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SCHOOL OF GRADUATE STUDIES

DETERMINANTS OF CONTAINER TERMINAL EFFICIENCY: A CASE STUDY ON MODJO DRY PORT

BY:

MELESECH WONDMNEH

JUNE, 2023

ADDISABABA, ETHIOPIA

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APPROVED BY BOARD OF EXAMINERS

_____	_____
Dean, School of Business	**Signature & Date**
_____	_____
Research Advisor	**Signature & Date**
_____	
External Examiner	**Signature & Date**
_____	_____
Internal Examiner	**Signature & Date**

DECLARATION

I, the undersigned, hereby declare that this thesis is my own original work prepared under the guidance of my advisor, **Dr. Nibretu Kebede**. The sources of materials used for the thesis have been duly acknowledged. Furthermore, I confirm that the thesis has been produced for the first time; and it was not submitted either in part or in full to any other higher education institutions for the purpose of earning any degree.

Melesech Wondmneh _____

Name **Signature**

St. Mary University, Addis Ababa **June, 2023**

ENDORSEMENT

This thesis has been submitted to St. Mary University, school of graduate studies for examination with my approval as a university advisor**.**

_____ _____

Advisor **Signature**

St. Mary University, Addis Ababa **June, 2023**

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CC: Custom clearance

CTE: Container terminal efficiency

DW: Durbin-Watson

ESLSE: Ethiopian shipping & logistics service enterprise

HE: Handling equipment

HT: Holding truck

IMF: International Monetary Fund

INF: Infrastructure

MTS: Multi-Trailer System

SPSS: Statistical package for social science

TEU: Twenty equivalent units

TTU: Tractor-Trailer Unit

UN: United Nations

UNCTAD: United Nations Conference on Trade and Development

UNESCAP: United nation economic & social commission for Asia & the pacific

VIF: Variance inflation factor

WMS: Warehouse management systems

WO: Warehouse operation

Abstract

The Modjo dry port of Ethiopia is serving as a safe location that handles, temporarily stores, inspects, and clears customs on cargo travelling in international trade. This study aimed to examine the key determinants of container terminal efficiency in Modjo dry port. The study used an explanatory design with a descriptive survey method, adopting both quantitative and qualitative approaches. Data were gathered from 240 respondents using questionnaire. Both primary and secondary data were collected, and data analysis was performed using descriptive and inferential statistics with the help of SPSS and MS Excel. The findings showed that Warehouse operation has the highest mean score of 3.957 followed by handling equipment (3.941), infrastructure (3.929), Custom clearance (3.924) and holding truck has the lowest mean score of 3.786. Moreover, the multiple linear regression analysis showed that the independent variables have a statistically significant contribution to container terminal efficiency (R^2*=0.758, P=<0.001). The regression coefficient for handling equipment was the highest (β = 0.465) followed by holding truck (β =0.241), custom clearance （β =0.162), infrastructure (β = 0.137), and warehouse operation (β =0.088). Ethiopian Shipping and Logistics Service Enterprise (ESLSE) shall invest in upgrading their handling equipment and holding trucks, provide quick maintenance services to minimize downtime and increase container terminal efficiency.*

Keywords: container terminal efficiency, handling equipment, warehouse operation, holding truck, port infrastructure and custom clearance.

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

Economic growth is crucial for every society in the world. Economic growth is necessary for development, and more rapid growth is thought to be a favorable sign of more access to global markets. In order to link global value chains and take advantage of trade prospects for growth and poverty reduction, reliable logistics is essential. According to (Verhetsel, A., Kessels, R., Goos, P., Zijlstra, T., Blomme, N., Cant, J., 2015) contend that poor logistics performance can cut off a nation from international trade.

Although maritime transportation is still considered the most sustainable mode of transportation, new environmental and social standards like green terminals and using green sources of energy, force the transition of this industry to an even more sustainable one (Amir Hossein Gharehgozli, Debjit Roy, and René de Koster, 2016). These trends will eventually demand that container terminals redesign their layouts to satisfy such standards and requirements. Container terminal layout influences the performance of the terminal and the amount of equipment used in it (Taner, M.E., O. Kulak, and M.U. Koyuncuoğlu, 2014).Thus, closer attention to layouts and handling systems used to move containers is the key (Gharehgozli, A., Y. Yu, R. de Koster, and S. Du., 2019)

In addition to their historic function as hubs of economic activity, ports now play a significant role in multimodal transport networks and international supply chains in the current highly competitive corporate environment typified by complex and quick-moving global supply chains. By integrating themselves into value chains, ports are enhancing the value of shipments that are in the port area. Numerous ports are being seen more and more as integral and interconnected nodes in the supply chains of their clients. Ports are essential to this industry's effective and efficient operation. Ports carry out a variety of tasks, including customs clearance and control, container handling, stuffing and unstuffing, and acting as storage and distribution facilities. (Worldbank, 2014)

Ports are under pressure to increase productivity and cut expenses in this setting in order to maximize economic profits (Tareg *et al.*, 2021). To meet the rising demand for containerized freight, more intermodal infrastructure must be installed in the port. The way multimodal transportation infrastructure is developed to handle freight has a significant impact on transportation costs and turnaround times (Mohammad Ghane-Ezabadi, 2016). Developing and improving this infrastructure are important elements of the port strategy, which help to increase efficiency (UNCTAD, 2019).

Lack of direct sea access creates rising obstacles to global integration and progress for this and other landlocked developing nations. According to (Amare Tigabu,2020, Hilemariam Abera, 2020, Sileshe Alebachew,2020…),The problem becomes worse in a landlocked nation like Ethiopia. Landlocked refers to the geographical situation of a country without direct access to the sea. According to the definition there are 44 landlocked countries in the world and of these, the United Nations lists 32 as landlocked developing countries (LLDCs) that are low and middle income countries based on the World Bank country classification with a population of nearly 440 million. Ethiopia, as one of a landlocked country, has established its trade route along the Ethio Djibouti corridor. (Arvis *et al.*, 2014).

Their foreign trade relies on transit through other nations because they don't have direct access to the sea. Additionally, lengthier travel times to global markets, complicated transit procedures, and poor infrastructure all raise the cost of commerce and transportation, decreasing foreign trade and therefore economic growth. (Arvis, D.S., L. Ojala, B. Shepherd, C. Busch & A. Raj, 2014). Physical isolation, supply chain constraints from the sea, and the high expenses of doing business with the rest of the world are all ongoing challenges for landlocked country's (Wornalkiewicz W and Kutsenko M, 2020).

According to, the dry port container terminals serve as the foundation for defining the effectiveness of global supply chains. There is growing worry over the expanding share of road transportation among other modes of transportation because of the sophisticated, intensive road transportation networks that offer door-to-door service and flexibility in routing and planning.

Ethiopia, a landlocked nation, has constructed the Ethio-Djibouti corridor as its trade route. A major sea outlet, the Ethio-Djibouti corridor is located 925 kilometers from Addis Ababa. It is the principal freight-dominated route for Ethiopia's import and export trade. Increased demand for container freight, a standardized package that allows for quicker handling of cargo and lowers the risk of harm to the subject cargo, is a result of Ethiopia's economic expansion. However, the rise in containerization has brought forth a number of difficulties, including increased demands on terminals, towns, and communities. Solutions to expand capacity include physical enlargement or better resource usage, coordination of dwell time, development of employee capacity, and alleviation of congestion and bottleneck issues that limit the inefficiency of the terminal.

Ethiopia has proceeded to develop multiple inland dry ports in various parts of the country in response to the constantly increasing volume of cross-border trade. Around eight dry ports were established in various parts of the nation to take advantage of inland ports like Modjo/Adama, Semera, Kombolcha, Dire Dawa, Mekele,Woreta, gelan, and Comet (Addis Abeba) and customer's bonded warehouse for containers cargo in order to address the challenges associated with sea disconnectedness (landlocked).

The effectiveness of the container terminal at the Modjo dry port is the focus of this study. Modjo dry ports have been start operations in Ethiopia the first half of 2009. It is located at Modjo, nearly 75 km East of Addis Ababa (ESLSE Magazine, 2019).The majority of the nation's exports are made possible through this port. A more centralized distribution point can be made by using dry ports and terminals to accelerate the flow of cargo between sea ports and significant land transportation networks. It is crucial to understand the variables that affect dry port logistics obstacles to maximize the benefits from those dry ports' efficient and effective logistics performance.

1.2. Statement of the Problem

The significant difficulty that importers and exporters face when it comes to making logistical arrangements is characterized by poor logistics service provision and a lack of coordination of goods transport, low level of port infrastructure development and insufficient fleets of freight vehicles in terms of number and capacity, poor cargo management at both sea and dry ports, which results in damage and quality deterioration of goods during handling, transport, and at the point of sale.

Ethiopia, like many countries in Sub-Saharan Africa, is enjoying a period of rapid growth in the past decade and within this period, the country international trade has grown rapidly. However, like other land locked developing countries lack of direct sea access imposes growing challenges to global integration and growth (Fekadu, 2013). As a result, the nation was exposed to factors such as high transit transportation costs, technical and technological capacity constraints, imported inflation, a lack of investable resources, and insufficient domestic financial resource mobilization to finance the massive investments required for rapid expansion. In addition to these problems, the country's poor logistics raise prices in home markets and lower its capacity to compete internationally. (IMF, 2014).

The Modjo container terminals dry port started with a capacity of only 700 containers at a time, but today it can accommodate 14,000 containers at once, with 1000 containers coming in and going out each day, and it has a share of about 76% of Ethiopia's import-export destinations. (2017, ESLSE Annual magazine). However, as the number of containers handled increase from time to time, the terminal's effectiveness in providing the service is deemed inadequate by a variety of stakeholders, beneficiaries, and terminal operators.

More port staff members and clients have voiced complaints about congestion as a result of inefficient performance trends in container delivery times, container handling equipment, container holding trucks, advanced ICT terminal management systems, lengthy customs clearance procedures, terminal warehouse operations, port infrastructure, and other issues. These issues are said to be the main contributors to slow operational processes and consequent terminal congestion.

As was mentioned above, there are numerous factors that can influence a terminal's inefficiency; however, for the purposes of this study, only a small number of these factors were taken into account as independent variables, including container handling equipment, port infrastructure, holding trucks, warehouse operations, and customs clearance. According to this Most of the studies on dry port determinants is positively correlated with container terminal efficiency has proponents by using descriptive design in the empirical literature (Abdurazak, 2016 & Hailemariam, 2020).

The problem has not been solved yet; the researcher motivated to do this study by identifying the significance level of the effect of each determinant by showing the cause and effect relationship. The study has focused on the problem related to independent variables of container terminal efficiency.

1.3. Research Questions

This research was tried to address the following research questions:

- What is the impact of container handling equipment on container terminal efficiency?
- What is the effect of warehouse operation on container terminal efficiency?
- To what extent container holding trucks affect container terminal efficiency?
- What is the influence of port infrastructure on container terminal efficiency?
- What is the effect of custom clearance on container terminal efficiency?

1.4. Objective of the Study

1.4.1. General Objectives of the Study

The general objective of this research was investigated to determinants of container terminal efficiency at Modjo Dry Port, Ethiopia.

1.4.2. Specific objectives

- To test the impact of container handling equipment on container terminal efficiency
- To determine the effect of warehouse operation on container terminal efficiency.
- To investigate the effect of container holding truck on container terminal efficiency.
- To examine the influence of port infrastructure on container terminal efficiency.
- To analyze the effect of custom clearance on container terminal efficiency.

1.5. Significance of the Study

The findings of this study on the determinants of container terminal efficiency at Modjo Dry Port have significant implications for various stakeholders in the logistics sector. The Ethiopian Shipping and Logistics Service Enterprise (ESLSE) and other container port operators can benefit from a better understanding of the factors that influence container terminal efficiency. Additionally, the study's findings and recommendations can inform decision-making and policy development at Modjo Dry Port and serve as a starting point for future research on container terminal efficiency in Ethiopia and beyond.

1.6. Scope & Delimitation of the Study

The objective of this study is to empirically examine the determinants of container terminal efficiency at Modjo dry port. To this end, achieve the research's objectives, the scope of this study is delimit as follow;

Conceptually, this study is delimit to the five independent variables that affect the Modjo dry port container terminal efficiency such as handling equipment, warehouse operations, holding trucks, infrastructure & custom clearance. Methodologically, delimit to descriptive & explanatory research design. Geographically, delimit to the one major branches out of eight branches, of Ethiopian Shipping and Logistics Service Enterprise. Finally the questionnaires were distributed to container terminal operator, Modjo Administrative staff, freight forwarders, and transporters.

1.7. Definition of Terms

Dry port: A dry port is an inland intermodal terminal serving as a hub for the transshipment of maritime cargo to interior locations. It is immediately connected to a seaport by road or rail. (Erica *et al*, 2020)

Port Efficiency: refers to the regularity and speed of port services. Most shippers cited "on-time delivery" as a top issue in fast-paced businesses where products must be delivered to markets on time. (Notteboom *et al*., 2022)

Multimodal: It is a method for moving goods using at least two different modes of transportation in accordance with a multimodal transport agreement from a location in one nation where the multimodal transport operator picks up the items to a delivery location in a different country. (UNESCAP)

Container: Containers are steel boxes with specified dimensions that are used as cargo carriers. They may be loaded and unloaded, stacked, efficiently transported over long distances, and transferred from one method of transportation to another without being opened, including container ships, rail, and semitrailer vehicles. (Jean-Paul Roderigue, 2020)

Container Terminal: A container terminal is a location where several container ships are frequently berthed side by side. Each ship is serviced by a number of quay cranes, which are supported by numerous yard cranes in the yard. (Jean-Paul Roderigue, 2020)

Operational Efficiency: The efficiency of a port's operations is usually measured by how quickly the cargo is transferred from the ship's yard to the exit gates. (Notteboom *et al*., 2022)

Container Dwell Time: The time it takes for a container to be picked up at a marine terminal after being discharged from a ship (Radifan Hassan *et al*., 2019)

Demurrage: Expenses are increased if the complete container is not removed from the port or terminal for unpacking within the allowed free days provided by the shipping company. (Hariesh Manaadiar,2012)

Loading/unloading: refer to the activities of loading or unloading cargo between any location or point of rest on a dock or terminal and rail cars, trucks, or any other kind of land transportation, as well as ships. (Jean-Paul Roderigue, 2020)

Cargo in Transit: refers to a shipment that is being transported by land from a point of origin to another nation across international borders. (Hariesh Manaadiar,2014)

Equipment: Crane, forklift, reachstacker, empty container handler, TTU and others machines used in the terminal.

Port infrastructure: The base for port operations to serve the vessel, cargo and passengers which pass through ports (Jean-Paul Roderigue, 2020).

Gate: a location in an intermodal terminal where all containers and trailers are checked in and out by a clerk. At the gatehouse, all reservations and documentation are inspected. (IANA)

Lead-time: is the speed at which activities are performed. This term gained more attention by the introduction of just-in-time production, where it is defined as the time that elapses between the start of a process and its completion. (Will Kenton, 2022)

1.8. Organization of the Research Report

The research report is consists of five chapters and it organized as follows. The first chapter is an introductory part in which background of the organization, statement of the problem, basic research questions, objectives of the study, research hypothesis, significance of the study, scope of the study, limitation of the study and definition of terms was present. In chapter two of this research is review of both theoretical and empirical literature on the determinants of container terminal efficiency of dry port. Subsequently, methods of the study are present in chapter three. Then, chapter four is analyses and interprets the finding of the study by using Multiple linear regression for 5 point Likert scale data. Finally, on Chapter 5, the main findings of the study are summarized and conclusions draw based on the results of the study and was forward appropriate recommendation.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter reviews relevant literature both about the topic of the research with dependent and independent variables on the dry port container terminal. Different types of researches on dry port container terminal efficiency were reviewed for this study. The frame of reference of this research project was guide by the problem and purpose. Hence, it was consider relevant in this research to review theory related to determinants of container terminal efficiency. For the purposes of this research project, the review was concentrating on the aspects of determinants on the dry port concept: Finally, the study looked at the hypothesized variables, conceptual framework, empirical review, research gap and summary.

2.2. Theoretical Literature Review

Today's global economy depends significantly on a country's capacity to provide and receive goods and services at the appropriate time and cost. Logistics services, which encompass various task needed for the transportation, storage, and handling of raw materials for production and finished goods from producers to consumers, are vital to global trade. Therefore, the effective provision of logistics services aid in the facilitation of global trade. Therefore, items can be delivered from the site of production to the point of consumption more efficiently and reliably the more timely, dependable, and efficient the logistics supply chain. (Tilahun, 2014).

2.2.1. Drivers behind the Emergence of Dry Ports Container Terminal

Sustainable access to hinterland sites, restrictions at the seaports, and a way to facilitate economic zones that are thought of as nodes in the supply chain are the main forces behind the development of dry ports. (Venstra,A.,Zuidwijk,R.& van Asperen,E., 2011). Several gateway ports are now constrained in their ability to develop because to scale constraints, environmental concerns, and a lack of available land. (Roso, V.Woxenius,J and Lumsden.K, 2009) In light of these limitations, the majority of seaports have invested in the creation of dry ports as a means of relieving loads and enhancing operations via a modal slip. Another motive for building dry ports

is to improve hinterland connectivity in order to obtain a competitive advantage. (John Gattorna and friends, 2009)

The transnational freight transport industry is fueled by the long-term support of expanding global trade and globalization. This is evident in the sector's innovations in management, supervision, and technology. Given the significant increases in container ship size (Cullinane,R.Berguqvist&G.Wilmsmeier(eds), 2006), the rationalization of cargo handling operations in pursuit of greater efficiency, and the requirement to reorient the marketing of port services for strategic positioning within inherently competitive supply chains, rather than simply within essentially captive hinterlands (Robinson,R., 2002).

Foreign trade has practically continued to grow unabated despite numerous circumstances of traffic and backups in and around ports that must impede the pace of what is otherwise an inexorable growth. The container terminal port industry sector itself and the agencies such as both governmental and others which influence its performance have responded to this constantly changing environment and the challenges it poses in a good and successful manner.

However, it is inevitable that the construction of transportation routes and related infrastructure to ease access to ports lags behind the ports' own responses to the challenges they periodically face. Furthermore, the availability of adequate warehouse operations within ports is a major challenge, particularly for those ports in conventional locations, such as close to or actually inside of suburban or metropolitan regions.

The establishment of a workable solution that resolves the potential conflicts between the need for capacity expansion, environmental concerns, community constraints (not the least those imposed by the geography of a port), and the continued integration of freight transport and logistics functions within integrated supply chains is crucial for facilitating the future evolution of container terminal ports.

The idea of a "dry port" is one projected result that is emerging more frequently both in practice and as a distinct area of study in the relevant literature.

2.2.2. The concept of Dry Port Container Terminal

Many authors have defined the term "dry port," and the meanings show the broad view of the idea from various angles. A dry port is a facility for multiple users with public authority status. It has fixed installations and provides services for the handling and short-term storage of various types of cargo, including containers. (Danilo Stefano & Erica Varese, 2020) In this case, the task is completed through customs transit utilizing any applicable method of transportation that is subject to customs control, as well as with customs and other agencies qualified to clear products for home use, warehousing, temporary admissions, re-export, temporary storage for further transit, and outright export. (UNCTAD, 2022).

A dry port is a specifically designated inland facility for the distribution and consolidation of commodities that performs duties similar to those of a seaport and offers customs clearing services.

Modern seaports and dry ports perform much of the same tasks, especially when it comes to their roles as distributional hubs for multimodal supply chains. Customers can pick up or drop off their containers at a dry port as if they were doing so in a seaport. A dry port is an inland intermodal terminal that is directly connected to one or more seaports. It has a high capacity transport option, most likely rail. (Rosmarzura, 2022).

A dry port can be thought of as an inland location with cargo-handling facilities to support a variety of operations, such as cargo distribution and consolidation, container temporary storage, customs clearance, connections between various transport modes, and the gathering of both private and public institutions that facilitate interactions between various supply chain stakeholders.(Theo Notteboom, Athanasios Pallis and Jean-Paul Rodrigue, 2022) Generally speaking, a dry port is a terminal with direct access to a seaport in a landlocked nation that provides services for handling and temporary storage of any type of goods placed under customs, where customers can pick up their shipments after receiving clearance.

The main purpose of a dry port is to extend the reach of a seaport into the hinterlands in order to operate in "big clearance" mode. This simplifies and standardizes inter-customs declaration processes by enhancing the inspection process inside the clearance procedures. There is no need for additional inspection at the seaport because the importer's or exporter's goods can be declared and discharged at the dry ports. The system is known as "One Checking." The public sectors include customs, inspection and quarantine, port agents, while private sectors include the shipping lines, more specifically inland freight transport companies, seaports, shipping lines, freight forwarders, and Container Freight Station (CFS) operators. The dry ports' functions are completed by these public and private sectors. (Kormilitsyn, 2020)

The following major categories can be used to categorize activities in the dry port: receiving and distributing goods, truck operations, loading and unloading cargo/containers onto and off of trains, Customs clearance, security inspections at the gates, Keeping containers and cargo in storage Communication and information exchange, data storage and record keeping, billing, and cash collection. (Nguyen, 2021)

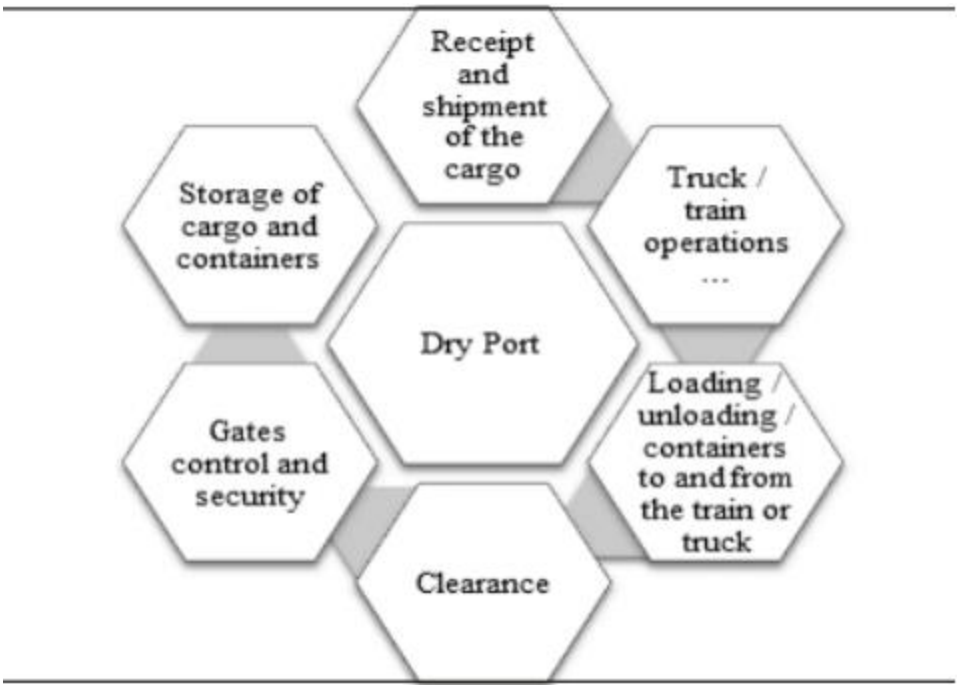

Figure 1 Dry port functions (Hayut, 1980; (Notteboom and Rodrigue, 2009; UNCTAD,1991).

2.2.3. Importance of Dry Port Container Terminal

According to (Charif Mabrouki, 2014), the benefits of dry ports for seaports include reducing traffic at entry points, facilitating inventory management, having a favorable impact on storage costs, increasing the capacity of storage for goods, and facilitating and speeding up service. Reduce storage costs, shipping costs, and access to seaports for shippers. Develop commercial transport flows for the benefit of the nation (society), greater advantages for landlocked nations, and more employment opportunities near the dry port.

As per study conducted by (UNCTAD, The Triad In Foreign Direct Investment, 1991), the potential benefits of dry port container terminals summarized as follow:

Improved communications: A dry port can be provided in conjunction with computerized freight tracking or customs clearance to facilitate the simple, quick transmission of documents and information that is essential for effective cargo movement. Speed up the distribution of the commodities' inland transportation infrastructure and the transit of cargo between ships. As the import and export of goods become speedier, this helps keep dry ports as major central distribution hubs.

Benefits to seaports: The construction of dry ports relieves congestion while also reducing the handling of cargo at nearby maritime ports. Due to faster onward transit, there is a decrease in the need for storage space, which results in savings on equipment maintenance expenses as well as capital expenditures associated with providing handling equipment and warehousing. Maritime ports benefit from higher berth throughput as a result of increased containerization of transit freight, which also lowers the cost per unit of cargo handled.

Lower customs staff costs: As dry ports allow customs clearance to be concentrated at a few sites, it may be possible to affect the same volume of clearance with reduced customs involvement, especially where a dry port accessed by two or more gateway ports.

Greater use of containers: the establishment of a dry port with container-handling facilities can encourage greater use of containers. Containerization of cargo carried in boxes of standard dimensions that allow the containers to handle mechanically, transferred from one mode of

transport to another. Efficiently and without disturbing the actual cargo inside, owing to high unit volume and weight handled per move, the productivity of handling equipment and through puts is many times greater than if the same volumes of cargo were handle in break-bulk fashion.

Better utilization of capacity: By serving as a center for the consolidation of return loads of export cargo, a dry port can lessen the number of empty rail wagon or truck movements. Consignment load factor increases may allow for some transportation cost reductions.

Avoidance of storage, demurrage, and late documentation fees: In conventional transit networks, products were frequently held up at land borders or at marine ports. And in all of these situations, storage fees beyond the permitted free periods may accrue, or demurrage fees and late documentation fees may arise, due to the absence of documentation (such as ocean bills of lading or commercial invoices), minor irregularities in existing documentation, prepayment of handling charges in foreign currency, lapse of a bond, non-availability of onward transport, etc.

Customs inspection at maritime ports and at the borders of transit nations should be unnecessary or at least considerably reduced with a dry port and unified transport bills of lading, and many of the common reasons for delays at maritime ports would be eliminated. Therefore, there won't be any storage cost, demurrage charges, or late documentation fees.

Avoidance of clearing and forwarding agents' fees at seaports: Where a dry port permits the use of integrated transport bills of lading or multi-modal transport documents, these expenses may be entirely avoided. When a shipping line issues such documents, it does so because it assumes liability for the movement of the cargo through the port. As a result, neither the importer nor the exporter needs to hire a clearing and forwarding agent.

Increased trade flows: Advantageous for an area or for the nation as a whole.

Lower door-to-door freight rates: Consignment consolidation and increased containerization are two factors that can drastically lower through rates. Containerization has a lot of benefits.

2.2.4. Dry Port Container Terminal Classification

As per study conducted by (Roso, V.Woxenius,J and Lumsden.K, 2009), the classification of dry port container terminals summarized as follows:

Close dry ports /Satellite Container Terminal less than 50KM to seaport are to relieve the seaports from the burden of space shortage, congestion, and environmental issues. With abundant land, available, all high space-consuming activities, such as warehousing or sorting, shifted from seaports to dry ports. The customs clearance procedures could be carry out in these close dry ports.

Mid-range dry port/ Freight Distribution Clusters (Load Centers) distance to seaport between 50 and 500 KM from a seaport serve as a point of consolidation for various rail services, signifying the administrative and technical tools necessary for maritime transport. In order to aggregate or consolidate cargo from shippers, they function as intermodal facilities. Before freight is transported to its intended markets, it can also serve as a trans-modal/trans-loading terminal.

Distant dry port / distance to seaport more than 500 kilometers Tran-shipment. More than 500 kilometers separate the distant dry port and the seaport cargo in transit. The benefits of this form of dry port are as follows: long-distance transportation; Reduced traffic congestion has a significant influence in lowering transportation costs and having a detrimental effect on the environment.

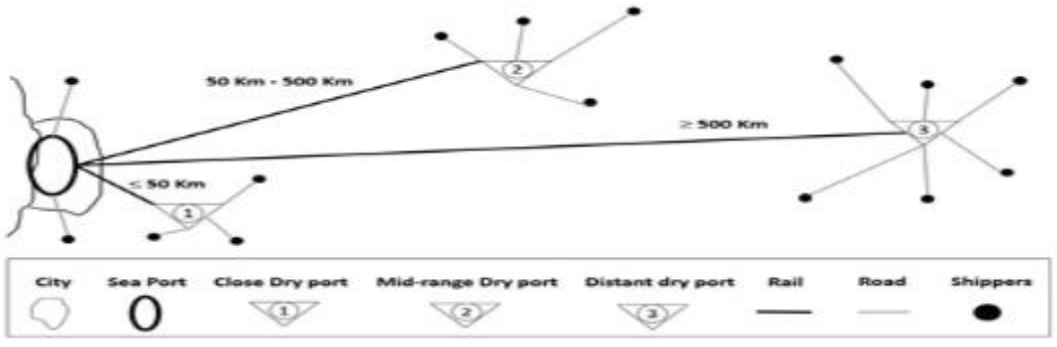

Figure 2 Dry port types (Rose et al, 2009)

2.3. Determinants of container terminal efficiency

2.3.1. Container handling equipment

The dry port facility will need to have specialist equipment on hand to transport containers boxes from trucks/rail to container yards and back. Numerous loading/discharge appliances, such as stevedore pallets, hand trucks, hydraulic hand lift trucks, pallet trucks, and forklift trucks, will be included in the equipment/machinery needed. (Brinkmann and Birgit, 2011)

Similar to seaports, dry ports also use equipment for handling containers, such as reachstackers, forklifts, top handlers, side handlers, rubber-tired gantry cranes, and mobile cranes. Container handling equipment is typically regarded as the primary handling equipment for both dry ports and seaports, and it has a significant impact on both the capabilities for processing containers and, consequently, the operation of the dry port.

Container Cranes: Container cranes are one of the most important handling equipment which is used to lift containers box on and off ships by using a long horizontal arm called a ‘boom’ that is part of the crane which can reach over the container ship. The crane's driver or operator is seated in a glass cabin that is attached beneath a trolley that is located near the top of the crane. To get above the container it wishes to take up, the operator or driver can move the cabin and trolley along the boom.

Figure 3 Container crane

Straddle Carriers: One kind of unregistered vehicle used to transport container boxes inside a container terminal is a straddles carrier. Container cranes are used at the port to move the boxes of the containers toward or away from the dock. The holding trucks that carry export containers into the port or import containers that go by road to enterprises in the country can also be loaded or unloaded using straddles. The driver or operator of the straddles sits in a glass cabin at the top of the vehicle facing the middle so they can see everything around them, much like the container crane. In contrast to most cars, the driver sits perpendicular to the direction of travel. The operator uses computers to tell them which containers box they need to pick up. (Brinkmann and Birgit, 2011)

Figure 4 Straddle Carrier

Reachstackers: are off-road handling equipment trucks used to carry containers waiting to switch from one mode of transportation to another, such as from a rail wagon to a truck. Compared to forklifts, these handling tools are quicker and more adaptable. Similar to other handling devices' Drivers or operators of reachstackers sit in a cabin at the front of the truck, where a long arm extends from behind and reaches over the top of the driver. The "spreader" at the end of the extended arm of a reachstacker can be used to pick up containers. The spreader is put on top of the container box and is secured to it by "twist locks" mechanisms. Reachstackers are able to stack containers on top of one another or place them directly onto the back of trains or holding trucks for storage. They can stack boxes of containers up to four rows deep using their long, flexible arms. (Brinkmann and Birgit, 2011)

Figure 5 Reachstackers

Empty Container Handlers: are one type's off-road vehicles used for handling empty containers that are to be stored in container terminal area. They are able to transport empty containers box and stack them in rows up to seven containers box high. Specialized drivers or operators who sit in a cubicle in the middle of the vehicle operate empty container handlers. They lift boxes of containers using a tool called a "spreader," which attaches to the corners of the boxes using professional "twist locks." The container raised the handler's long, vertical arm, which may reach a height of around twenty meters. These empty container handlers are crucial for storing containers in locations with a constrained amount of storage space. (Brinkmann and Birgit, 2011)

Figure 6 Empty Container handler

Forklift: Moving huge containers around a terminal requires the use of forklifts. They may need to be moved to warehouse operation areas or onto and off of holding trucks. There are two

different kinds of forklifts that can pick up boxes of containers. To hold a container box in the right position, one kind of forklift utilizes a tool called a "spreader," which has unique "twist locks" that lock into the corners of the container box. The other kind of forklift raises the container using two flat prongs that are positioned underneath it. (Brinkmann and Birgit, 2011)

Figure 7 Forklift

Trailer Systems: Movement of containers between the Quay Cranes and the storage yard is achieved using equipment such as TTUs or MTSs. The trailers, which are generally of a skeletal type, are connected to terminal tractors. The tractors are designed for optimal speed-to-tractive-effort performance to move the heavy loads between the Quay Cranes and storage yard. As mentioned previously, trailer systems fall into the category of 'passive' vehicles since they are unable to lift containers by themselves.

Figure 8 Existing tractor-trailer unit used at the Modjo Container Terminal

2.3.2. Warehouse Operation

The six fundamental warehouse processes comprise receiving, put-away, storage and picking, packing, and shipping. Optimizing these six processes will allow you to streamline your warehouse operation, reduce cost & errors, and achieve a higher perfect order rate. (Hector Sunol, 2022)

Receiving: The first and most important warehouse process is receiving. The warehouse must be able to confirm that it has received the relevant product in the proper quantity, in the proper condition, and at the proper time in order to carry out the receiving process properly. Failure to do so will have negative effects on all procedures that follow.

Transferring ownership of the goods to the warehouse is another aspect of receiving. As a result, the warehouse is responsible for keeping the items in good condition up until they are dispatched. When you receive cargo properly, you may identify damaged items and avoid liability for them.

Put-Away: The second warehouse procedure, put-away, involves moving merchandise from the receiving dock to the best warehouse storage site. The productivity of a warehouse operation might be hampered by failing to store goods in their most advantageous location. There are various advantages to correctly storing products, including:

- Cargo is stored more quickly and effectively.
- Travel time is cut down
- Safety of both employees and commodities is guaranteed
- The use of warehouse space is maximized
- Finding, tracking, and retrieving cargo is simpler and quicker.

Storage;-is the warehouse procedure in which items are put in the best storage location for them. When carried out correctly, the storage procedure completely utilizes the space that is available in your warehouse and improves worker productivity.

Picking;-In order to fill customer orders, picking is the warehousing procedure that gathers products in a warehouse. As the most expensive process in the warehouse, accounting for up to 55% of all operating costs, streamlining this process will enable you to drastically save costs and boost warehouse productivity. Since errors can negatively affect your customers' satisfaction, streamlining this procedure should also concentrate on obtaining improved accuracy.

Packing;-The warehouse procedure known as packing gathers selected items into a sales order and gets them ready to ship to the customer. Making ensuring that there are as few damages as possible before the things leave the warehouse is one of the main objectives of packing. Additionally, packing needs to be simple and light enough to keep expenses under control while still preventing the goods from becoming heavier.

Shipping;- is the last step in the warehouse process and the point at which the goods leave the facility to be delivered to the client. Only when the proper order is sorted and loaded, sent to the proper recipient, transported via the proper method of transportation, and delivered promptly and safely can shipping be deemed successful. Ordering, putting away, picking, and packing are examples of earlier procedures that are essential to the success of shipping since they have a significant impact on how precisely and safely the order is fulfilled. When carrying out the operations of pickup, delivery, and bookkeeping, Warehouse is an automated, unmanned, and paperless warehouse. (H Liu, Y Shang, XX Jin, XL-Acta.Circumstantiae,, 2018) Modern supply

chains have made warehousing a key component as a competitive tactic to boost organizational performance.

Since emphasis has been placed on customer happiness and supply chain visibility in recent years, the role of the warehouse has changed. Due to the old warehouse management approaches' complexity and ineffectiveness, it has been challenging to meet the needs given the competitive market conditions and changing client demands. (P.Hettiarachchi, Lu Ranwala, 2015)Warehouses is one of the major obstacles for efficient freight transport and logistics system of the country in rural, regional and international freight movement and distribution system is lack of storage facilities, adequate loading and unloading equipment and efficient management of the system.

There are already warehouses across the nation with a combined capacity of about 0.8 million metric tons. The majority of these are owned by public organizations, including the World Food Program, Ethiopian Grain Trade Enterprise, and coffee marketing. (ESLSE, 2018) The majority of warehouses, especially those that are privately owned, are not made to handle huge truck trailers and semi-trailers. There aren't enough doors or turning spaces. In other words, there isn't a standardized standard for commercial warehouse construction. All around the nation, there is a severe shortage of the cargo handling equipment that is typically a component of storage operations.

Cranes, forklifts and other equipment's are rented as and when cargo is already waiting to be loaded and unloaded at the warehouses. (Afro consult & Trading PLC, 2010) The enterprise logistic function known as warehousing is in charge of managing inventories and providing storage space from the point of receipt of supplies from suppliers to the point of consumption. In-depth processes and areas covered by warehouse operations include receiving, organizing, fulfilling, and supplying orders as well as integrating and maintaining tracking software.

The goal of warehouse operations is to meet customer needs and wants while efficiently utilizing space, tools, and people. The ever-rising client scrutiny levels, inventory optimization, time stability, and cost minimization are the current trends and pressures on supply chain and

logistics, and they have predictably changed the structure of supply chains as well as the location and operation of warehouses within the network. (Afro consult & Trading PLC, 2010)

The role of Warehousing in Dry Ports :- Warehousing is crucial to Port-Centric Logistics (PCL) because it enables companies to store their goods at a port rather than a separate distribution facility. This eliminates pointless air travel, reduces emissions, lowers expenses, and greatly streamlines supply chain operations. The demands of the global economy have meant warehouses have transformed and are now playing a bigger role in the movement of commodities. (Ratmalana, 2015) After ten years, they are being strategically used as e-commerce hubs within a multi-tiered supply chain. The same trends that have made PCL such a well-researched concept have led to this development. Here are three of the principal commercial trends fueling its expansion (Afro consult & Trading PLC, 2010)

Time-to-delivery: On a wide scale, e-commerce and the rising volume of goods carried are the main factors driving growth in the maritime industry. Due to the tremendous rise in customer expectations, time-to-delivery has overtaken price as the most crucial competitive differentiation. (Nyema, 2014) Due to the e-commerce industry leader's concentration on ensuring that things reach at customers' homes in the quickest and most efficient manner, this phenomenon is frequently referred to as the "Amazon Effect." Time-to-delivery, or fulfillment responsiveness as it is also known, will become more crucial, as industry research and surveys frequently demonstrate. (Ratmalana, 2015)

Drop shipping: is a growing common supply chain practice in which retailers passes orders to producers or wholesalers, who subsequently deliver the products to customers. The strain on warehouses increases as a result of having to ship items directly, which enables merchants to raise their profit margins and reduce costs.

Automation: All warehouses must make an investment in automation technology in order to run effectively and store larger quantities of goods. Warehouse Management Systems (WMS) or Automated Storage Systems are a particularly well-liked innovation. This aid in ensuring that warehouses make good use of available space, spend minimal energy, and operate smoothly, as

well as that automation is applied effectively. Traditional technology, such as forklifts, sorters, conveyors, etc.as well as collaborative robotics are both used in warehouse automation.

(Afro consult & Trading PLC, 2010) The "Amazon Effect" has shown how vitally important warehouses are to the supply chain. Providers such as Siemens Logistics Westphalia and Knapp have adapted to supply solutions that meet export, import and transshipment needs. This not only shows the nuanced nature of port operations but also that if PCL is going to realized, the journey will begin in the warehouse. (Afro consult & Trading PLC, 2010) Warehousing is the glue for supply chain coordination.

In landlocked nations, the administration of dry ports has become more crucial due to this purpose. Ethiopia is one of the landlocked nations that use dry ports to lessen associated difficulties. More than 95% of freight currently passes via the main and first dry port, Modjo. The operation of the warehouse is impacted by the increasing flows of empty containers at the terminal, which causes the designated volume of the warehouse to exceed its dedicated capacity. (Afro consult & Trading PLC, 2010)

2.3.3. Container Holding Heavy Truck

An automobile that is intended to transport freight is referred to as a truck. The majority of heavy trucks feature a "body-on-frame" design, with what is commonly referred to as a ladder frame serving as the truck's backbone.

Container trucks are frequently used freight transport vehicles that consist of a steel container that is put into a truck and is uniform and reusable. Without having to unload or reload the product they hold, these boxes will sail aboard ships before being pulled by a vehicle, trailer, or other mode of transportation. The major workhorses of the global supply system are trucks. They are the primary means of moving commodities across land effectively, along with railways. They frequently have chassis that can support common cargo containers. (Rosalie Hudson , 2008) In order to carry goods from one location to another, container trucks are frequently used in Africa. One truck vehicle is capable of transporting one to two containers at once.

As they leave the port of Djibouti, container truck vehicles are caught in a traffic jam along the Ethiopian route. To get goods from Ethiopia to local markets in the past, the East African region heavily relied on container truck trucks. With the opening of Ethiopia's Standard Gauge Railway, this will soon change, allowing double-stacked trains to move cargo. Modern cargo trains called double stack trains may move more than one hundred containers at once by stacking two tiers of containers on top of one another.

Trucks in the Supply Chain: Trucks have access to locations that other modes of transportation do not. Airfreight is expensive, weight- and airport-constrained, and does not reach all destinations through railways. Trucks are therefore always the preferred option for transporting large loads of goods. In the United States, trucks transport more products than pipelines, railroads, waterways, and air freight put together. A truck can carry shipping containers swiftly and effectively while hauling a chassis.

Challenges of container truck service: It is significantly more expensive for long hauls than certain competing means of transit due to traffic congestion and small roads. Many bulk and low-grade items are too expensive for intercity service. The size of the vehicles being used and state-imposed size and weight constraints have an impact on how much it can transport. Weather and road conditions have an impact. While Ethiopia is working to lessen its reliance on a single corridor, the corridor to Djibouti is the current area of attention for logistics improvements.

Today, more than 850,000 tons per month and over 95% of Ethiopia's trade pass through this route. More than 80% of all port traffic for the port as a whole comes from or is headed for Ethiopia. The main connection is to Addis Ababa and the surrounding region, where the Modjo Dry Port processes around 90% of incoming containers. Low load factors for freight vehicles cause them to enter cities more frequently, which raises transport costs for operations and causes congestion in the city. (ESLSE, Annual Magazine, 2018) ESLSE offers large vehicles that facilitate quick freight delivery from Djibouti to inland ports or other specified locations.

Regarding this, ESLSE initially had 60 heavy duty trucks with a total lifting capacity of 2400 tons of dry cargo, and when Comet Transport SC joined the company, 205 heavy duty trucks were added. In addition, 215 new Renault Trucks were purchased, increasing the land fleet

capacity of the company to 480 trucks. In addition to using its own trucks, ESLSE subcontracts trucks from commercial and public transport providers for direct or aggregated cargo delivery. (ESLSE, Annual Magazine, 2018)

Figure 9 Container Holding Heavy Truck

2.3.4. Dry Port Container Terminal infrastructure

When evaluating the effectiveness of dry ports, the infrastructure can be one of the variables. According to Ethiopian shipping and logistics services firm, Modjo dry port is slated to be connected to industrial parks via rail and road infrastructure to increase the country's exports. The Modjo Dry Port Expansion Plan was prepared by the Ethiopian government with full consideration for Ethiopia's manufacturing exports. (ESLSE, Annual report, 2019) three years ago, the World Bank has approved 150 million USD for the project.

The infrastructure of dry ports is taken into account in a number of research publications as another aspect that affects their effectiveness. Size of the land impacts a dry port's overall storage capacity. In the busiest time of year, it is extremely crucial. (Gujar Girish chandrakant, 2011) The dry port will be connected to the nation's expressways and railways with additional funding in order to provide efficient logistical services to the industrial parks and increase export. The project will also increase the size of the dry port from 158 to 188 hectares. (ESLSE, Annual report, 2019) Modjo is becoming a hub of dry port services in Ethiopia as it meets international standards and largest of all, hosts almost 74 percent of the country’s imports. (ESLSE, Annual

report, 2019) Currently, while the annual throughput of Modjo dry port reaches 600,000 containers with the total area coverage of 180 hectares, but there is still ongoing expansion that will take the service of the port to the advanced and standardized level by.

Port infrastructures: As every product generated by the port depends on them, port infrastructure is a good indicator of the performance, capacity, and competitiveness of the port, according to (Rodrigue, J.P. e Notteboom, T., 2009) It is believed that the infrastructure and equipment characterization accurately captures the size, capacity, and reality of the port. One of the markers is the dry port area since it depicts the places where cargo activities take place.

The terminal's storage capacity and warehouses are another factor to take into account. As a result, the indicator takes into account the size of the terminal, the number of TEU slots that are available, and the typical amount of time that a container is parked in the terminal for import and export. Finally, the indicators related with containers handling equipment. In order to calculate the terminal's investment in cargo handling, the throughput capacity placed in the terminal, and the units of land equipment, the equipment performance (availability, reliability, and operational productivity) has to be measured.

The effectiveness of logistics is positively impacted by port infrastructure quality. In a similar line, an investment in physical infrastructure improves the business climate and transportation effectiveness, which supports an increase in exports (Alberto Portugal-Perez and John Wilson, 2012) discovered that a port's competitiveness is greatly influenced by the quality of its port services, logistical costs, regional connections, hinterland conditions, and port accessibility. According to (Limao, N. and Venables, A.J. , 2001), infrastructural characteristics and transportation costs are crucial for export-driven economic growth. Thus, it follows that efficient ports perform better in terms of infrastructure quality and logistics than inefficient ones. A country's ability to attract foreign direct investment is also significantly influenced by its port infrastructure, according to (Photis M Panayides, 2009). On the other hand, ineffective ports hinder both domestic and foreign trade and have a negative impact on economic growth (Clark et al, 2004).

2.3.5. Customs Clearance of dry port

Customs must take into account the relationship between the demands of control and process facilitation because they are public domain offices in the dry port terminal environment and control the movement of goods into and out. While automation and customs changes can enable quicker container clearance and cut down on dwell time. Due to the effects it has on system costs and operating times, customs clearance is seen to be important for both port operations and the integration of logistical chains.

Indicators are selected in this field. First, consider how long it takes the container to leave the port following the client's request. The time that has passed after the withdrawal request before the exit authorization is assured is known as the lead-time to receive a gate out authorization with and without physical inspection.

Customs Clearance Process : The effectiveness of customs' operational procedures, according to the World Customs Association, has a significant impact on how products travel through borders around the world. Customs must therefore be prepared to update its operational methods in order to improve trade facilitation and control. Because of the absence of teamwork and cooperation among customs inside and between themselves, excessive delays are a big issue for company that significantly depresses them and other governmental organizations that inspect the same items more than three times and above, causing the cargo to wait longer to clear customs. These variables are linked to attendant costs that can have a substantial impact on the trading community's ability to compete. (World custom organization, 2015) cited a number of factors as the main causes of why it takes so long for goods to clear customs when they cross international borders. The border management regulatory bodies have onerous documentation requirements, little use of information technology and lower automation consumption, ambiguous and vague import and export requirements, ineffective customs procedures coupled with onerous physical and factual control, and a lack of cooperation and modernization among customs and other governmental agencies involved in the regulation.

(World custom organization, 2015) For some processes, the customs clearance is effectively managed by the shipper, clearing, and forwarding agents, and transaction dwell time does not significantly affect total dwell time. Another factor that contributes significantly to lengthy delays is the time lost during the clearing procedure as a result of missing documents, mistakes

in the declaration, or simply a lack of preparation. Additionally, the management of sanctioned procedures is handled by a variety of parties, including the customs administration.

However, in terms of dwell time, customs procedures still frequently "mark" the start and finish of the majority of procedures. Because security and customs regulations can cause significant delays in terminal operation, collaboration with the authorities in charge of these regulations must be negotiated, and security procedures must be ingrained in terminal management. Similar to seaports, the provision of custom clearance and quarantine services places a high level of security requirements for accessing the dry port, which may include high fencing, cameras, and guards depending on the country. (Violeta Roso & Kent Lumsden, 2010).

It is generally known how customs clearance processes at ports and in transportation affect operation. (Clark, X., Dollar, D. and Micco, A. , 2004). The ability to concentrate custom inspections outside of the seaport terminals is one of the key benefits of dry ports. (Roso, V., Woxenius, J. and Lumsden, K. , 2009)

There is a rising understanding of the relevance of customs clearing processing time efficiency to enable international trade, and the performance of profit collecting performance is still the main focus of the strict monitoring of customs efficiency at the port of Modjo dry port. The time needed to complete import clearance procedures begins long in advance of the arrival of container ships and is not precisely correlated with the amount of time the cargo is in transit.

However, in fact the bulk of formalities still performed after ship arrival in most developing countries ports despite trade facilitation initiatives of which Djibouti port is no exception as a logistical hub that can offer services including handling, storage, stuffing and unstuffing, consolidation, customs clearance, and container repair, dry ports can play a significant supporting role. The customs clearance process for the products, which is a part of dry port premises customs practice, has an impact on the effectiveness of the dry port container terminal.

2.4. Empirical Review

This empirical review focus on the researches about dry port has done by some academicians by different people at different times while they have their own limitations evaluated empirically.

Accordingly, the researcher has evaluated the following research titles which were directly related the study under investigated.

(Nyema, 2014) is performed research on the factor affecting container terminal efficiency. The study reveals that both hard and soft infrastructure—the management of port operations—inversely affects container terminal efficiency. Infrastructure, he continued, is a prerequisite for effective container handling operations, and sufficient port infrastructure is required to prevent port yard congestion, promote trade growth, and ensure deep-sea container connectivity for economies that rely heavily on international trade. According to his research, infrastructure is affected by issues like a limited yard's ability to keep containers before collection and a congestion issue brought on by an overabundance.

(Rajasekar, T & Deo, P Malabika, 2014) made an effort to pinpoint the elements that contributed to the performance of India's major ports between 1993 and 2011. Panel data models including the pooled normal least square method, fixed effect models, and random effect models are used to identify the components. According to the study's findings, berth production, operational costs, employee count, cargo equipment, and idle time all had a major impact on port efficiency.

The World Bank's Logistics Performance Index (LPI) and Drivers of Logistics Performance was the title of a study that (Ojala R, 2015) completed and presented at an international transport meeting in Finland. His research demonstrates the critical role capacity management plays in the effectiveness of infrastructure. He discovered that despite the low usage rates of the majority of transportation facilities, these services frequently have capacity issues at times of strong demand. In lieu of capacity expansion, he advised flexible transport systems, better resource allocation, and increased use of the physical infrastructure already in place. A superior transport infrastructure also supports intermodal transport systems, including access roads to terminals and seaport channels.

The assessment of container handling service practice and its influencing factor: The case of Modjo dry port, claims (Amare Tigabu , 2020). According to his research, factors like inadequate equipment dwell time in the port yard, container cargo volume, truck turnaround time, customs clearance, a lack of available storage space, poor logistics connections to the hinterland, and port

infrastructure all have a direct impact on how well the container handling operation in the port yard performs. Increasing awareness through a workshop or seminar for the port community and users of port services could be helpful in outlining the direct and indirect effects of dwell time. He also advises that operational hours are crucial in managing congestion and in improving dwell times.

Sileshi Alebachew (2020) assessed the performance of Modjo dry port's dry port logistics. On the basis of dry port logistics performance indicators such as customs, port Infrastructures, quality of Logistics Service, and timeliness, he measures some logistical operations, such as Customer response, Inventory planning and management, Transportation, and Warehousing.

Moreover Hailemariyam Abera (2020) examined the factor influencing container terminal efficiency: A Case Study on Modjo Dry Port. He disclosed that elements including port equipment, container holding vehicles, warehouse operations, customs operations, and dry port size directly affect the effectiveness of the container terminal.

Eyerussalem Erkayehu (2021) has investigated the determinants of Dry Port Operational Performance of ESLSE in the Case of Modjo and Kality Branch. She primarily takes into account internal (resource-based) elements for evaluation of the performance of the port, such as inflation and the value of international trade, in addition to exterior (environmental) aspects like terminal area, terminal tractor, terminal chancy, reachstacker, and forklift. She suggested maximizing the ports' resource allocation, fostering cooperation between ports within the company, fostering collaboration between ports and businesses in the hinterland, extending the port industrial chains, encouraging scale development, and more.

In a setting of competition, a variety of factors may have an impact on a container terminal's efficiency. The market in the area where it is located, organizational and physical capabilities, integration into logistic networks, level of competition, accessibility to the sea and land, handling equipment used at quays and parking areas, liner shipping services, and networks connected to the inland. (Wu Heng & Tongzon, 2005). For the majority of ports, measuring port efficiency is a difficult problem. The administration and operation of port organizations have been impacted by the growing usage of containerization and supply chains, the creation of new production-

distribution-consumption systems, and the rising specialization of the various port sectors. (Rodrigue, J.P. e Notteboom, T., 2009)

2.5. Summary and research gap

In the case of the Modjo dry port; this thesis has determined the determinants of container terminal efficiency. The study's review has focused on theories and empirical investigations that have attempted to identify the factor affecting container terminal efficiency. Container handling equipment, warehouse operations, container holding trucks, and port infrastructure were a few of the factors mentioned. The analysis also revealed that there are a variety of theoretical viewpoints and models on container terminal efficiency that have been created for the maritime container terminal business. But this study differs from others in that it employs a multiple linear regression approach to demonstrate how the aforementioned factors affect the efficiency of container terminals.

2.6. Theoretical foundation of the story

Widely used approaches to measure/analyze the factors influencing container terminal efficiency/productivity include, stochastic frontier analysis (SFA), Data Envelopment analysis (DEA), Vector error model (VEM), Corrected original least squares (COLS), Original least Squares (OLS). (Roso et al. 2009)

Stochastic Frontier Analysis (SFA): measuring efficiency of container terminals by means of Bayesian Stochastic Frontier Analysis is a parametric and stochastic approach to estimate productive efficiency. A terminal is efficient if it produces a maximum output (container traffic in TEU) for given inputs (terminal superstructure). Traditional studies on container terminal efficiency tend to focus on partial productivity measures such as TEU per crane. (Culliname & Song, 2003)

Data Envelopment Analysis (DEA): DEA is a mathematical programming approach to estimate productive efficiency. The approach maps out a production frontier based on information on inputs and outputs. The degrees of efficiency were assesses by the distance between the observation and the frontier. The scholars claim that the efficiency of a container port is an

important factor for the international competitiveness of the country. For this reason, intensive studies have carried out in order to determine port performance across all the regions of the world. (Cullinane and Wang, 2006)

Vector Error Model (VEM): The earliest models employed stochastic frontier analysis (SFA) and data envelope analysis (DEA). The model employed here is a Vector Error Correction Model (VECM), which takes into account the long run and short-run relationships among several variables: monthly container moves, gross labor hours, crane and straddle carrier operating hours and containers yard storage capacity. (Cullinane and Wang, 2006)

Corrected Original Least Squares (COLS) is a parametric approach to evaluate productive efficiency. It belongs to the regime of regression methods but differs from the original least squares estimation methods, in this approach one calculate an „average line" that cuts through the observations, and then shifts (corrects) the line to a position such that it encloses all the data. The corrected line can measured against this frontier. (Greene, 1993)

Original Least Squares (OLS): Estimation method is a regression method that fits an average line through the data. This average line calculated by the production or cost function, which represents the production technique of the considered industry and indicates information such as the degree of returns to scale of the industry and individual firms in the industry. (Cullinane and Wang, 2006)

2.7. Conceptual framework

Enhancing logistics efficiency is at the base of the economic growth and competitiveness issues (Arvis, D.S., L. Ojala, B. Shepherd, C. Busch & A. Raj, 2014). Inefficient logistics raises the costs of trading and reduces the potential for global integration. Identifying those factors that influence the efficiency of ports is crucial. The variables in the left sides that are; container handling equipment, warehouse operation, container holding truck, infrastructure and custom clearance are the independent variables of terminal efficiency which are identified from the literature. The dependent variable in the right side believed to influence the efficiency of the dry port either directly or indirectly and the arrow showed that the activities and interaction of those variables affect container terminal efficiency.

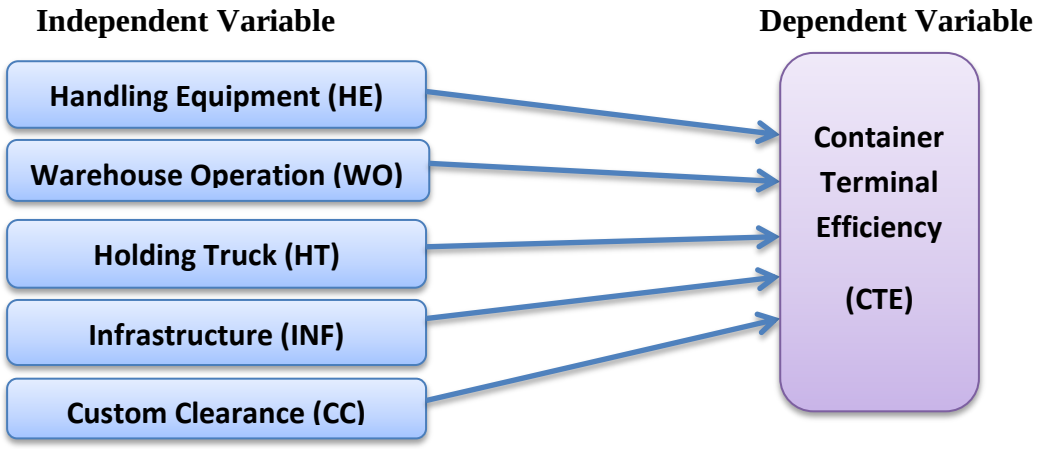

Figure 10 Conceptual Framework, Adopted from the research works of Ng (2006), and Vaggelas and Pallis (2015)

2.8. Research hypothesis

The hypothesis of this study aims to investigate the influence of container handling equipment, warehouse operation, Container holding truck, port infrastructure and custom clearance on the efficiency of Modjo container terminal. Based on theoretical and empirical evidence, it is hypothesized that all this independent variables significantly affect container terminal efficiency. To achieve the research objectives, the following hypotheses were formulated and tested.

- **H1**: Container handling equipment has a significant positive effect on container terminal efficiency.
- **H2:** Warehouse operation has a significant positive effect on container terminal efficiency.
- **H3:** Container holding truck has a significant positive effect on container terminal efficiency.
- **H4:** Port infrastructure has a significant positive effect on container terminal efficiency.
- **H5:** Custom clearance has a significant positive effect on container terminal efficiency.

CHAPTER THREE: RESEARCH METHODOLOGY

This chapter explains the research design and research methodological considerations of the study. It has been set out under the sub-headings is containing research study area, research design, target population, sample frame, sampling Techniques, data collection instruments & procedure, data processing & analysis, reliability & validity of data, and finally ethics consideration.

3.1. Description of the Study Area

Modjo dry port gets within Ethiopian Shipping and Logistics Service Enterprise (ESLSE) under port and terminal sector. It is a common user facility with public authority status that equipped with fixed installations and offering services for handling and temporary storage of any kind of goods including containers.

The main service provided by the port are to provide the services of loading and unloading and storage of imported and exported goods, stowing and unpacking (stuffing and unstuffing) of containerized export and imported goods, to provide container depot services and to engage in other related activities for the achievement of its purposes. The efficient utilization of scarce resources is an ongoing trend in dry port container terminals. As the largest dry port offering logistics services for Ethiopia, it is crucial to examine the variables that affect the Modjo dry port's container terminal's efficiency. Because of this the study was done at the determinants of container terminals efficiency on Modjo dry port.

The following criteria were used to select this research area as a case study: First, as the port is the biggest, there should be a greater volume of transactions and better access to the necessary data and information for the study. Second, the port has a sizable personnel, freight forwarders

(clearing and forwarding agents), and transporters (drivers and other clients), thus the majority of data could be simply gathered and collected. Third, there are roads that lead right to the places. Finally, since the majority of the data required for the research is located at this port and many groups of targeted respondents engage in everyday business there, it is simpler to connect them to the research.

3.2. Research Design

The study employed an explanatory approach using a descriptive survey method. This method was used to obtain pertinent information concerning the topic of the study. The study is adopting both quantitative and qualitative survey as a major method. Quantitative surveys designed to fit a questionnaire schedule.

3.3. Population of Study

Population as defined by Mugenda,A. And Mugenda,O, (2003) is an entire group of individual or objects having common observable characteristic. According to (Keller, 2009) a population is the group of all items of interest to a statistics practitioner. (Sekaran, 2010), refers to population as the entire group of people or things of interest that the researcher aims to assess. The target population was included all terminal operators, administrative staff, freight forwarders, and transporters. Therefore, the study targeted 600 employees of dry port staff.

Table 1 Summary of Target Population

Department	**Target population**	**%(percentage)**
Terminal operators	200	33
Administrative staff	50	9
Freight forward	200	33
Transporter	150	25
Total	**600**	**100**

3.4. Sampling Frame

To determine the appropriate sample size from the given finite total population, Yamane's (1967) simplified formula was used. To draw a sample from the total population, (600), the researcher has used 95% confidence level. Accordingly, the total sample size was determined as follows

Where: n = Sample size, N= Population Size for the study, e= the desired level of precision

$$n = \frac{N}{1+N(e)^2}, \qquad n = \frac{600}{1+600(0.05)^2} = \textbf{240 which} \text{ is 40 } \textbf{\%} \text{ of the total population}$$

The sample distribution for the study from each department was administered proportionally 40% and this was shown here in the following table.

Table 2 Summary of Sampling Frame

Department	**Target population**	**Frequency** (40% of TP)
Terminal operators	200	80
Administrative staff	50	20
Freight forward	200	80
Transporter	150	60
Total	**600**	**240**

A stratified random Sampling technique was employed to stratify four (4) units at the Port of Modjo dry port container terminal such as Terminal operators, Administrative staff, Freight forward and Transporter. Therefore from 200 terminal operators, 50 administrative staff, 200 freight forward and 150 transporters expresses, a sample size of the study was 40% of the total population which is 240

3.5 Sampling Techniques

Stratified random sampling with probability sampling was used in this study to collect samples from a diverse population (based on employment histories of various departments), and

purposive sampling with non-probability sampling (deliberate sampling) was used to choose respondents and top-level managers from each department. The researcher used purposive sampling in order to get respondents according to their managerial roles and help to get relevant data. Through the use of this sampling technique, one manager from each four departments was selected independently.

3.6. Data Sources and Collection Methods

Both primary and Secondary data were used to collect relevant data. The process of gathering data was organized into a series of steps. Questionnaire was used as a major primary source of data. To avoid a lack of response, the approach begins by first asking the respondent for permission. After that, sample selection was conducted based on the strata as described in the sampling technique. The secondary data, on the other hand, was gathered by reviewing secondary sources such as records from the Modjo container terminal as well as from articles, journals, booklets, policy documents, and reports of the performance of the operation of container terminals on a weekly, monthly, and annual basis.

3.7. Data Processing and Analysis

Data were analyzed using descriptive and inferential statistics in statistical package for social sciences (SPSS) version 20 and Microsoft Excel 2010.

Data were checked, adjusted and coded for further analysis. Accordingly, Regarding the sex of the respondents, Men are coded as 1 and women are coded as 2, and they are categorized according to age as 1 (under 24), 2 (between 24 and 30), 3 (between 30 and 45), 4 (between 45 and 50), and 5 (over 51); they are also categorized according to educational level as 1 (certificate), 2 (diploma), 3 (first degree), 4 (post graduate degree), and 5 (PhD); Participants in the section or department with the codes 1 (container terminal operator), 2 (administrative employees), 3 (freight forwarders), 4 (transporters), and 5 (if others): When it comes to the respondent's positions, they are coded as 1 (director), 2, 3, 4, and 5 (division manager,

coordinator, and senior officer respectively). Finally, for experience with the codes 1 (above 10 Years), 2 (5-10 Years), 3 (2-5 Years), 4 (1-2 Years), and 5 (less than 1 Year).

Second part of the questionnaire which dealt with the variables; container handling equipment, warehouse operation, holding truck, infrastructure, custom clearance and Container terminal efficiency; were coded with a 5-point Likert scale. Strongly disagree was coded as 1, disagree was coded as 2, neutral was coded as 3, agree was coded as 4, and strongly agree was coded as,5.

Finally, the analysis part is presented in the form of tables, frequency, percentage, figures and charts form to ensure easily understanding of the analysis.

Inferential Statistics

Inferential statistics were used to identify the degree of correlation between the variables using Pearson's Correlation. Further regression analysis would be done to determine the degree of relationship between independent and dependent variables meaning container handling equipment, warehouse operation, holding truck , port infrastructure and custom clearance affects the container terminal efficiency is (dependent variables).

Model Specification

In this study multiple linear regression models were used to achieve research objectives. The basic objective of using multiple linear regression analysis in this study is to make the research more effective in analyzing impacts dependent and independent variables. According to Gujarati defines a regression function as follows:

The specified regression equation takes the following form

$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + St.\ Error$

$Y = \alpha + \beta 1\ (HE) + \beta 2\ (WO) + \beta 3\ (HT) + \beta\ 4\ (INF) + \beta 5\ (CC) + St.\ Error$

Where:-Y = Container terminal efficiency (CTE) HE = Handling equipment

WO = Warehouse operation HT = Holding truck

INF = Infrastructure CC = Custom clearance

Std. Error = Standard Error

β1, β2, β3, β4 and β5 = The Regression standardized coefficient of each variable

3.8. Reliability and Validity of Data

3.8.1. Reliability

Reliability refers to the extent to which data collection technique or analysis procedures will yield consistent findings (Mark et al., 2007). All surveys tested before the actual survey is conducted. This is to ensure that the questionnaire is clear to respondents and can complete it in the way the researcher wishes (John Adams,Haftz T.A. Khan Robert Raeside and David White, 2007). Pretesting is an activity that aids in identifying any weaknesses in the design, such as errors or restrictions, and enables the researcher to make any necessary modifications before beginning the survey. To assess the validity and reliability of the questionnaire, a pilot study was conducted on close to 15 personnel from the terminal operators, administrative employees, freight forwarders, and transporters since they are directly involved with container operations.

Furthermore, in order to insure the reliability of the questionnaire Cronbach Alpha was calculated using SPSS and the score between 0.70 up to 1. The alpha value is ranges from a maximum of 1.0 for a perfect score to minimum of zero, good measure of the alpha should be 0.70 or higher Neumann (2007). According to (William G. Zikmund, Barry J. Babin,Jon C Carr,Mitch Griffin, 2010) exhibiting a coefficient of alpha between 0.80 and 0.96 are considered to have very good reliability, between 0.70 and 0.80 are considered to have good reliability and alpha value between 0.60 and 0.70 indicated fair reliability and when the coefficient of alpha is below 0.60, the scale has poor reliability.

Table 3 Summary of Measures

No	Variables	**No. of Items in the Scale**	**Chronbach's Alpha Results**
1	Container terminal efficiency	4	**0.912 "Very**

			good”
2	Container handling equipment	9	**0.777 “Good”**
3	Warehouse operation	6	**0.811 “Very good”**
4	Container holding truck	4	**0.765 “Good”**
5	Infrastructure	5	**0.856 “Very good”**
6	Custom clearance	5	**0.828 “Very good”**

Source: **Analysis of survey data using SPSS data, 2023**

The Cronbach’s alpha scored by the six variables that incorporated by the 5- points Likert scale, the alpha results shows above 0.7, which is above the lower limit , 0.70.

3.8.2. Validity

Validity is concerned with whether the findings are really about what they appear to be about (Mark et al., 2007). Also in conformity to (Babbie, 1990), validity refers to the extent to which an empirical measure adequately reflects real meaning of the concept under consideration. For guaranteeing the validity of this study, all the concepts and theories which are used here are referred to relative literature and certain authority’s documents in that correlative area.

3.9. Ethical Consideration

Employee respondents were required for this study, particularly professionals, as it addressed a number of ethical problems. To protect the respondents' privacy and safety, it is essential to take ethical issues into mind. The researcher was informed of all pertinent information regarding the study, including its goal and objective, in order to get the informed permission of the chosen participants. The significance of the respondents' contribution to the study's completion was made clear to them by elaborating on these crucial facts. As a result, the subjects weren't pushed into taking part in the study.

By keeping the participants' names and other personal information out of the research topic, the confidentiality of the participants is also guaranteed. Only information that was pertinent to addressing the study questions was included. In general, this study was keep participant confidentiality and prevents doing much harm to the business.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

The study represents the empirical findings and results of the research. The data presented here includes response rate, background information of the respondents and the presentation of research findings against each individual. Descriptive statistics also employed in analyzing the findings.

4.1. Response rate

All questionnaires were checked for completion in order to make the obtained data appropriate for analysis. The survey data was corrected by removing all unreturned questionnaires and returned partial questionnaires. 235 of the 240 questionnaires that were issued were completed and returned, and 5 were not. Two incomplete questions were discovered and eliminated after the gathered questionnaires were reviewed for mistakes. 233 of the 235 questionnaires that were collected and used for the final analysis were determined to be usable.

As a result, a response rate of about 97% was attained. Because of this, the study determined that the response rate was excellent, and it can be concluded that enough amount of responses were collected for analysis. According to Schein (1992), a response rate of 60% or higher is great, a response rate of 50% is good, and a response rate of 30% is unworkable. The findings are show in the bar chart below.

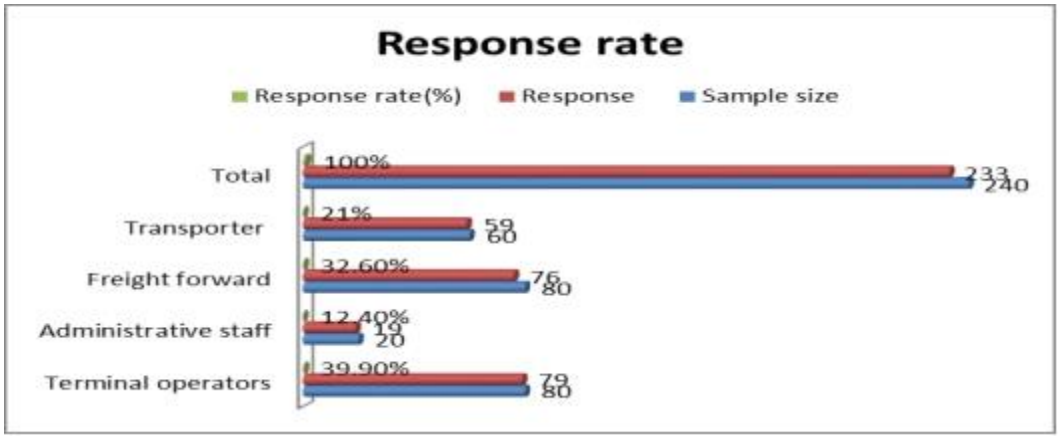

Figure 11 Response Rate

Source: Analysis of survey data using SPSS data, 2023

4.1.1. Demographic characteristics of respondent

The study needed to determine the background information of the respondents using the following factors: sex, age, education level, section, position held by the respondents, and length of time they had worked for the enterprise.

Table 4 Demographic Characteristics of Sample Respondents

Item No.			Frequency	Percent
1	Sex	male	123	52.8
		female	110	47.2
		Total	233	100
2	Age	<24 years	27	11.6
		24-30 years	93	39.9
		30-45 years	59	25.3
		45-50 years	23	9.9
		above 50 years	31	13.3
		Total	233	100
3	Education Level	diploma	9	3.9

		first degree	159	68.2
		post graduate degree	65	27.9
		Total	233	100
4	Section	container terminal operator	79	33.9
		administrative staff	29	12.4
		freight forwarders	76	32.6
		transporters	49	21
		Total	133	100
5	Position	division manager	13	5.6
		coordinator	51	21.9
		senior officer	111	47.6
		Junior officer	54	23.2
		Total	233	100
6	experience	over 10 years	67	28.8
		5-10 years	125	53.6
		2-5 years	27	11.6
		1-2 years	14	6
		Total	233	100

Source: Analysis of survey data using SPSS data, 2023

The table shows that out of the total sample, 123 participants (52.8%) were male and 110 participants (47.2%) were female, indicating a higher representation of males at Modjo dry port. Although the percentage of male participants was higher, the results based on gender were balanced, suggesting an equal probability of answering the questionnaire across the gender spectrum of the total sample population.

The table above also provides the classification of respondents by age interval and corresponding percentage over the total sample. The results show that the majority of participants (39.9%) fell

within the 24-30 age range, with 93 respondents, followed by the 30-45 age range with 59 respondents (25.3%). This implies that most managers, supervisors, freight forwarders and administration staffs are young (highly productive age).

The data on the educational level of respondents indicate that 9 participants (3.9%) held a diploma, 159 (68.2%) held a first degree, and 65 (27.9%) held a master's degree. The data also show that 224 respondents (96.1%) had education above the diploma level, which can positively impact the effectiveness and efficiency of management practices at the organization. This suggest that the Modjo dry port has a sufficient supply of educated manpower, which is not a problem for container terminal efficiency.

Regarding the section of the respondents, container terminal operator were 79 (33.9%), administrative staff 29 (12.4%), freight forwarder 76(32.6%) and transporter 49(21%). As per the data indicated the survey cover all the section as per the sample size of the populations.

Table 4, item 5 indicate the position of the respondents. In relation to the director 4(1.7%), division manager 13(5.6%), coordinator, 51(21.9%), and senior officer 111(47.6%) and junior officer 54(23.2%).As per the data indicated the survey cover all the position as per the sample size of the populations.

In relation to the work experience, 67(28.8%) of them were found over 10 years of service, on the other hand, 125(53.6%) of respondents between the service years of 5 – 10 , 27(11.6%) of respondents between 2-5years and between 1-2 years of the respondent work experience 14(6%). As the data indicated the majority of the respondents were found between 5- 10 years of experience and followed by over10 service years. This implies that almost all respondents had taken reasonably enough experience to see the determinants of container terminal efficiency.

4.1.2. Determinants of container terminal efficiency

4.1.2.1. Descriptive statistics analysis

To describe the mean score of the participants, mean score measurement used by Pihie (2009) was applied where mean score: ≥4.5 = Very High, 3.51-4.51= High, 2.51-3.5= Moderate, 1.51-2.5= Low; < 1.5= Very Low (Crewel, 2012).

Table 5 Handling equipment

Intervening variables	Mean	Standard deviation
Fewer container handling equipment available comparable to the present capacity of the port	**4.06**	**0.861**
Poor quality of container cranes are being used in the port	**4.17**	**0.796**
Poor quality of straddle carriers are being used in the port	**3.95**	**0.899**
Poor quality of reachstackers are being used in the port	**3.65**	**1.007**
Poor quality of forklifts are being used in the port	**3.98**	**0.947**
Poor quality of empty container handlers are being used in the port	**4.15**	**0.864**
Poor quality of Truck-Trailer-Unit are being used in the	**4.00**	**0.903**

port		
Handling equipment operators are available efficiently	**3.72**	**1.028**
There is no well-organized container handling equipment maintenance work shop	**3.8**	**0.995**
Aggregate	**3.94**	**0.534**

Source: Analysis of survey data using SPSS data, 2023

According to Brinkman and Brigit, 2011 Container handling equipment is typically regarded as the primary handling equipment for both dry ports and seaports, and it has a significant impact on both the capabilities for processing containers and, consequently, the operation of the dry port.

Here, the influence of the handling equipment is the first variable to be evaluated and investigated. One of the most important pieces of dry port operation equipment for loading and unloading containers is handling equipment. In this case, we can see that fewer container handling equipment available comparable to the present capacity of the port scored a mean and standard deviation of (4.06 & 0.861), poor quality of container cranes are being used in the port scored a mean and standard deviation of (4.17 & 0.796), poor quality of straddle carriers are being used in the port scored a mean and standard deviation (3.95 & 0.899), poor quality of reachstackers are being used in the port scored a mean and standard deviation (3.65 & 1.007), poor quality of forklifts are being used in the port scored a mean and standard deviation (3.98 & 0.947), poor quality of empty container handlers are being used in the port scored a mean and standard deviation (4.15 & 0.864) , Poor quality of Truck-Trailer-Unit are being used in the port scored a mean and standard deviation (4.00 & 0.903), handling equipment operators are available efficiently scored a mean and standard deviation (3.72 & 1.028) and there is no well-organized container handling equipment maintenance workshop scored a mean and standard deviation (3.8 & 0.995)

The above aggregated mean score (3.94) of handling equipment found in the high score measurement level and the respondents fall under the agree scale based on the rule of thumb

(criteria) for the five likert scale data mean values. Moreover, the standard deviation (0.534) fall with in the acceptable rage with respects to the handling equipment dimension of Modjo dry port.

Generally, using outdated or old machines, technical problems caused on by overusing machines, inadequate machine spare parts and a lack of regular service maintenance, this has occurred are the results of poor quality handling equipment. These effects not only have an impact on the port's ability to operate smoothly, but also on the logistics system as a whole.

The overall results for handling equipment is indicates, handling equipment are important determinants of container terminal efficiency. Likewise, the research works of Nyema (2014), Abdurezak (2016) and Hailemariam(2020). Except with the statement that handling equipment operators were available efficiently. This result contradicts from earlier research result done by Hailemariam (2020).

Table 6 Warehouse operation

Intervening variables	Mean	Standard deviation
Properly receiving cargo is a problem in the port.	**3.86**	**0.934**
Optimization of storage space is a weakness in the port.	**4.03**	**0.773**
Lack of Proper identification of all storage location	**3.97**	**0.84**
Unsuitable construction for proper storage item	**3.87**	**0.883**
Storage areas are not only filled with valuable assets.	**3.97**	**1.102**
Availability of storage capacity at the port is insufficient	**4.05**	**0.889**
Aggregate	**3.95**	**0.466**

Source: Analysis of survey data using SPSS data, 2023

The descriptive statistics of the study as shown in the above Table 6, Presented as follow:

According to (Hector Sunol,2022), streamlining your warehouse operation will enable you to cut costs and errors, increase the percentage of perfect orders, and achieve these goals by optimizing the basic warehouse processes including receiving, put-away, storage & picking, packing, and shipping.

The second factor that needs to be evaluated and investigated in this case is the influence of warehouse operations on the effectiveness of the Modjo dry port container terminal.

From the above table we can see that Properly receiving cargo is a problem in the port scored a mean and standard deviation (3.86 & 0.934), optimization of storage space is a weakness in the port scored a mean and standard deviation (4.03 & 0.773), lack of proper identification of all storage location scored a mean and standard deviation (3.97 & 0.840), unsuitable construction for proper storage item scored a mean and standard deviation (3.87 & 0.883), storage areas are not only filled with valuable assets scored a mean and standard deviation (3.97 & 1.102) and availability of storage capacity at the port is insufficient scored a mean and standard deviation (4.05 & 0.889).

The above aggregated mean score (3.95) of warehouse operation found in the high score measurement level and the respondents fall under the agree scale based on the rule of thumb (criteria) for the five likert scale data mean values. Moreover, the standard deviation (0.466) fall with in the acceptable rage with respects to the warehouse operation dimension of Modjo dry port.

In general, the study's overall findings were unfavorable toward the basic warehousing process procedure. Warehouse operation are important determinants of container terminal efficiency. Likewise, the research works of Hailemariam (2020) and Sileshi (2020).

Table 7 Holding truck

Intervening variables	Mean	Standard deviation
The cargo is transported by truck that have reached the end of their service life	**3.94**	**0.701**

Timely service maintenance is not provided efficiently	**3.9**	**0.59**
Adequate truck spare parts are not available in the work shop	**3.69**	**0.7**
Experienced holding truck drives are available in the port	**3.62**	**0.71**
Aggregate	**3.78**	**0.373**

Source: Analysis of survey data using SPSS data, 2023

The descriptive statistics of the study as shown in the above **Table 7,** Presented as follow:

The third factor that needs to be evaluated and investigated in this case is the influence of holding truck containers on the effectiveness of the Modjo dry port container terminal. The function of containers holding large trucks is one of the best modes of transportation in the logistics sector.

According to the findings, we can see that the cargo is transported by truck that have reached the end of their service life scored a mean and standard deviation (3.94 & 0.701), Timely service maintenance is not provided efficiently scored a mean and standard deviation (3.90 & 0.590), Adequate truck spare parts are not available in the work shop scored a mean and standard deviation (3.69 & 0.700), and Experienced holding truck drives are available in the port scored a mean & standard deviation (3.62 & 0.710).

The above aggregated mean score (3.78) of holding truck found in the high score measurement level and the respondents fall under the agree scale based on the rule of thumb (criteria) for the five likert scale data mean values. Moreover, the standard deviation (0.373) fall with in the best acceptable rage with respects to the holding truck dimension of Modjo dry port.

The effectiveness of this truck affects how the Modjo dry port cargo terminal operates as a whole. The quality of the truck, which was discussed above as resulting from the availability of

outdated or old trucks, lack of prompt service maintenance due to insufficient spare parts, and technical failures as a result of excessive use of the truck were the first factors that each contributed to the inefficiency of the container holding truck.

In general, holding trucks are important determinants of container terminal efficiency. Likewise, the research works of Hailemariam (2020) except with the statement that there was no issue with experienced truck drivers being accessible in the port.

Table 8 Infrastructure

Intervening variables	Mean	Standard deviation
Unavailability of Suitable port area for operation	**3.71**	**0.88**
Connectivity to road networks is poor	**4.04**	**0.88**
Quality of telecommunication infrastructure & IT service are poor	**3.87**	**0.762**
Facilities like cafeteria, internet & banking services are unavailable	**3.91**	**0.963**
There is a well Organized office layout.	**4.12**	**0.861**
Aggregate	**3.93**	**0.448**

Source: Analysis of survey data using SPSS data, 2023

According to Rodrigue, J.P. and Notteboom (2009), port infrastructure is an excellent measure of the performance, capacity, and competitiveness of the port because every product generated by the port depends on it.

The fourth factor that needs to be evaluated and investigated in this case is the influence of port infrastructure on the effectiveness of the Modjo dry port container terminal.

Based on the table presented above, we can see that unavailability of suitable port area for operation scored a mean and standard deviation (3.71 & 0.880), connectivity to road networks is poor scored a mean and standard deviation (4.04 & 0.880), Quality of telecommunication infrastructure & IT service are poor scored a mean and standard deviation (3.87 & 0.762), facilities like cafeteria, internet & banking services are unavailable scored a mean and standard deviation (3.91 & 0.963) and there is a well Organized office layout scored a mean & standard deviation (4.12 & 0.861).

The above aggregated mean score (3.93) of port infrastructure found in the high score measurement level and the respondents fall under the agree scale based on the rule of thumb (criteria) for the five likert scale data mean values. Moreover, the standard deviation (0.448) fall with in the best acceptable rage with respects to the port infrastructure dimension of Modjo dry port.

In general, the study's overall findings were unfavorable toward the basic port infrastructure. Port infrastructure are important determinants of container terminal efficiency. Likewise, the research works of Abdurazak (2016), Hailemariam(2020) and Eyerusalem(2021).

Table 9 Custom clearance

Intervening variables	Mean	Standard deviation
Continuous operation of custom clearance is not a day to day activities	**3.97**	**0.96**
Efficiency of custom clearance is a problem	**4.09**	**0.815**

Unavailability of speed of custom procedures	**4.01**	**0.704**
Transparency of charges & custom clearance procedure is a problem	**3.86**	**0.772**
Provision of adequate, on- time information is unavailable	**3.69**	**0.865**
Aggregate	**3.92**	**0.465**

Source: Analysis of survey data using SPSS data, 2023

The fifth factor that needs to be evaluated and investigated in this case is the influence of custom clearance on the effectiveness of the Modjo dry port container terminal. According to the survey results, we can see that Continuous operation of custom clearance is not a day to day activities scored a mean and standard deviation (3.97 & 0.960), efficiency of custom clearance is a problem scored a mean and standard deviation (4.09 & 0.815), unavailability of speed of custom procedures scored a mean and standard deviation (4.01 & 0.704), transparency of charges & custom clearance procedure is a problem scored a mean and standard deviation (3.86 & 0.772) and provision of adequate, on- time information is unavailable scored a mean and standard deviation (3.69 & 0.865).

The above aggregated mean score (3.92) custom clearance found in the high score measurement level and the respondents fall under the agree scale based on the rule of thumb (criteria) for the five likert scale data mean values. Moreover, the standard deviation (0.465) fall with in the best acceptable rage with respects to the custom clearance dimension of Modjo dry port. In general, the effectiveness of the container terminal is mostly determined by the port's customs operations, according to research on the factors influencing port performance by Nyema (2014), Abdurezak (2016), and Hailemariam (2020). The performance of customs and their effectiveness in clearing goods is one of the key challenges in global trade. It has become increasingly crucial for businesses to be assured of a quick and predictable release of goods in the modern business climate of just-in-time production and delivery. Importers, exporters, and national economies all profit from streamlining and simplifying clearance procedures.

Table 10 Container terminal efficiency

Intervening variables	Mean	Standard deviation
Container terminal efficiency can be measured by the level of increase input and throughput.	**3.9**	**0.779**
The throughput of container cargo at the port is currently high	**3.9**	**0.512**
Expanding the current terminal will increase the volume of container inputs and throughput respectively.	**3.82**	**0.64**
The current performance of container terminal at the port is poor.	**3.45**	**0.656**
Aggregate	**3.76**	**0.646**

Source: Analysis of survey data using SPSS data, 2023

From the above table we can see that container terminal efficiency can be measured by the level of increase input and throughput scored a mean and standard deviation (3.90 & 0.779), the throughput of container cargo at the port is currently high scored a mean and standard deviation (3.9 & 0.512), expanding the current terminal will increase the volume of container inputs and throughput respectively scored a mean and standard deviation (3.82 & 0.640) and the current performance of container terminals at the port scored a mean and standard deviation (3.45 & 0.656).

The aggregated mean score (3.76) container terminal efficiency found in the high score measurement level and the respondents fall under the agree scale based on the rule of thumb (criteria) for the five likert scale data mean values. Moreover, the standard deviation (0.646) fall with in the best acceptable rage with respects to the container terminal efficiency dimension of Modjo dry port. Likewise, the research works of Nyema (2014).

4.1.2.2. Summary of Descriptive Statistic

Table 11, demonstrate the summary descriptive statistics which contains different characteristics of data used in the analysis. The summary of descriptive statistics includes the mean and standard deviation of the five explanatory variables such as handling equipment (HE), warehouse operation (WO), holding truck (HT), infrastructure (INF) and custom clearance (CC)

Table 11 Descriptive Statistic

Descriptive Statistics

	N	Mean	Std. Deviation
Handling equipment	233	3.9413	.53417
Warehouse operation	233	3.9578	.46605
Holding truck	233	3.7865	.37321
Infrastructure	233	3.9296	.44820
Custom clearance	233	3.9245	.46549
Valid N (listwise)	233		

Source: Analysis of survey data using SPSS data, 2023

According to the above Table 11, warehouse operation, with a mean score of 3.9578 and a standard deviation of 0.46605, is the first stage that has the greatest influence on the container terminal efficiency in the research area. Handling equipment has the second-highest influence stage score of 3.9413 and the largest standard deviation of 0.53417. Infrastructure is the third stage with the highest influence; with a mean score of 3.9296 and a standard deviation of 0.44820.With a mean score of 3.9245 and a standard deviation of 0.46549, custom clearance is the fourth step with the greatest influence. Finally holding truck is in the fifth stage of highest influence with a mean score of 3.7865 and the lowest standard deviation of 0.37321.

There are many intervening variables are typically present to account for the efficiency and inefficiency of the independent variables as seen on the conceptual framework above figure 10. In light of the fact that all of the above independent variables' mean values fall within a high level of standard as per the literature mentioned above, it has been determined that the efficiency of the container terminal is significantly impacted by the handling equipment, warehouse operations, holding trucks, infrastructure, and custom clearance along with their intervening variables.

4.2. Inferential statistics analysis

4.2.1.Association between Dependent and Independent Variables

Based on the observed data, the following bivariate correlation analysis was made and presented in table 12 below.

Table 12 Association between Dependent and Independent Variables

Correlations							
		HE_ MEAN	WO_ MEAN	HT_ MEAN	INF_ MEAN	CC_ MEAN	CTE_ MEAN
HE_ MEAN	Pearson Correlation	1	.501**	.526**	.618**	.595**	.817**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	233	233	233	233	233	233

WO_ MEAN	Pearson Correlation	.501**	1	.297**	.406**	.437**	.519**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	233	233	233	233	233	233
HT_ MEAN	Pearson Correlation	.526**	.297**	1	.443**	.320**	.624**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	233	233	233	233	233	233
INF_ MEAN	Pearson Correlation	.618**	.406**	.443**	1	.450**	.640**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	233	233	233	233	233	233
CC_ MEAN	Pearson Correlation	.595**	.437**	.320**	.450**	1	.616**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	233	233	233	233	233	233
CTE_ MEAN	Pearson Correlation	**.817****	**.519****	**.624****	**.640****	**.616****	1
	Sig. (2-tailed)	**.000**	**.000**	**.000**	**.000**	**.000**	
	N	233	233	233	233	233	233

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Analysis of survey data using SPSS data, 2023

Pearson correlation test was conducted to know the degree of relationship between the independent variables (handling equipment, warehouse operation, holding truck, infrastructure, and custom clearance) and the dependent variable (container terminal efficiency). In addition, the correlation between independent variable is also made. As the results of the correlation between the independent variables with dependent variable shown in above table 12, display the bivariate correlation results for the data collected on the criterion variable on dependent and independent variables. (Cohen, 1998) cited by (Warokka et al. 2012), interpreted the coefficient of correlation between 0 and 1 as in the following manner. The correlation coefficient (r) ranging from 0.10 to 0.29 may regarded as indicating a low degree of correlation, (r) ranging from 0.30 to 0.49 may considered as a moderate degree of correlation, and (r) ranging from 0.50 to 1.00 may regarded as a high degree of correlation. Considering the relationship of the container terminal efficiency with each of the independent variables as shown none of the independent variables had

correlations out of between -1 and +1 .As it is indicated in the table, there is a high degree of positive relationship between the independent variables and the dependent variable within the range of +0.519** to +0.817**; all are significant at p<0.001). In other words:-

The survey results showed that handling equipment, warehouse operation, holding truck, infrastructure, and custom clearance all had a significant positive correlation with container terminal efficiency. Specifically, the Pearson correlation coefficients between handling equipment and container terminal efficiency (r=0.817), warehouse operation and container terminal efficiency (r=0.519), holding truck (r=0.624), infrastructure (r=0.640), and custom clearance (r=0.616) were all statistically significant at p<0.01. These findings indicate that ensuring proper handling equipment, holding truck, efficient warehouse operations, port infrastructure, and customs clearance processes can all contribute to higher levels of efficiency in container terminals.

4.2.2. Multicollinearity

The study checked for multicollinearity among independent variables using SPSS. No correlations were found outside the range of -1 and +1. Tolerance values were close to 1 and VIF values were around 1 and not more that 2.5, indicating no multicollinearity. Table 13 shows all independent variables had Tolerance values greater that 0.10 and VIF values less than 2.5, confirming the absence of multicollinearity.

Table 13 Collinearity statistics

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Handling equipment	**.417**	**2.400**
	Warehouse operation	**.708**	**1.412**
	Holding truck	**.700**	**1.428**

	Infrastructure	**.581**	**1.721**
	Custom clearance	**.613**	**1.631**

a. Dependent Variable: CTE_MEAN

Source: Analysis of survey data using SPSS data, 2023

4.2.3. Normality of Distribution

Skewness indicates the symmetry of the distribution. A value of zero indicates symmetry, while positive and negative values indicate right and left skew, respectively. The histogram in figure 12 shows a little left skew. Kurtosis measures how much the peak of a distribution differed from a normal distribution. Positive values indicate a more pointed distribution, while negative values indicate a flatter distribution. Table 14 shows that all variables have acceptable skewness statistics for normality (-1.0 to +1.0). However, the skewness and kurtosis values are between the acceptable ranges. Despite this, the data still meets the assumption of normality for multiple regression.

Table 14 Skewness and Kurtosis

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Container terminal efficiency	233	**-.033**	.159	**-.459**	.318
Handling equipment	233	**-.583**	.159	**-.706**	.318
Warehouse operation	233	**-.359**	.159	**-.024**	.318
Holding truck	233	**.289**	.159	**.511**	.318

Infrastructure	233	**-.338**	.159	**-.216**	.318
Custom clearance	233	**-.178**	.159	**-.389**	.318
Valid N (listwise)	233				

Source: Analysis of survey data using SPSS data, 2023

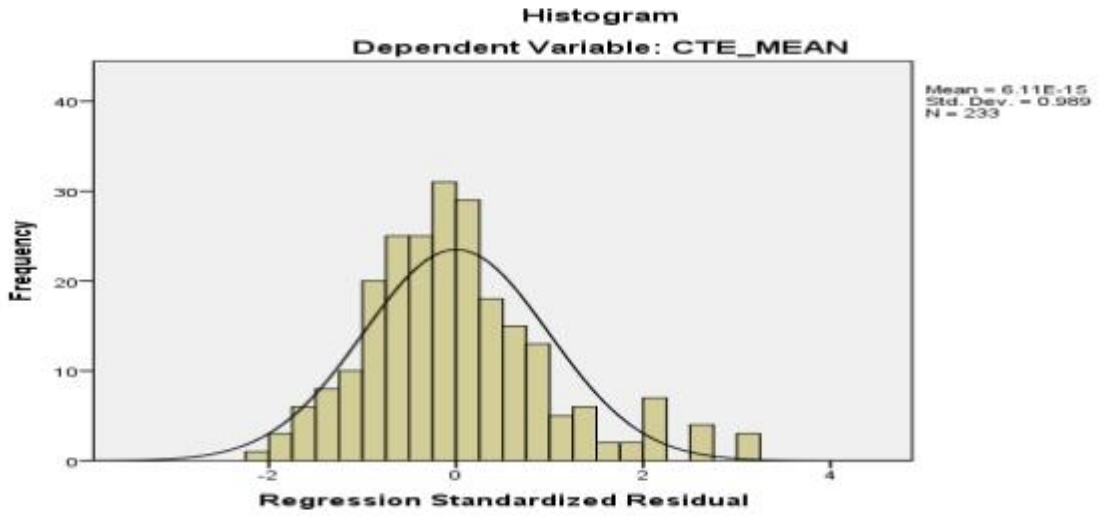

Figure 12 Histogram test for normality

Source: Analysis of survey data using SPSS data, 2023

4.2.4. Linearity

Linearity is conducted by a visual examination of the normal probability plots of the residuals. The normality probability plots were plotted to assess normality. The P-P plots showed in figure 13, is approximately a straight line instead of a curve.

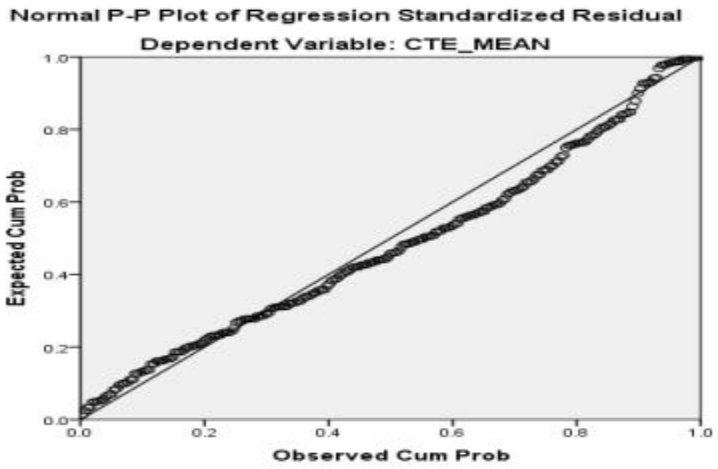

Figure 13 p-p plot

Source: Analysis of survey data using SPSS data, 2023

4.2.5. Homoscadecity

According to Garson (2012), homoscadecity help as to check for the relationship under investigation is the same for the entire range of the dependent variable and lack of homoscadecity is shown by higher errors (residuals) for some portions of the range, which can be seen on the scatter plot. In this regard, as Field (2009) describes, the graph of *ZRESID and *ZPRED should look like a random array of dots evenly dispersed around zero, if the assumption of homoscadecity has to be met. Likewise, as shown in the figure 14, almost all the points are randomly and evenly dispersed throughout the plot and almost there are no obvious outliers on this cloud of dots which are spaced around zero.Therefore, we can conclude that the assumptions of random errors and homoscadecity have been met.

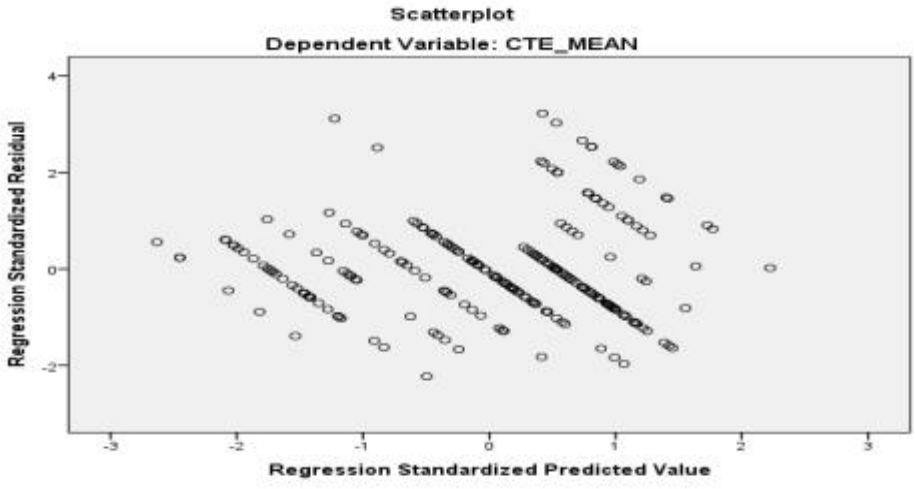

Figure 14 Scatter plot

Source: Analysis of survey data using SPSS data, 2023

4.2.6. Auto-correlation

The Durbin Watson test detects auto-correlation in regression analysis, which occurs when the dependent variable at time t is related to its value at the previous time period. A value of 2 indicates no auto-correlation, while values 0-2 indicate positive auto-correlation and values 2-4 indicate negative auto-correlation. The acceptable range for no auto-correlation is 1.5<DW<2.5. the Durbin-Watson value in this study is 1.85 showed in the table 15, which falls within the acceptable range, indicating no auto-correlation.

4.2.7. Multiple Linear Regression Analysis

Overall container terminal efficiency was regressed on the five independent variables (handling equipment, warehouse operation, holding truck, infrastructure and custom clearance), the independent variables contribute to statistically significant level p value < 0.001. The multiple correlation coefficient $R = 0.874$ indicates that there is a strong correlation between the observed container terminal efficiency and those predicted by the regression model. In terms of variability in observed container terminal efficiency accounted for by the fitted model, this amounts to a proportion of $R^2 = 0.763$, or 76.3% showed in table 15. Since by definition R^2 will increase when further terms are added to the model even if these do not explain variability in the population, the

adjusted R^2 is an attempt at improved estimation of R^2 in the population (Landau and Brian, 2004). Use of this adjusted measure leads to a revised estimate that 0.758 (75.8% of the variability in container terminal efficiency can be explained by the five explanatory variables. Other factors beyond those independent variables had an impact on the remaining 24.2%. The respondent's response indicated that in addition to these factors, the efficiency of container terminals is impacted by national politics, climate change, inflation, and the absence of peace. Therefore, adding these variables in future research could lead to better results.

Table 15 Model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.874[a]	.763	.758	.24719	1.851

a. Predictors: (Constant), CC_MEAN, HT_MEAN, WO_MEAN, INF_MEAN, HE_MEAN

b. Dependent Variable: CTE_MEAN

Source: Analysis of survey data using SPSS data, 2023

Table 16 Anova

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	44.740	5	8.948	146.440	.000[b]
	Residual	13.870	227	.061		
	Total	58.610	232			

a. Dependent Variable: CTE_MEAN

b. Predictors: (Constant), CC_MEAN, HT_MEAN, WO_MEAN, INF_MEAN, HE_MEAN

From the above table 16 it's been observed that the value of f = 146.440 and the value of p= 0.000. In this case, the significance value was less than 0.05 indicating that the model shows high significant. The F-statistic is applied to test for tests overall significance. In this case, 5% level of significance will be used. The decision rule is that, if the probability values are ≤ 0.05, we can tell that it is significant. Based on this fact the model is significant and it can tell the relationship of the variables.

Table 17 Regression analysis of independent on dependent variable

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.850	.207		-4.116	.000
	Handling equipment	.438	.047	**.465**	9.300	**.000**
	Warehouse operation	.095	.041	**.088**	2.301	**.022**
	Holding truck	.324	.052	**.241**	6.234	**.000**
	Infrastructure	.154	.048	**.137**	3.241	**.001**
	Custom clearance	.174	.045	**.162**	3.919	**.000**

a. Dependent Variable: Container terminal efficiency.

Source: Analysis of survey data using SPSS data, 2023

The result of standardized regression coefficient (Beta weight) showed in table above 17, for handling equipment, warehouse operation, holding truck, infrastructure and custom clearance were 0.465, 0.088, 0.241, 0.137 and 0.162, respectively.

The multiple linear regression analysis result revealed that there is a positive significant effect of the independent variables on the dependent variable. Since, coefficients of the predictor variables were statistically at less than five percent level of significance for all independent variables.

From the findings of standardized coefficient (beta), Handling equipment was 0.465 at the first place of importance to influence container terminal efficiency this indicates that this variable has relatively a strong degree of importance to container terminal efficiency than others.

Holding truck ranked at the second place with a standardized beta 0.241, custom clearance at the third place with a standardized beta 0.162, infrastructure at the fourth place with a standardized beta 0.137 and finally warehouse operation at the fifth place with a standardized beta 0.088 to have a positive effect on container terminal efficiency.

From the Multiple Linear Regression equation, the interpretation as follows:

The constant -0.850 shows the effect of handling equipment, warehouse operation, holding truck, infrastructure and custom clearance on container terminal efficiency. It means that, in a condition where all independent variables are constant (zero), container terminal efficiency as dependent variable is predicted to be -0.850. In condition where other variables are constant, if handling equipment increases by one unit container terminal efficiency is predicted to be increased by 0.465 (46.5%) unit. In condition where other variables are constant if holding truck increases by one unit, container terminal efficiency is predicted to be increased by 0.241 (24.1%) unit. In condition where other variables are constant if custom clearance increases by one unit, container terminal efficiency is predicted to be increased by 0.162 (16.2%) unit. In condition where other variables are constant if infrastructure increases by one unit, container terminal efficiency is predicted to be increased by 0.137 (13.7%) unit. In condition where other variables are constant if custom clearance increase by one unit, container terminal efficiency is predicted to be increased by 0.088 (8.8%) unit.

Therefore the regression equation for this study derives as:

Y = -0.850 + 0.465HE + 0.088 WO + 0.241 HT + 0.137 INF + 0.162 CC +0.207 Std. Error

Overall Outcome of the Research Hypothesis:- The regression analysis has enabled the researcher to examine the five hypotheses and the subsequent relationship of the independent variables to CTE (the dependent variable in the equation). Through careful examination

including successive runs**,** support has been found to accept the three of the proposed alternative hypotheses. A summary of each of the hypotheses listed in table below.

Table 18 Hypothesis test result

Hypothesis	**Result**	**Decision (Accept or Reject)**
H1: Container handling equipment does have significant effect on container terminal efficiency.	β =+0.465, p<0.05	Accept
H2: Warehouse operation does have a significant effect on container terminal efficiency.	β =+0.088, p<0.05	Accept
H3: Container holding truck does have a significant effect on container terminal efficiency	β =+0.241, p<0.05	Accept
H4: Infrastructure does have a significant effect on container terminal efficiency.	β =+0.137, p<0.05	Accept
H5: Custom clearance does have a significant effect on container terminal efficiency.	β =+0.162, p<0.05	Accept

Source: Survey data (2023)

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

This chapter explains the study's key findings, as well as its conclusions, suggestions, and limitations. It also provides guidance for upcoming researchers. As a result, the main section of this chapter explains the study's findings, including a concise summary and conclusions taken from them. The next section then discusses recommendations, limitations, and key points of the study's intended direction.

5.1. Summary of the findings

Male participants made up 52.8% of the total, while 39.9% of the participants were between the ages of 24 and 30. 68.2% of them have a first-degree education, which is the majority level. 53.6% of participants in the Modjo dry port enterprise had experience that was mostly between 5 and 10 years old. The correlation analysis had demonstrated that the five independent variables (handling equipment, warehouse operation, holding truck, port infrastructure, and custom clearance) have a strong correlation with the dependent variable (container terminal efficiency) at 0.01 p-values 2-tailed, by scoring an "R value" of 0.817**, 0.519**, 0.624**, 0.640**, and 0.616** respectively.

All independent factors in the regression analysis of the five independent variables with container terminal efficiency contribute to a statistically significant p-value of less than 0.05. The corrected measure yields a revised estimate that the five explanatory factors may explain 0.758% of the variability in container terminal efficiency in the population. The coefficient correlation determination (R^2) score was 0.763, which equals 76.3%. The beta weight score for this study demonstrates that handling equipment has a bigger impact than the other independent factors.

5.2. Conclusion

The purpose of this study was to examine the factors that affect the effectiveness of the container terminal at the Modjo dry port. Dry ports' existence depends on the effectiveness of the cargo terminals.

The study also looked at two major theories: Data Envelopment Analysis (DEA) and DEA Window Analysis as well as other empirical studies related to the topic and was directed at the Modjo Container Terminal operators, administrative employees, freight forwarders, and transporters. A questionnaire was a key tool for gathering primary data. All of the questions, with the exception of one open-ended inquiry, were developed using the 5-point Likert scale.

A total of 240 questionnaires were distributed for the data collection from the dispersed questions since 233 of the respondents participated fully in the survey by answering all of the researcher's questions. Both the statistical package for the social sciences (SPSS) and Microsoft Excel 2010 were used to analyze the data. The results demonstrate the cause-and-effect link between the dependent variable (container terminal efficiency) and the independent variables (handling equipment, warehouse operation, holding truck, port infrastructure, and custom clearance).

With the aim of examining these factors' effects on container terminal efficiency, the researcher conducted the necessary scientific research. Handling equipment, warehouse operations, holding tracks, port infrastructure, and custom clearance were tested to see if they contributed to the explained variance of container terminal efficiency. Out of the research findings of this study, the following conclusions are made.

The measures taken into consideration in this study significantly increase the efficiency of the container terminal, as indicated by the R square value. Five of the variables of container terminal efficiency taken into account in this study for the sample and population, respectively, explain 75.8% and 76.3% of the variability in overall container terminal efficiency. According to the study, situational factors including politics, the weather, inflation, and national security can account for the remaining 24.2% of the variation in overall container terminal efficiency.

Each independent variable, has a major impact on how effectively container terminals function. The results of the investigation support all alternative possibilities. Each of the independent variables had an effect on the container terminal's effectiveness (the dependent variable). Handling equipment has the most impact on the container terminal's effectiveness, followed by holding vehicles, customs processing, infrastructure, and warehouse operations.

5.3. Recommendation

Based on the findings of the study, the following recommendations are put forward.:-

- ESLSE have to allocate enough budgets for purchase of new and modern handling equipment and holding truck to alleviate the quality and quantity problem of port machinery.
- ESLSE should provide quick maintenance services for handling equipment and holding trucks to minimize downtime. Predictive maintenance can be used to ensure safety compliance, proactive corrective actions, and extended asset life.
- Upgrading the technical skills levels of all operators through local and international training programs, focusing on developing a positive workplace culture, and applying good management practices can increase container terminal efficiency.
- ESLSE should set up sufficient funds for managing warehouse operations, including cargo receiving, storage space optimization, proper item identification, disposing of unused items, and improving the working environment.
- The government of Ethiopia should invest in improving port infrastructure, including adding adequate berthing facilities, yard capacity, a railway, expanding the hinterland road system, and telecommunications services. Integrating internal and external network systems can also improve port operations and business processes.
- ESLSE must closely collaborate with customs and other customers to improve custom clearance activities, the speed of customs procedures, and the availability of suitable , timely information to customers.

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Appendix- Questionnaire

Dear Modjo Dry port container terminal employees,

I am a post graduate MBA student in the department Business Administration at St Marry University. Currently, I am undertaking a research study on, **"DETERMINANTS OF CONTAINER TERMINAL EFFICIENCY: A CASE STUDY ON MODJO DRY PORT.**

This questionnaire prepared for collecting data for purely academic purposes and to know your opinions regards the factors affecting container terminal operations efficiency. So your responses and views are truly important to this study and treated with the utmost confidentiality. Please kindly spare a few minutes and complete this questionnaire? I would highly appreciate if you help me by responding to all questions as completely, correctly and honestly as possible.

Thank you very much for your participation, cooperation, and understanding.

If you need further explanation or questions, please do not stagger to contact me by the following cell phone.

Yours faithfully,

Melesech Wondmneh Belete

Mobile, 0911 66 02 03

E-mail: melesech66@gmail.com

QUESTIONNAIRE

Answer all questions as indicated by either filling in the blank or ticking the options that apply.

PART I :

PERSONAL INFORMATION OF RESPONDENTS

Sex of Respondent: 1. Male { } 2.Female { }

2. **Age of Respondent**: 1. < 24 years { } 2. 24 – 30 years { }

3. 30 – 45 year { } 4. 45 – 50 years { } 5. Above 50 { }

3. **Level of Education Acquired:**

1. Certificat{ } 2. Diploma { } 3. First Degree { } 4. Post Graduate Degree { }

5. PHD { }

4. **Section or unit**:

1. Container Terminal Operator { } 2. Administrative Staff { }

3. Freight Forwarders { } 4. Transporters { }

5. Other (Specify)_____

5. What is your position/status in the organization?

1. Director { } 2. Division Manager { } 3.Coordinator { }

4. Senior officer { } 5. Junior officer{ }

6. How many years have you worked in this organization?

1. Over 10 years { } 2. 5 – 9 years { }

3. 2 – 4 years { } 4. Less than 1 year{ }

PART II. Determinants of container terminal efficiency of Modjo Dry Port as per the following Measurement Variables (Make tick Mark as √)

No	Container terminal efficiency determinant	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	I. Handling Equipment					
1	Fewer container handling equipment available comparable to the present capacity of the port.					
2	Poor quality of container cranes are being used in the port					
3	Poor quality of straddle carriers are being used in the port					
4	Poor quality of reachstackers are being used in the port					
5	Poor quality of forklifts are being used in port					
6	Poor quality of empty container handlers are being used in the port					
7	Poor quality of Truck-Trailer-Unit are being used in the port					
8	Handling equipment operators are available efficiently					
9	There is no well-organized handling equipment maintenance work shop					
No	**Container terminal efficiency determinant**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	II. Warehouse operation					
1	Properly receiving cargo is a problem in the port.					

2	Optimization of storage space is a weakness in the port.					
3	Lack of Proper identification of all storage location					
4	Unsuitable construction for proper storage item					
5	Storage areas are not only filled with valuable assets.					
6	Availability of storage capacity at the port is insufficient					
No	**Container terminal efficiency determinant**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	III. Holding truck					
1	The cargo is transported by truck that have reached the end of their service life					
2	Timely service maintenance is not provided efficiently					
3	Adequate truck spare parts are not available in the workshop					
4	Experienced holding truck drives are available					
No	**Container terminal efficiency determinant**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	IV. Infrastructure					
1	Unavailability of Suitable port area for operation					
2	Connectivity to road networks is poor					
3	Quality of telecommunication					

	infrastructure & IT service are poor					
4	Facilities like cafeteria & internet services are unavailable					
5	There is a well Organized office layout.					
No	**Container terminal efficiency determinant**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	V. Custom clearance					
1.	Continuous operation of custom clearance is not a day to day activities					
2	Efficiency of custom clearance is a problem					
3	Unavailability of speed of custom procedures					
4	Transparency of charges & custom clearance procedure is a problem					
5	Provision of adequate, on- time information is unavailable					
No	**Container terminal efficiency determinant**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	VI. Over all container terminal efficiency					
1	Container terminal efficiency can be measured by the level of increase input and throughput.					
2	The throughput of container cargo at the port is currently high					
3	Expanding the current terminal will increase the volume of container inputs and throughput respectively.					
4	The current performance of container					

	terminal at the port is poor.					

PART III : OPEN ENDED QUATION

1. If there are any issues that need to be explored about Determinants of container terminal efficiency other than those mentioned the above variables, please let us know as it will be useful for the future researcher.

Thank you for your time and participation!