payments, variations, and price adjustments, and the deployment of competent professionals in project management roles.

2.9 Conceptual Framework Delay

The conceptual model presented in this study is based on an analysis of existing literature and various factors contributing to project delays. The framework depicts the hypothesized relationships among variables causing delays in projects. Delay occurrences are influenced by both internal and external factors, with internal causes encompassing issues related to clients, contractors, and consultants.

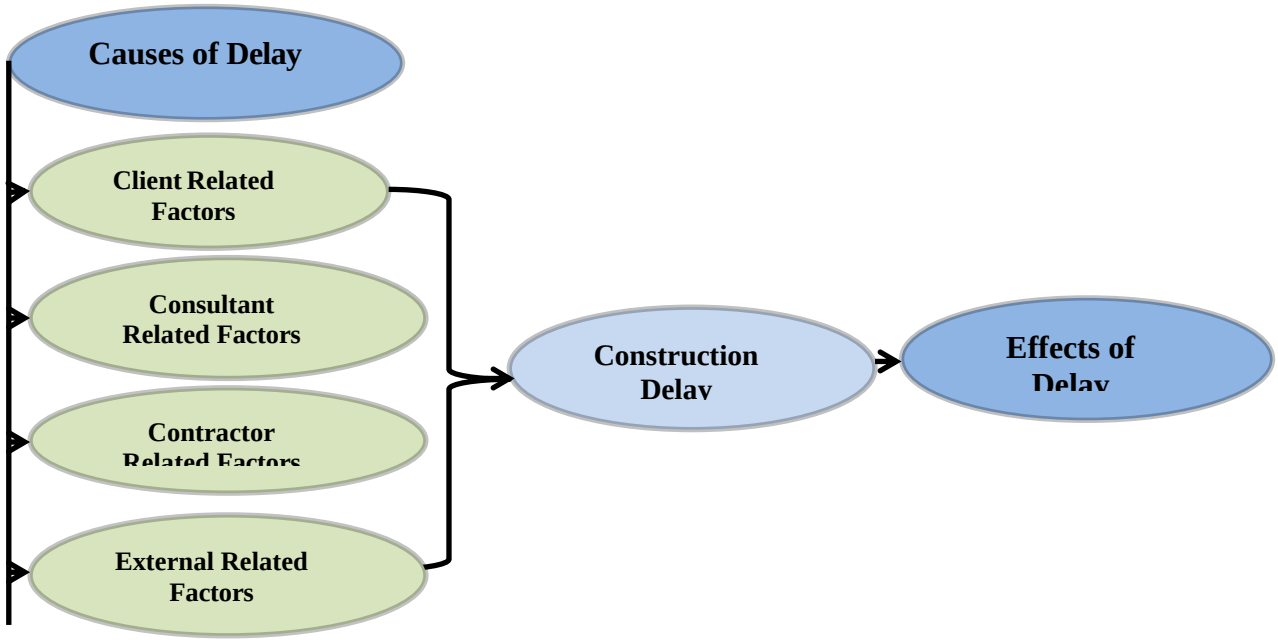

Figure 1: Conceptual Framework

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 THREE - RESEARCH METHODOLOGY

3.0 Introduction

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 Target Population

The targeted populations selected for this research to evaluate and to analyze the causes of Dry Port infrastructure Construction project delay are client, 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 Port and Facility Development Department PFDD (serves as project office) staffs are 13. All 13 staff members are included. Regarding consultant's the 10 professionals (RE, civil engineers, hydrologist, and electrical) were also taken as population. Similarly, the contractor's staff members have 20 professional individuals were also taken. The totals of 43 respondents" populations were targeted for this study.

3.4 Sample Size and Sampling Technique

Yamane"s formula issued 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)

$$n = \frac{43}{(1+(43*0.0025)}$$

$$n=38.9 \approx 39$$

Calculated total sample size is found to be n=39. And 16 from contractors, 13 from clients, 10 from consultants) were taken as respondents.

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, 49 delay 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 rating Likert 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 indexing were 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 compute Severity Index (SI) for each factor of delay is:

$$SI(\%) = \frac{\sum Wifi/}{5\sum fi]} \times 100\% \quad \text{………………………………………………… (1)}$$

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

$$FI(\%) = \frac{\sum i=1Wifi}{4 \sum fi\ 4i=1]} \times 100\% \quad \text{……………………………………………………. (2)}$$

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:

$$II(\%) = \frac{[S.I(\%) \times F.I(\%)]}{100} \quad \text{…………………………………………………….. (3)}$$

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

3.7 The Kendall coefficient of concordance Analysis

The Kendall coefficient is used to measure how the evaluators (raters, respondents) have common degree of agreement on rankings delay 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 with non-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).

3.8 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."

Table 2:- Reliability Statistics

Construct	No. of Items	Cronbach alpha	Internal Consistency
Client Related factors	14	0.935	high
Consultant Related factors	17	0.884	good
Contractor Related factors	13	0.869	good
External Related factors	5	0.735	good
	Average	0.856	

Source:- Own Survey result, (2024)

3.9 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 FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

To the presentation of the data obtained from respondents via questionnaires and document reviews. Efforts were directed towards acquiring pertinent information from specific contractors, clients/owners, and consultants engaged in the Dry Port infrastructure Construction Project, using the devised questionnaire. The primary objective of this study is to prioritize the identified delay factors in the construction project and determine the critical elements that necessitate significant attention to substantially mitigate delays in port construction endeavors.

The questionnaire was meticulously crafted to effectively gather data on the causes of delays. The significance of the factors contributing to project delays as perceived by clients, contractors, and consultants is evaluated; various forms of ranking analysis are applied to elucidate the findings. The consistency among the perspectives of clients, contractors, and consultants regarding delay factors is also scrutinized.

Moreover, interviews were conducted to gain further insights into the delay factors of the dry port project from select individuals representing clients, contractors, and consultants. The results of the analysis are interpreted, and their implications on delays are rigorously examined under distinct categories.

4.2 Survey Responses

A total of 43 questionnaires were distributed, with 39 (90.69%) being completed and returned. The respondents consisted of 13 (100%) clients, 10 (100%) consultants, and 16 (80%) contractors from whom responses were gathered. This suggests that there are adequate responses for data analysis.

Table 3:- Survey Reponses

Respondent	Questionnaires Distributed(N)	Filled & Returned (N)	Response Rate (%)	Responses from Total (%)
Client	13	13	30.23	33.33
contractor	20	16	37.21	41,03
consultant	10	10	23.26	25.64
Total	**43**	**39**	**90.69**	**100**

Source: Own Survey result, (2024)

The overall response rate stands at 90.69% (Table 2). When compared with contractors, the response rate from clients and consultants is the highest (100%), possibly due to the increased office presence of client and consultant staff. Conversely, contractors and their staff are often occupied with meeting project schedules.

Nonetheless, the response rates from contractors and consultants in this survey are deemed sufficient for data analysis. To ensure the data is fit for analysis, a response rate of over 40% is preferred; anything below 30% is non-representative and renders the analysis results of little value for further interpretation (Moser and Kalton, 1993).

4.3 Demographic Characteristics of the Respondents

The demographic characteristics of the respondents in this study encompass gender, age, educational background, experience, and professional fields of the project participants. are presented below.

4.3.1 Respondents Gender

In terms of gender, 35 (89.74%) of the respondents are male, while the remaining 4 (10.26%) are female. This indicates a higher male participation rate in port construction.

4.3.2 Respondents Age

Regarding the age distribution of respondents, 15.3% fall in the 25-30 years bracket, 23.1% in the 31-35 category, and 25.6% in the 36-40 years range. More than 64% of respondents are aged between 25-40 years, reflecting the age profile of the study participants.

The respondents exhibit a suitable level of maturity for to observe the causes of delay in the project.

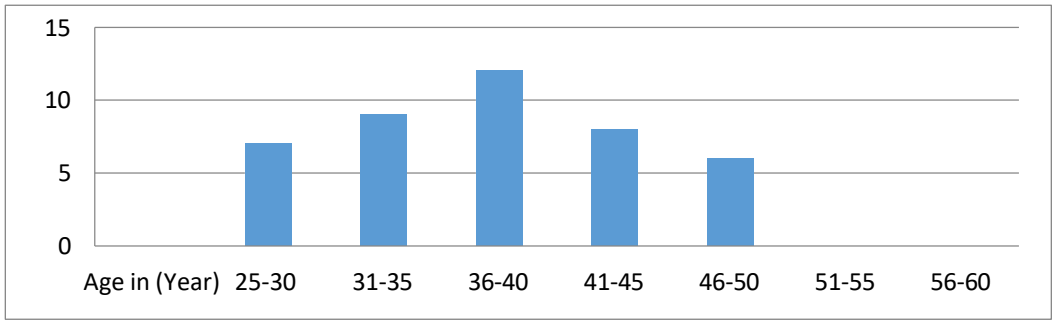

Figure 2:- Respondents Age

Source: Own Survey result, (2024)

4.3.3 Respondents Education Background

Furthermore, concerning the educational background, 79.5% hold a bachelor's degree in engineering and social sciences, while 15.4% possess a master's degree in Highway & Construction management. Additionally, 5.1% have an advanced Diploma in building construction, indicating a relevant educational background for the project.

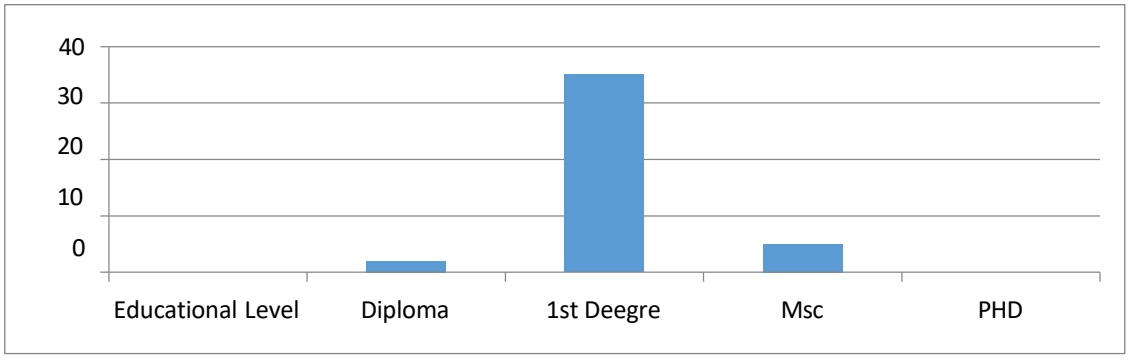

Figure 3: Respondents Educational Background

Source: Own Survey result, (2024)

4.3.4 Respondents by fields of studies

The respondents have graduated from various fields of study, with 71.8% in civil engineering, 18% in sanitary & water supply, electrical and mechanical engineering, and 10.25% in contract administration & architectural engineering and quantity surveying.

Table 4:- Respondents fields of studies

Educational Background	Number
Civil Engineer	28
Sanitary Engineer	2
Mechanical Engineer	2
Electrical Engineer	2
Contract Administration Eng.	3
Architect Engineer	1
Office Engineer	1
TOTAL	**39**

Source: Own Survey result, (2024)

4.3.5 Respondents Experience

On the other hand, client, contractor, and consultant respondents bring experience in building, road, water works, and other projects such as bridges and housing developments. Approximately 12.8% have 1-5 years of experience, 20.5% have 6-10 years, and 66.6% have 10-15 years of experience.

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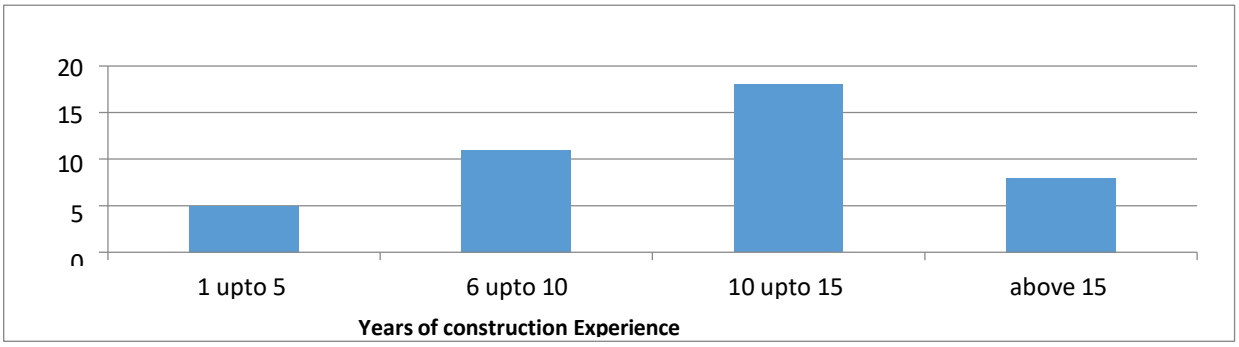

Figure 4:- Experiences in Construction
Source: Own Survey result, (2024)

4.4 Causes of Construction Project Delay Analysis

In the data analysis, delay factors have been ranked based on stakeholders' (contractors, consultants, and owners) opinions of project delays. The severity, frequency, and importance of these factors were analyzed and discussed with the aid of the Statistical Package for Social Science (SPSS version 20) to test reliability using Cronbach's and Kendall Coefficient for respondents' agreement on ranking.

4.5 Perception of the Respondents on Causes Delays

The respondents' perceptions of project delay factors are reflected in the degree of impact, frequency index, and importance index. The importance of a factor on project delays is assessed using five Likert scales, while the frequency of occurrence is rated on a four-point scale.

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,

4.5.1 The Severity Analysis of Causes of Delay

By utilizing statistical techniques outlined in chapter three, the severity indices of delay causes are examined based on the data provided in Annexx-B-1. The primary five critical factors leading to delays as perceived by the client are as follows:

- Unrealistic project duration
- Delay in approving sample materials
- Lack of Experience of Dry port construction by the contractor

- Lack of effective communication and coordination
- Lack of proper planning & scoping of the project
- Design team experience deficiency/ Lack full investigations
- Contractor financial problems
- Letter of Credit(LC) problem (for imported materials)

Table 5:- Severity Indices of Causes of Delay Identified by Client

Item No.	Five most sever causes of Delay	SI (%)	Rank	Related
1	Unrealistic project duration	96.7	1	Consultant.
2	Delay in approving sample materials	90.8	2	Consultant.
3	Lack of Experience of Dry port construction by the contractor	90.8	2	Contractor
4	Defective in design quality such as Mistakes, errors, incomplete…	90.8	2	Consultant
4	Lack of effective communication and coordination	89.2	5	Consultant
5	Lack of proper planning & scoping of the project,	87.7	8	Consultant
6	Design team experience deficiency/ Lack full investigations	87.7	8	Consultant
7	Contractor financial problems	86.2	5	Contractor
8	Letter of Credit(LC) problem (for imported materials)	86.2	5	External

Source: Own Survey result, (2024)

The origins of these delay factors can be attributed to early stages of project planning and scoping, design issues, contractor-related aspects, input from consultants, and external factors.

Moreover, the contractor has identified the top five severe causes of delays as:

- Repeated design change;
- Late in revising and approving design document;

- Defective in design quality such as mistakes, errors, incomplete…;
- Lack of proper planning & scoping of the project,, which is later manifested in many change orders, redesigns and reworks;
- Unrealistic project cost estimation; and
- Delay in delivering project site to the contractor

Table 6:- Severity Indices of Causes of Delay Identified by Contractor

Item No.	Causes of Delay	SI (%)	Rank	Related
1	Repeated Design change	98.6	1	Consultant
2	Late in revising and approving design document	94.3	2	Consultant
3	Defective in design quality such as Mistakes, errors, incomplete…	91.1	3	Consultant
4	Lack of proper planning & scoping of the project,	90	4	Consultant
5	Unrealistic project cost estimation	90	4	Consultant
6	Delay in site handover to the contractor	88.6	5	client

Source: Own Survey result, (2024)

The additional delay factors recognized by the contractor are predominantly associated with design matters, while the remaining causes are linked to planning, scoping issues, and client-related concerns. The shared severe causes of delays highlighted by both the contractor and client include:

- 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 highlighted numerous severe factors contributing to delays, many of which hold similar rankings. They are:

- Unforeseen condition such as hard rocks that risk 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 7:- Severity Indices of Causes of Delay Identified by Consultant

Item No.	causes of Delay	SI (%)	Rank	Related
1	Facing Unforeseen conditions (such as hard rock,..)	95.0	1	External
2	Poor schedule management	92.5	2	Contractor
3	Lack of proper planning & scoping of the project,	92,5	2	Consultant
4	Inaccurate cost estimation (pricing) of the project activity.	90	4	Contractor
5	Lack of proper planning and scheduling	90	4	Contractor
6	Lack of foreign Currency	90	4	Contractor
7	Inefficient equipment or construction tools	90	4	Contractor
8	Discrepancies and/or deficiencies in contract agreement document	90	4	Client
9	Repeated design change	90	4	Consultant
10	Lack of skilled manpower of contractor(hiring inexperienced technical staff)	87.5	10	Contractor
11	Delay in decision making process by owner	87.5	10	Client
12	Late in revising and approving design document	87.5	10	Consultant

Source: Own Survey result, (2024)

These factors pertain to contractor-related issues, design challenges, and client-specific matters. In this scenario, the consultant seems to allocate blame to other parties for the project delays.

Commonly identified causes of delay by the three parties are:

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

This discrepancy implies that factors perceived as causing delays by one party may not align with the perspective of the other party. It indicates a lack of consensus among respondents regarding the prioritization of delay factors in the project.

4.5.2 The Frequency Occurrence of Causes of Delay

The frequency of occurrence indices for delay causes is utilized to pinpoint factors that have significantly recurred throughout the project lifecycle. Each party evaluates the frequency of delay causes, and the resulting indices are instrumental in ranking these factors.

From the viewpoints of the client, contractor, and consultant, the most frequently encountered delay causes are ranked (refer to Annex-B-2).

The client's perspective on the frequency of delay causes ranks them as follows:

- 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 contractor including 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 8:- Frequency Occurrence of Delay Factors in Project According to Client.

Item No.	causes of Delay	FI (%)	Rank	Related
1	Under estimating activity duration	92.3	1	Consultant
2	Inaccurate cost estimation (pricing) of the project activity	88.5	2	Contractor
3	Lack of proper planning and scheduling	86.5	3	Contractor
4	slow supply of materials	86.5	3	Contractor
5	Inadequate Construction site supervision by the Consultant.	86.5	3	Consultant
6	Conflict between the main parties to the contract	86.5	3	Consultant
7	Lack of complete definition of project scope.	86.5	3	Consultant
6	Delay in approving sample materials	86.5	3	Consultant Consultant
7	Lack of proper planning & scoping of the project,	86.5	3	Consultant
8	Delay in decision making process by owner	86.5	3	Client

Source: Own Survey result, (2024)

The top five frequently occurring delay factors identified by the client are predominantly linked to planning and scoping issues, encompassing aspects such as defining project scope, early planning stages (such as requirements identification), contractor-related planning errors (e.g., activity estimation and sequencing), as well as delays in foreign procurement and inadequate manpower. Furthermore, design preparation deficiencies based on insufficient information and delays in revising and approving design errors by the consultant are highlighted. The client also demonstrates a tendency to make decisions at a slow pace.

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.

Table 9:- Frequency Occurrence of Delay Factors According to Contractor

Item No.	Causes of Delay	FI (%)	Rank	Related
1	Defective in design quality such as mistakes, Errors, incomplete…	94.6	1	Consultant
2	Repeated design change	94.6	1	Consultant
3	Lack of proper planning & scoping of the project,	91.1	3	Consultant
4	Late in approving major change in scope of work	89.3	4	Consultant
5	Late in revising and approving design document	89.3	4	Consultant
6	Unclear and inadequate details in drawings	87.5	6	Consultant
7	Lack of effective communication and coordination	87.5	6	Consultant

Source: Own Survey result, (2024)

These factors predominantly revolve around design, consulting, and planning challenges within the project. Much like the client and contractor, the consultant has also emphasized the following frequently occurring delay factors:

- 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 10:- Frequency Occurrence of Causes of Delay According to Consultant

Item No.	Causes of Delay	FI (%)	Rank	Related
1	Facing Unforeseen conditions (such as hard Rock… .....)	93.8	1	External
2	Repeated Design change	90.6	2	Consultant
3	Lack of proper planning & scoping of the project,	87.5	3	Consultant
4	Unrealistic contract duration imposition to contractor by the client	87.5	3	Client
5	Lack of proper planning and scheduling	87.5	3	Contractor
6	Defective in design quality such as mistakes, errors, Incomplete…	84.4	6	Consultant
7	Late in revisiting and approving design document	84.4	6	Consultant
8	Inefficient equipment or construction tools	84.4	6	Contractor
9	Contractor financial problems	84.4	6	Contractor
10	Reworks required due to poor work or the wrong materials used	84.4	6	Contractor

Source: Own Survey result, (2024)

The identified causes of delays are intertwined with contractor, client, design, and planning issues within the project. The mutually identified frequently occurring causes of delays by the three parties include: inadequate definition of project goals, scope, and requirements (planning and scoping), leading to numerous 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.

4.5.3 The Importance Index of Causes of Delay

In order to pinpoint the most significant contributors to project delays, the Importance Index (II) of delay factors is calculated for each factor (refer to Annex-B-2). This index represents the product of severity and frequency indices, thereby enabling the ranking of key delay factors crucial to 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 11:- Importance Index of Causes of Delay

Item No.	Causes of Delay	Indices			Rank	Related
		SI (%)	FI (%)	II (%)		
1	Repeated Design change (Planning &scoping) of the Lack	90.9	88.6	80.5	1	Consultant
2	of proper planning & scoping of the project,	89.7	88.6	79.5	2	Consultant
3	Defective in design quality such as mistakes, errors, incomplete…	89.7	87.9	78.8	3	Consultant
4	Late in revisiting and approving design document	89.14	86.43	77.04	4	Consultant
5	Unrealistic project duration	87.9	85.0	74.7	5	Consultant
6	Design team experience deficiency/ Lack full investigations	84.6	82.1	69.5	6	Consultant
7	Lack of effective communication and coordination	83.43	82.86	69.13	7	Consultant
8	Unrealistic project cost estimation	84	80.7	67.8	8	Consultant
9	Unclear details in drawings	83.43	80.7	67.34	9	Consultant
10	Lack of proper planning and scheduling	81.1	82.9	67.23	10	Contractor

Source:- from different literatures

The above top ten important factors contributing to project delays, including design, planning, scoping, consultants, and contractors, were identified. Design changes are influenced by factors such as the inability to create the initial design based on detailed information, design errors, and changes in client expectations. Delays are also attributed to slow revision and approval of designs by consultants, lack of attention to project planning by clients and contractors, inadequate project scope planning, and insufficient information for execution planning..

In general the project faced challenges related to early planning and defining project scope. Issues such as consultants' inability to design based on client expectations, lack of detailed information, and slow preparation and approval, worsened the delay problem. Insufficient focus on project was planning during execution, including activity duration estimation, cost estimation, and activity sequencing, led to change orders and rework.

4.5.4 The Significance of Grouped Causes of Delay Analysis.

The detailed causes of delay of the project are summarized into four important major categories. They are ranked according to their importance index. 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 12:- Grouped Causes of Delay

Item No.	Group Delay Factors	Importance Index	Rank
1	Consultant related causes of Delay	68.03	1
2	Contractor related causes of Delay	55.62	2
3	External Factor related causes of Delay	53.77	3
4	Client related causes of Delay	53.19	4

Source: Own Survey result, (2024)

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 delays as follows:

- 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 four 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.

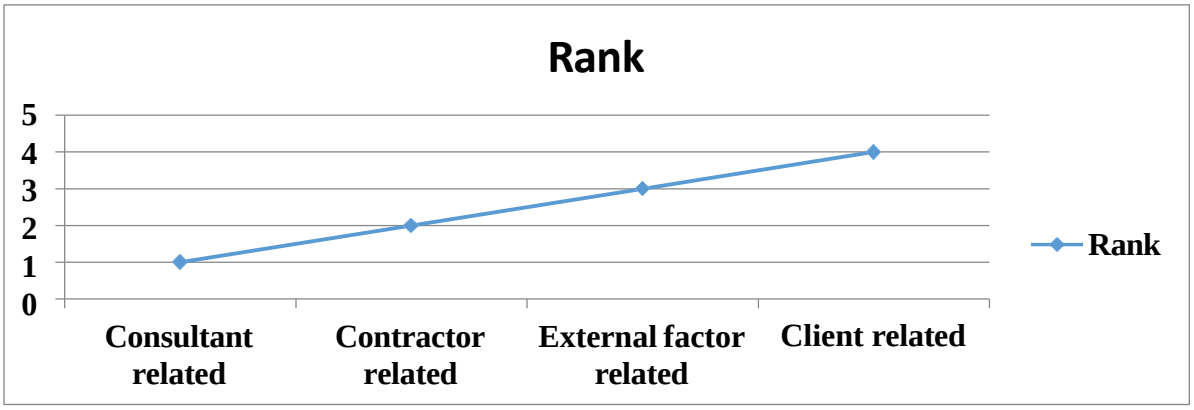

Figure 5:- Ranks of Grouped Categories
Source: Own Survey result, (2024)

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

These chapters focus on summary and conclusion of the findings, conclusion and recommendation 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

It has also been disclosed that delays in Dry port construction projects within the Ethiopian shipping & logistics (ESL) are attributable to various factors associated with the stakeholders involved in the project. These projects continue to face challenges such as significant delays, changes in work orders, excessive quantities, variation orders, quality issues, and design modifications.

Within this investigation, all potential causes of delay as identified in existing literature have been outlined, totaling 49 factors that are directly relevant to the project under examination and have been integrated into the questionnaire. Out of the 43 distributed questionnaires, 39 (90.5%) were completed and returned. The survey instrument comprises a Likert scale (consisting of five points) for assessing the degree of impact, alongside a four-point scale for determining the frequency of occurrence of the delay factors. The reliability of the scale was assessed and confirmed through Cronbach's alpha, yielding an average of 0.856, thus affirming the reliability of both the research design and the findings.

Consequently, the primary significant causes of project delays as highlighted by the client, contractor, and consultant include:-

- insufficient and ineffective early planning by the client and consultant (e.g., defining project scope and identifying requirements),
- lack of clarity in the early planning and scoping stages,
- inadequate estimation of activity duration, sequence, and costs by the contractor,
- scheduling errors by the contractor,
- poor communication between the employer and consultant during the design phase,
- insufficient and unclear information in drawings prepared by the consultant,

- delays in the preparation, revision, and approval of drawings and design documents by the consultant,
- Repeated design changes,
- lack of contractor experience in dry port construction,
- inadequate equipment or tools by the contractor, shortage of skilled labor by the contractor, and
- Unrealistic contract duration imposed by the client.
- Additionally, unforeseen circumstances such as encountering hard rocks that disrupt the scheduled project timeline,
- Challenges in obtaining letters of credit for foreign procurement due to currency shortages, were noted.

The primary factors that frequently contribute to delays in the project, as identified by the client, contractor, and consultant, encompass inadequate early planning (including incomplete project requirement definitions and unclear project scope definitions), repeated design chnage, insufficient and unclear details in drawings, delays in revising and approving design documents, poor communication during the design phase, slow drawing preparation and approval, unrealistic contract duration demands on the contractor, ineffective planning and scheduling (encompassing activity sequencing, resource allocation, and project time management), insufficient equipment or tools, financial challenges faced by the contractor, variation orders, lack of skilled labor, discrepancies in contract agreements, improper construction methods employed by the contractor, delays in foreign procurement, and unexpected conditions.

All three stakeholders involved in the project (client, consultant, and contractor) have commonly identified inadequate early planning as a significant issue leading to subsequent challenges like numerous change orders, redesigns, reworks, and insufficient details in drawings. Likewise, the prevalent causes of frequent delays identified by all parties include insufficient early planning, delays in revising and approving design documents, 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 four grouped causes of delay in accordance of their importance are also ranked as, consultant, contractor, external and client related factors.

5.2 Conclusion

The study's overall findings reveal that delays in Dry Port development projects within Ethiopian Shipping & Logistics (ESL) primarily stem from repeated design changes, planning and scoping issues. These are followed by factors related to consultants, contractors, external elements, and client-related delays.

Client-related delays are associated with defining project objectives, scope, and requirements, which can significantly impact project operations. This may manifest during project execution through scope changes, scope creeping, and hope creeping, all stemming from shifts in client expectations leading to change orders, redesigns, and project reworks.

Furthermore, the project's design lacks detailed information, resulting in frequent client and/or contractor change requests. As knowledge sharing and site visits increase, clients are more likely to request design changes. Contractors may also seek changes due to unforeseen conditions or design errors. Moreover, consultants often delay revising and approving designs promptly, leading to approval delays that hinder project progress. Consultants' site staff may lack confidence to issue instructions without consulting top managers, causing further delays in contractor responses.

Ineffective scheduling also contributes to construction delays, with inadequate attention given to activity duration estimation, activity sequencing, and cost estimation by contractors.

5.3 Recommendations

Delays are a part of the construction projects, however, they can be avoided or minimized when their causes are effectively identified and analyzed. Based on the above-mentioned results and findings of this study, the following points can be recommended as ways to minimize and control delay in building construction projects.

5.3.1 Client Related Recommendations

- Ethiopian Shipping & Logistics (ESL) ought to formulate a comprehensive project scope document through engagement with senior management and relevant stakeholders to validate the specific needs and requirements of the owner.
- Adequate time allocation is imperative during the initial phases of project planning to craft a detailed statement of requirements, to ensure that all the needs of owners are incorporated to avoid later interferences by the client.

5.3.2 Consultant Related Recommendations

- It is essential for the consultancy firm to designate a seasoned and competent designer capable of facilitating communication among the design team, project stakeholders, particularly the client, to guarantee the unequivocal clarity of project objectives aligning with client requirements.
- The designer's profound understanding of the port project objectives and future development plans, such as expansion and master planning, is crucial for effective management and coordination of necessary alterations and adjustments during both the design development phase and project execution.
- The consultant must check the contract documents to eliminate all discrepancies before inviting tenders for biddings the projects.
- The consultant 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 drawings are prepared by the contractor is correct and interface to the design.
- The consultant should revise and approve design documents quickly submitted by the contractor.

- The consultant should assure that contractor's planning and scheduling is prepared on the basis of information almost near to fact.

5.3.3 Contractors related Recommendations.

- The contractor must efficiently devise a plan and adhere rigorously to the project schedule.
- The client should enhance the capacity in manpower for effective contract administration and decision-making processes..
- All three parties should convene regularly to exchange information on project performance; challenges encountered, and proposed solutions.

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APPENDIX

Appendix-A-1,Part I:Survey Questionnaire

Addis College School of Graduate Studies

Questionnaire to

Investigating Causes of Delay in Ethiopian Dry Port Construction Projects

Dear Respondents:

My name is TesfayeHagos, I am a post graduate student undertaking a research study on "Investigating Causes of Delay in Ethiopian Dry Port Construction Projects" For the Partial Fulfillment of the Requirements of Master Degree in Construction Technology and Management in Addis College. I request your help to spend some minutes of your time by filing the provided questionnaire.

Please note that, the information provided will kept confidential and used only for academic purpose. Your cooperation in completing the survey questionnaire by providing reliable information is highly valuable and greatly appreciated. Thanking you in advance for giving your time and sharing experience. No need have written your name.

If you have question or look for clarification on the questionnaire;

Name: - TesfayeHagos.

Mobile: 09-13-90-39-74

E-mail: deveking24@gmail.com

SECTION I- GENERAL INFORMATION

Part I: Organizational and Respondents Back ground information (Make tick Mark as √)

1. **Respondent Category**: client ☐ Contractor ☐ Consultant ☐

2. Sex Male ☐ Female ☐

3. Age 20-25 ☐ 26-30 ☐ 31-36 ☐ 37-40 ☐

41-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐

4. Educational Background

TVTE ☐ Diploma ☐ Degree ☐ Masters ☐ Doctorate (PHD) ☐

5. Position/Status in the organization

Senior ☐ Middle level ☐ Lower level ☐ other (specify) ————

5. Work Experience

1-5 Years ☐ 6-10 Years ☐ 11-15 Years ☐ above 16 Years ☐

6. Your Profession in the Project:

Civil Engineer ☐ Mechanical Engineer ☐

Road Engineer ☐ Architect Engineer ☐

Sanitary&water supplyEngineer ☐ Electrical Engineer ☐

Contract Admin. Engineer ☐

Surveyor ☐

Appendix-A-1, Part II. Assessment of Degree of Causes of Delay

(Make tick Mark as √)

Item No.	Five most sever causes of Delay	Degree of Agreement					Frequency of occurrence			
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	High	Medium	Low	Never
		5	4	3	2	1	4	3	2	1
	1.Consultant Related									
	A. Project Management Team									
Coslt.1	Inadequate Construction site supervision by the consultant.									
Coslt.2	Unclear details in drawings									
Coslt.3	Late in approving of change in the work									
Coslt.4	Lack of timely decision									
Coslt.5	Change in specification during construction									
Coslt.6	Lack of effective communication and coordination									
Coslt.7	Unrealistic project cost estimation									
Coslt.8	Conflict between the main parties to the contract									
Coslt.9	Lack of complete definition of project scope.									
Coslt.10	Unrealistic project duration									
Coslt.11	Delay in approving sample materials									
Coslt.12	Lack of proper planning & scoping of the project,									
	B.Designer									
Coslt.13	Defective in design quality such as mistakes, errors, incomplete…									
Coslt.14	Inadequate communication between owner and designer during the design phase									
Coslt.15	Design team experience deficiency/ Lack full investigations									
Coslt.16	Repeated design change									
Coslt.17	Late in revising and approving design document									

Item No.	Five most sever causes of Delay	Degree of Agreement					Frequency of occurrence			
		Strongly Agree	Agree	Neuteral	Dis Agree	Strongly Disagree	High	Medium	Low	Never
		5	4	3	2	1	4	3	2	1
	2. Client Related									
Clt.18	Delay in site handover to the contractor									
Clt.19	Changes issued by client (Variation orders)									
Clt.20	Lack of detailed Master plan of the project									
Clt.21	Inappropriate owner representative management									
Clt.22	Lack of contractual agreement enforcement, i.e., inability to manage & administer the project on contractual basis.									
Clt.23	Selection of the lowest bidder contractor									
Clt.24	Lack of skilled manpower that manage contract administration									
Clt.25	Discrepancies and/or deficiencies in contract agreement document									
Clt.26	Changes in scope of the project									
Clt.27	Unrealistic contract duration imposition to contractor by the client.									
Clt.28	Owner‟s poor communication with construction parties									
Clt.29	Delay in decision making process by owner									
Clt.30	Delay in progress payments by the client									

Item No.	Five most sever causes of Delay	Degree of Agreement					Frequency of occurrence			
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	High	Medium	Low	Never
		5	4	3	2	1	4	3	2	1
	3. Contractor Related									
Cont.31	Inefficient equipment or construction tools									
Cont.32	Contractor financial problems									
Cont.33	Poor site management competence									
Cont.34	Improper construction methodology implementation									
Cont.35	Lack of foreign Currency									
Cont.36	Lack of skilled manpower of contractor(hiring inexperienced technical staff)									
Cont.37	Lack of proper planning and scheduling									
Cont.38	Inaccurate cost estimation (pricing) of the project activity.									
Cont.39	Problems due to construction resources management									
Cont.40	Reworks required due to poor work or the wrong materials used.									
Cont.41	Poor schedule management									
Cont.42	slow supply of materials									
Cont.43	Shortage of Materials in the Market									
Cont.44	Lack of experience of dry port construction by the contractor									
	4. External Factors Related									
Extr.45	Price escalation/Inflation									
Extr.46	Letter of Credit(LC) problem (for imported materials)									
Extr.47	Shortage of construction materials in the market									
Extr.48	Facing Unforeseen conditions (such as hard rock,..)									
Extr.49	Force major									

Appendix A-2: Interview Questions

Section II- In-Depth Interview Questions

Part I: Personal Information questions

- **Please tell me a bit about yourself?**
- **Your position?**
- **Education?**
- **Work experience in the field?**

Question 1 what are the main causes of delay in your construction project?

Question 2 what are the possible solutions to mitigate the delay problems? What are your main duties and responsibilities?

Question 3: What are the contributions of client, contractor and consultant to project delay?

Question 5: Do you have any working procedures to accomplish your task?

Question 4: What should consultant have to do, to avoid project delay cause by itself?

Question 5: What should the client have to do, to minimize project delay?

Question 6: What consultant should have to do, to avoid project delay cause by itself?

Thank you!

Appendix B-1.Client,Contractor&ConsultantSeverity&FrequencyIndices

Item No.	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
	1.Consultant Related	85.1		82.9		83.5		82.6		79.4		77.6	
Coslt.1	Inadequate Construction site supervision by the consultant.	84.6	11.0	86.5	11.0	71.4	27.0	71.4	22.0	60.0	22.0	68.8	52
Coslt.2	Unclear details in drawings	83.1	17.0	76.9	31.0	88.6	6.0	87.5	6.0	75.0	6.0	75.0	37
Coslt.3	Late in approving of change in the work	76.9	35.0	80.8	17.0	87.1	8.0	89.3	4.0	80.0	4.0	71.9	23
Coslt.4	Lack of timely decision	83.1	17.0	80.8	17.0	85.7	10.0	83.9	9.0	75.0	9.0	71.9	37
Coslt.5	Change in specification during construction	75.7	40.0	75.0	33.0	75.7	17.0	66.1	35.0	80.0	35.0	78.1	23
Coslt.6	Lack of effective communication and coordination	89.2	5.0	80.8	17.0	81.4	13.0	87.5	6.0	77.5	6.0	78.1	29
Coslt.7	Unrealistic project cost estimation	83.1	17.0	78.8	26.0	90.0	4.0	85.7	8.0	75.0	8.0	75.0	37
Coslt.8	Conflict between the main parties to the contract	81.5	26.0	86.5	4.0	64.3	38.0	71.4	22.0	80.0	22.0	75.0	23
Coslt.9	Lack of complete definition of project scope.	81.5	26.0	86.5	4.0	72.9	23.0	71.4	22.0	70.0	22.0	71.9	44
Coslt.10	Unrealistic project duration	96.7	1.0	92.3	1.0	81.5	13.0	82.1	11.0	85.0	11.0	78.1	13
Coslt.11	Delay in approving sample materials	90.8	2.0	86.5	4.0	77.1	16.0	76.8	14.0	85.0	14.0	71.9	13
Coslt.12	Lack of proper planning & scoping of the project,	87.7	6.0	86.5	4.0	90.0	4.0	91.1	3.0	92.5	3.0	87.5	2
Coslt.13	Defective in design quality such as mistakes, errors, incomplete…	90.8	9.0	82.7	14.0	91.4	3.0	94.6	2.0	85.0	2.0	84.4	13
Coslt.14	Inadequate communication between owner and designer during the design phase	86.2	10.0	80.8	17.0	82.9	12.0	76.8	14.0	77.5	14.0	78.1	29
Coslt.15	Design team experience deficiency/ Lack full investigations	87.7	6.0	82.7	14.0	87.1	8.0	83.9	9.0	75.0	9.0	78.1	37
Coslt.16	Repeated design change	83.1	17.0	80.8	17.0	98.6	1.0	94.6	2.0	90.0	2.0	90.6	4
Coslt.17	Late in revising and approving design document	84.6	11.0	84.6	11.0	94.3	2.0	89.3	4.0	87.5	4.0	84.4	10

Item No.	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
	2. Client Related	**76.3**		**72.8**		**69.1**		**69.9**		**78.8**		**72.6**	
Clt.18	Delay in site handover to the contractor	67.7	45.0	61.5	49.0	88.6	6.0	82.1	11.0	67.5	11.0	65.6	49
Clt.19	Changes issued by client (Variation orders)	81.5	26.0	73.1	36.0	74.3	19.0	73.2	20.0	85.0	20.0	81.3	13
Clt.20	Lack of detailed Master plan of the project	76.9	35.0	71.2	42.0	74.3	19.0	69.6	28.0	77.5	28.0	75.0	29
Clt.21	Inappropriate owner representative management	84.6	11.0	80.8	17.0	71.4	27.0	60.7	45.0	82.5	45.0	71.9	21
Clt.22	Lack of contractual agreement enforcement, i.e., inability to manage & administer the project on contractual basis.	83.1	17.0	78.8	26.0	62.9	41.0	69.6	28.0	82.5	28.0	71.9	21
Clt.23	Selection of the lowest bidder contractor	80.0	32.0	73.1	36.0	48.6	49.0	58.9	47.0	70.0	47.0	62.5	44
Clt.24	Lack of skilled manpower that manage contract administration	76.9	35.0	73.1	36.0	54.3	45.0	69.6	28.0	85.0	28.0	81.3	13
Clt.25	Discrepancies and/or deficiencies in contract agreement document	72.3	42.0	65.4	46.0	60.0	42.0	60.7	45.0	90.0	45.0	81.3	4
Clt.26	Changes in scope of the project	72.3	42.0	63.5	36.0	70.0	30.0	62.5	42.0	80.0	42.0	68.8	23
Clt.27	Unrealistic contract duration imposition to contractor by the client.	83.1	17.0	80.8	17.0	67.1	34.0	73.2	20.0	85.0	20.0	87.5	13
Clt.28	Owner‟s poor communication with construction parties	75.4	40.0	75.0	33.0	84.3	11.0	82.1	11.0	67.5	11.0	71.9	49
Clt.29	Delay in decision making process by owner	81.5	26.0	86.5	4.0	74.3	19.0	75.0	19.0	87.5	19.0	75.0	10
Clt.30	Delay in progress payments by the client	56.9	49.0	63.5	36.0	68.6	33.0	71.4	22.0	65.0	22.0	50.0	51

Item No.	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
	4. Contractor Related	**80.4**		**80.4**		**63.5**		**67.2**		**82.9**		**78.8**	
Cont.31	Inefficient equipment or construction tools	67.7	45.0	73.1	36.0	64.3	38.0	71.4	23.0	90.0	23.0	84.4	4
Cont.32	Contractor financial problems	86.2	8.0	76.9	31.0	54.3	45.0	64.3	38.0	80.0	38.0	84.4	23
Cont.33	Poor site management competence	81.5	26.0	78.8	26.0	51.4	48.0	62.5	42.0	77.5	42.0	68.8	29
Cont.34	Improper construction methodology implementation	84.6	11.0	78.8	26.0	55.7	44.0	64.3	38.0	77.5	38.0	81.3	29
Cont.35	Lack of foreign Currency	83.1	17.0	84.6	11.0	65.7	37.0	64.3	38.0	90.0	38.0	81.3	4
Cont.36	Lack of skilled manpower of contractor(hiring inexperienced technical staff)	83.1	17.0	82.7	14.0	67.1	34.0	76.8	14.0	87.5	14.0	78.1	10
Cont.37	Lack of proper planning and scheduling	84.6	11.0	86.5	3.0	72.9	23.0	76.8	14.0	90.0	14.0	87.5	4
Cont.38	Inaccurate cost estimation (pricing) of the project activity.	84.6	11.0	88.5	2.0	67.1	34.0	67.9	33.0	90.0	33.0	81.3	4
Cont.39	Problems due to construction resources management	76.9	35.0	80.8	17.0	64.3	38.0	62.5	42.0	85.0	42.0	75.0	13
Cont.40	Reworks required due to poor work or the wrong materials used.	72.3	42.0	67.3	45.0	58.6	43.0	55.4	49.0	77.5	49.0	84.4	29
Cont.41	Poor schedule management	83.1	17.0	80.8	17.0	71.4	27.0	76.8	14.0	92.5	14.0	75.0	2
Cont.42	slow supply of materials	81.5	26.0	86.5	3.0	70.0	30.0	71.4	22.0	75.0	22.0	78.1	37
Cont.43	Shortage of Materials in the Market	66.2	47.0	75.0	33.0	72.9	23.0	69.6	28.0	75.0	28.0	68.8	37
Cont.44	Lack of experience of dry port construction by the contractor	90.8	2.0	84.6	11.0	52.9	47.0	57.1	48.0	72.5	48.0	75.0	43

Item No.	Delay Factors	Client				Contractor				Consultant			
		SI	Rank	FI	Rank	SI	Rank	FI	Rank	SI	Rank	FI	Rank
	6. External Factors Related	**77.5**		**72.7**		**74.3**		**66.8**		**76.5**		**74.4**	
Extr.45	Price escalation/Inflation	76.9	35.0	73.1	36.0	75.7	17.0	69.6	28.0	70.0	28.0	59.4	44
Extr.46	Letter of Credit(LC) problem (for imported materials)	86.2	8.0	78.8	26.0	70.0	30.0	67.9	33.0	70.0	33.0	71.9	44
Extr.47	Shortage of construction materials in the market	66.2	47.0	69.2	43.0	74.3	19.0	66.1	35.0	77.5	35.0	78.1	29
Extr.48	Facing Unforeseen conditions (such as hard rock,..)	78.5	34.0	69.2	43.0	72.9	23.0	66.1	35.0	95.0	35.0	93.8	1
Extr.49	Force major	80.0	32.0	73.1	36.0	78.6	15.0	64.3	38.0	70.0	38.0	68.8	44

Appendix -B.2 Importance Index

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
	1.Consultant Related					
	A. Project Management Team					
Coslt.1	Inadequate Construction site supervision by the consultant.	73.71	76.43	56.34	27	consultant
Coslt.2	Unclear details in drawings	83.43	80.71	67.34	9	consultant
Coslt.3	Late in approving of change in the work	81.71	82.14	67.12	11	consultant
Coslt.4	Lack of timely decision	82.29	80	65.82	13	consultant
Coslt.5	Change in specification during construction	76.67	72.14	55.30	30	consultant
Coslt.6	Lack of effective communication and coordination	83.42	82.85	69.12	7	consultant
Coslt.7	Unrealistic project cost estimation	84	80.71	67.8	8	consultant
Coslt.8	Conflict between the main parties to the contract	74.28	77.85	57.83	26	consultant
Coslt.9	Lack of complete definition of project scope.	75.42	77.14	58.18	23	consultant
Coslt.10	Unrealistic project duration	87.87	85	74.69	5	consultant
Coslt.11	Delay in approving sample materials	84	79.28	66.6	12	consultant
Coslt.12	Lack of proper planning & scoping of the project,	89.71	88.57	79.46	2	consultant
	B. Designer					consultant
Coslt.13	Defective in design quality such as mistakes, errors, incomplete…	89.71	87.86	78.82	3	consultant
Coslt.14	Inadequate communication between owner and designer during the design phase	82.85	78.57	65.10	13	consultant
Coslt.15	Design team experience deficiency/ Lack full investigations	84.57	82.14	69.47	6	consultant
Coslt.16	Repeated design change	90.85	88.57	80.47	1	consultant
Coslt.17	Late in revising and approving design document	89.14	86.43	77.05	4	consultant

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
	2. Client Related	74.02	71.59	53.19	35	
Clt.18	Delay in site handover to the contractor	76	70.71	53.74	33	client
Clt.19	Changes issued by client (Variation orders)	79.42	75	59.57	22	client
Clt.20	Lack of detailed Master plan of the project	76	71.43	54.28	32	client
Clt.21	Inappropriate owner representative management	78.85	70.71	55.76	28	client
Clt.22	Lack of contractual agreement enforcement, i.e., inability to manage & administer the project on contractual basis.	74.85	73.57	55.07	31	client
Clt.23	Selection of the lowest bidder contractor	65.14	65	42.34	48	client
Clt.24	Lack of skilled manpower that manage contract administration	69.71	73.57	51.28	40	client
Clt.25	Discrepancies and/or deficiencies in contract agreement document	71.43	67.14	47.96	45	client
Clt.26	Changes in scope of the project	73.14	64.28	47.02	46	client
Clt.27	Unrealistic contract duration imposition to contractor by the client.	77.14	79.28	61.16	19	client
Clt.28	Owner‟s poor communication with construction parties	77.14	77.14	59.51	21	client
Clt.29	Delay in decision making process by owner	80	79.28	63.43	15	client
Clt.30	Delay in progress payments by the client	63.43	63.57	40.32	49	client

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
	4. Contractor Related	74.20	74.74	55.62		
Cont.31	Inefficient equipment or construction tools	71.42	75	53.57	34	contractor
Cont.32	Contractor financial problems	72	73.57	52.97	36	contractor
Cont.33	Poor site management competence	68.57	70	48	44	contractor
Cont.34	Improper construction methodology implementation	71.42	73.57	52.55	38	contractor
Cont.35	Lack of foreign Currency	77.71	75.71	58.84	24	contractor
Cont.36	Lack of skilled manpower of contractor(hiring inexperienced technical staff)	77.71	79.28	61.61	18	contractor
Cont.37	Lack of proper planning and scheduling	81.14	82.85	67.23	10	contractor
Cont.38	Inaccurate cost estimation (pricing) of the project activity.	78.85	78.57	61.95	17	contractor
Cont.39	Problems due to construction resources management	73.71	72.14	53.18	35	contractor
Cont.40	Reworks required due to poor work or the wrong materials used.	68	66.42	45.17	47	contractor
Cont.41	Poor schedule management	80.57	77.85	62.73	16	contractor
Cont.42	slow supply of materials	75.43	78.57	59.26	22	contractor
Cont.43	Shortage of Materials in the Market	70.86	71.42	50.61	42	contractor
Cont.44	Lack of experience of dry port construction by the contractor	71.43	71.42	51.02	41	contractor

Code	Delay factors	Indices			Rank-II	Cause Related to
		SI	FI	II		
	6. External Factors Related	76	70.71	53.77		
Extr.45	Price escalation/Inflation	74.86	68.57	51.33	39	external
Extr.46	Letter of Credit(LC) problem (for imported materials)	76	72.85	55.37	29	external
Extr.47	Shortage of construction materials in the market	72	70	50.4	43	external
Extr.48	Facing Unforeseen conditions (such as hard rock,..)	80	73.57	58.85	23	external
Extr.49	Force major	77.14	68.57	52.89	37	external

Appendix C-1: Effects of delay on ESL Dry Port infrastructure construction projects.

No	Project name	Original contract amount	Original contract time in Calendar days	Time elapsed delays in Calendar days	Total delayed time in Calendar days	Total delayed time in %	Remark
1	Dire-Dawa port and terminal construction project	70 Million USD	365	755	390	106.85	Delay and cost Overrun
2	Dire-Dawa Access road construction project (Rigged Pavement)	10 Million USD	300	610	310	103.33	Delay and cost Overrun
3	Modjo port and terminal construction	500 Million ETB	455	2180	1725	379.12	Delay
4	Mekelle port and terminal Terminal Maintenance	50 Million ETB	180	340	160	88.89	Delay
5	Mekelle port and terminal Where house construction	47 Million ETB	210	420	210	100.00	Delay and cost Overrun
6	ESL head office building construction	900 Million ETB	700	5840	5140	734.29	Delay, cost Overrun and Termination/Dispute
7	Old maritime G+ 6 building Renovation project	200 Million ETB	365	1460	1095	300.00	Delay
8	Djibouti Guest house and MTS office building renovation project	10 Million USD	120	395	275	229.17	Delay
9	Woreta dry port infrastructure building	200 Million ETB	150	210	60	40.00	Delay
Average Delay in %						**231.29**	