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**THE ROLE OF RAIL TRANSPORT TO THE MULTIMODAL OPERATOR
PERFORMANCE OF ETHIOPIAN SHIPPING AND LOGISTICS ENTERPRISE**

**BY
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A Thesis Submitted to Addis Ababa University School of Commerce Graduate Studies in Partial Fulfillment of the Requirements for the Degree of Masters of Art in Logistics and Supply Chain Management

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Statement of Declaration

I, **Sirak Menberu**, hereby declare that to the senate of Addis Ababa University School of Commerce that the work contained in this thesis entitled “**The Role of Rail Transport to the Multimodal Operator performance of Ethiopian Shipping and Logistics Service Enterprise**” is my own original work with the guidance of **Shiferaw Mitiku (PhD)**. I confirm that all the references of other researcher work referred and ideas adopted are fully acknowledge at reference sections. I have not previously in its entirety or in part submitted at any university for a degree.

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Statement of Certification

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Abstract

The Ethiopia- Djibouti corridor linking Ethiopia to the port of is now the dominant gateway for the country with over 95 percent Ethiopia imports and export using this route. Recent investment in road and rail along the Djibouti corridor have the potential to significantly reduce transport costs and time and are a key element encouraging greater interest from investor in opportunities to develop manufacturing export capabilities in Ethiopia. Multimodal transport system is modern transport and freight distribution system all over the world is tending towards the adoption of best practices. The study examined to assess the role of rail transport to the multimodal operator performance of Ethiopian Shipping and Logistics Enterprise. Factors that measure the role and performance are delivery performance or timeliness, cost effectiveness and reliability in terms operation liability. The study used exploratory research methodology and survey techniques to collect data related to the topic understudy. Both qualitative and quantitative approaches were used in data analysis. In particular, primary data collected through questionnaire and the secondary data were collected from journal and reports. Mainly the data was analyzed Statistical Package for Social Science Version 20.0 software. As the major finding of the result shows rail transport increases the average of cargo traffic, reduce transit time, lowering the cost of logistic and improves customer satisfaction. Therefore, rail transport is one among the major factors which can accelerate the growth in economies. Despite of this contribution to multimodal transport performance, the situation of railway transport is in a poor state. It is noted that, the government have invested mainly in road infrastructure improvement, while neglecting railways. The responsible factors for this decline includes lack of efficient rail system, low capacity of rail transport, poor emphasis in rail to dry port intermodal and limited financial resources. This implies that there are strong and positive relationship between rail transport and the multimodal operation performance. Finally, the study recommends that the government should promote railway sector in order to improve the delivery performance of multimodal transport system.

Key words: *rail transport, multimodal transport, delivery performance and cost effectiveness*

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List of Abbreviation and Acronyms

DCT: Dorale Container Terminal port

DMP: Dorale Multi-purpose port

ERC: Ethiopian Railways Corporation

ESLSE: Ethiopian Shipping and Logistics Service Enterprise

F: Frequency

GDP: Growth Domestic Product

MTO: Multimodal transport operator

SD: Strongly Agree

SPSS: Statistical Package for Social Science

TEU: Twenty Equivalent Units

UNCTAD: United Nations Conference on Trade and Development

CHAPTER ONE

INTRODUCTION

In this chapter the researcher deals with the general over view of the international logistics experience and role of rail transport for Multimodal operator performance of ESLSE mainly includes the background of the study, statement of the problem, general and specific objectives, scope of the study, delimitation and definition of operational terms.

1.1 Background of the study

The economic policy in many countries especially in the developing world is currently encouraging the export-led economic growth with an increasing in value added manufactured goods. Economic transformation, and indeed, the development of any country are hardly possible without an efficient transport system (Andrew, 2011). This emphasis will continue to affect the technology required by transport operators. Freight transportation is a critical element in the overall demand-supply chain of commodities and services in a region. The ability to transport goods quickly, safely, economically and reliable is seen as vital to success of businesses, and to a nations prosperity and capacity to compete in globalized economy (Douglas, *et al*, 1998).

Ethiopia being one of the developing countries needs to be integrated with global economy and that can only be possible through efficient and effective flows of goods to and from the country in international trade. To this end, the country needs to adopt or develop an efficient multimodal transport system for freight transport. With the aim of improving the flow of goods between Djibouti port and dry ports in Ethiopia, implemented what referred multimodal transport system since January 2011 by new proclamation number 548/2007 in Ethiopia targets for seamless, low cost, and maximum customer convenient transporting of imported goods form Djibouti to dry port in Ethiopia and reverse flow in case of exported goods (T. K. Amentae, G. Gebresenbet, 2015). On the other hand freight transportation is critically tied to the economic growth and well-being of a region that freight transportation planning has become a major focus of transportation planning around the world (Ram, 2011). The road freight transport system, the main stream of inland freight transport, is highly congested and is having several infrastructural limitations

which make it inextensible to accommodate the drastic increasing freight transport demands and volumes (Muh Patrick, 2007).

Rail is also generally recognized as safer and more efficient in terms of land-use and energy efficiency. Recent investment in road and rail along the Djibouti corridor have the potential to significantly reduce transport costs and time and are a key element encouraging greater interest from investor in opportunities to develop manufacturing export capabilities in Ethiopia. With projections that imports and export will more than double under growth transformation plan two by 2020 the performance of this corridor will be paramount importance. This has been recognized by the government which is paying special attention to logistics performance and has developed national logistics strategy (World Bank, 2017).The liability of multimodal transport operator (MTO) for loss of goods, or damage to, goods as well as delay in delivery. That to say that the MTO is liable If occurrence which caused the loss, damage or delay in delivery took place while the goods were in his charge unless the MTO proves that he or his agents or any other person of whose services he makes use the performance of the contract, took all measure that could reasonably be required to avoid the occurrence and its consequences. From the point onwards, the MTO concludes a number of sub contracts with individual carriers, road rail, shipping lines, port authorities, terminal operators, stevedores, etc..., on the MTO'S own name, not that of shipper or the consignee. Only the MTO is entitled to take delivery of the goods from each actual sub carrier and pass them to the next sub carrier. The MTO, is acting as a principal, is responsible for the whole transport chain (UNCTAD, 2017).

About 65 percent of the dry bulk and container cargo imported through Djibouti uses the ESLSE multimodal system. So that there is high demand of safe and reliable transportation service for these freight transportation. A critical area of focus for government is a seamless logistics system characterized by an efficient flow of freight that promotes the economies of Ethiopia competitiveness. Government analysis points to the fact that poor performance of the transport system is imposing significant costs on business activity and therefore considers it important that blockages within ports and rail systems be dealt with urgently (UNCTAD, 2018). Measuring transportation performance allows the firm to identify problem areas and then make changes, resulting in improved transportation service and can be comparing against predetermined

standards, competitive benchmarks, or previous period performance problems. These are transportation cost, percent on time deliveries, and average transit time (Wisner *et al.*, 2005:300). The study started with review of existing literature on the development and prospects of multimodal transport system and role of transport for multimodal transport operator performance in general and Ethiopian context was analyzed from the existing literature.

1.2 Statement of the problem

Ethiopia is a land locked country in East Africa Since, the independence of Eritrea in 1993; a key factors shaping the external environment in which Ethiopia export and imports. The Ethiopia-Djibouti corridor linking Ethiopia to the port of is now the dominant gateway for the country with over 95 percent Ethiopia import and export using this route. Ethiopia's freight transport practice is characterized by a number of problems including underdeveloped and fragmented management system, inadequate and inappropriate fleets of vehicles and poor and lack of transport and logistics infrastructure, etc., very high accidents which is ranked among the worst in the world and congestion in cities at inlets/outlets of cities, lack of coordination of goods transport, damage of goods and quality deterioration due to inappropriate storage, packaging, and transporting, (Fikadu Debela, 2012; Tadesse, 2006). Among the problems that face during transportation of freight using multimodal transportation system are vehicle and freight congestion at transfer station due to lack of proper synchronization and unbalance between the delivery and convey vehicles. But during the transportation of this freight, Ethiopian Government pays a huge amount of money to the government of Djibouti for long time storage in Djibouti due to shortage of freight transporting vehicles and improper management of them. According to the data gathered from ESLSE the total amount of freight which is discharged at Djibouti port from year 2016 to 2019 GC.

Table 1. 1 Overall performances report

Service type	Msr.	Years			
		2016	2017	2018	2019
Imported goods by ESLSE	Ton	4,966,265	4,538,722	4,065,569	4,338,437
Imported containers by ESLSE	Ton	2,855,300	2,899,445	2,347,290	2,564,904
Imported containers by ESLSE	TEU	176,749	185,832	171,541	192,925
Imported containers by multimodal transport	TEU	174,915	179,170	173,911	181,049
Containers served at dry port	TEU	159,051	169,241	165,502	170,833
Average Containers dwell time at Djibouti	Days	10.3	7	9	6.4
Average Containers dwell time Modjo dry port	Days	55.8	43	59	57
ESLSE own available truck on average	Units	95976	93159	80449	70498

Source: ESLSE bulletin 2011 EFY

As the per report shows and according to ESLSE the freight which reach port of Djibouti stay for two month or more and a freight which reach dry port of Modjo stay for three weeks and more due to shortage of freight vehicle or due to miss management of the vehicles. With less experience operational efficiency and effectiveness may be under problem unless appropriate care is taken. Rail transport is critical for the efficient functioning of an economy and subsequently performance of the port (Bojan, 2010; César Ducruet, 2009). The importance of ensuring efficiency in transport infrastructure including rail transport is related to the ability of the performance of ESLSE multimodal transport to be competitive at international level.

Despite of the observation presented above especially in the importance of railway transport performance, highly increased the enterprise revenue, claims handling it takes 3 days, and due to unavailability of truck 9560 boxes are not loaded for seven days. But, when the rail stated operation within two years 14030TEU and 38468 TEU respectively transported. Truck accidents on average 324 trucks are faced accident. In so doing, the available knowledge is insufficient to understand the topic understudy. Therefore, this study intends to fill that knowledge gap through examining the role of rail transport performance on multimodal operator (Ethiopian Shipping and Logistics Service Enterprise) at Modjo Dry port.

1.3 Research Objective

1.3.1 General Objective

The general objective of this study is to assess the Role of Rail transport performance for multimodal operator performance of Ethiopian Shipping and Logistics Service Enterprise.

1.4.2 Specific Objective

The study was to address the following specific objectives

- To assess the delivery performance of rail transport for multimodal operator.
- To identify the cost effectiveness of multimodal transport operation and rail transport with relationship between terminal ownership status and container dwell time.
- To analyze multimodal transport operation liability and insurance performance during damage or loss of goods while in transit.
- To identify the role of rail transport for multimodal operator performance.

1.4 Research Question

The study would have intended to answer the following research questions

- i. What is the delivery performance of rail transport for multimodal operator performance at container terminal?
- ii. Which mode of transportation is cost effective between multimodal transport operation and rail transport with relationship between terminal ownership status and container dwell time?
- iii. What is the multimodal transport operation liability and insurance performance during damage or loss of goods while in transit?
- iv. What is the role of rail transport on the performance of multimodal transport operator?

1.5 Significance of the study

The study presented to increase knowledge towards the existing stocks of knowledge related to rail transport and multimodal operator performance. The findings are also expected to give a clear picture for Government (policy makers), different stakeholders, academicians, and the enterprise top management to examine the delivery performance of rail transport. It allows for effective operation with access to different means of transport to support economy and regional development and enhance the cargo flow in national transit port system are performed by Multimodal operator. It helps to improve strength of the enterprise and to reduce the weakness of the enterprise on multimodal transport operation.

1.6 Scope of the study

Ethiopian shipping and Logistics Enterprise is the result after the merging of three independently working enterprises and it's vested with a huge responsibility of rendering sea transport and logistics service to the importers and exporters. Multimodal transportation of freight from abroad to Ethiopia through Djibouti port use different mode of transportation. Among these rail, water, and road transportation system are the major modes of transportation systems which used in the delivery of the cargoes. But, in this research only focuses the role of rail transport on multimodal transport operation performance of containerized cargo from Djibouti to Modjo dry port and the population size taken, it only considering the multimodal transport operation directly i.e. Multimodal department and Modjo dry port operation staff.

Despite the time and budget constraint the study focused only on the import side of containerized cargo of multimodal transport system and thus the researcher was not cover export side of multimodal transport system.

1.7 Limitation of the Study

The study covers only the role of rail transport to the multimodal transport operator performance of Ethiopian Shipping and Logistics Enterprise at Modjo dry port. The rail transport operation is freight transport of form Djibouti to Modjo dry port only. This research is conducted Ethiopian Shipping and Logistics Service Enterprise as Multimodal transport operator. However, the multimodal operation has been operated in eight dry ports. Mainly, the study was multimodal operation at Modjo dry port only. Because, Ethiopian Railway operate multimodal transport by sub contacting and transport service to Modjo dry port only. Among Ethiopian Shipping and Logistics Enterprise department this studies focuses only Multimodal department and Modjo operation.

The finding of this study aimed to assess the role of rail transport for multimodal operator. On the time of data collection study there were different challenges due to COVID-19 some of the respondent were not interested to respond by questionnaire and the time schedule were shorten to collect the data. The study only focuses on import containers by rail transport. Thus the export cargo has not been considered.

1.8 Definition of operational Terms

Multimodal transport operator: ESLSE as a carrier who concludes multimodal transport contracts who act as a principal, not as agent involving transport by more than one mode of transport control what referred to as multimodal transport services is meaning that its activities start at the port of origin and finish at an internal container depot (dry port) and that the process uses both ships, roads and rail way as mode of transport hence multimodal (proc. 548/2007).

Rail Infrastructure: The 752.7 km electrified, standard gauge Addis Ababa- Djibouti railway, completed in 2016 and in the process of opening for commercial traffic, is jointly owned by the government of two countries and was constructed by China Railway Group and the China Civil Engineering Construction Corporation (UNCTAD 2008).

Multimodal transport: “the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country at which the goods are

taken in charge by the multimodal transport operator to a place designated for delivery situated in a different country” (UNCTAD, 2001). Therefore, the concept of Multimodal transport, facilitates the origin-to-destination freight transport service under a single operator’s responsibility using more than one mode of transport, is a natural extension of containerization (Hayuth, 1987; D’Este, 1996; & Muller, 1999).

Intermodal transport: is the movement of goods in one and the same loading unit or vehicle, which uses successively several modes of transport, without handling of the goods themselves in changing modes. But there may need more than one contact agreement Dong Wook Song, *et al.* (2015).

Dwell time: is an indicator of how efficient the ports are operating and how quickly the containers are flowing through the terminals. Every time a truck shows up to pick up a container, a stack of containers get shuffled around to get to the intended one; this is a time-consuming process which hinders the efficiency for both terminals and truckers. With longer dwell times, terminals are storing more containers, and truckers must wait for longer periods as containers must be moved to reach the older containers on the bottom of each stack PMSA, Dong Wook Song, *et al.* (2015).

Grace period: a period of time gives for importer days of free time cargoes remain at the port without paying storage cost Djibouti port tariff book, (2018).

ERC: Ethiopian government has taken several steps to improve the transport infrastructure. Ethiopian railway Corporation (ERC) recently completed the first phase of an extensive railway development program to build modern railway development program to build a modern railway network extending over 5000km. The priority route and the first one to be built is a line linking Addis Ababa to Djibouti, stretching some 752km in total of which 82km are Djibouti.

1.9 Organization of the study

This research study comprises five main chapters. The first chapter is devoted to the general introduction covering the background of the study, the statement of the problem, the objectives of the study, the significance of the study, the scope and limitation of the study, definitions of

terms and the ways of the research study organized. The second chapter presents related literature review where it comprises both theoretical and empirical literature followed by conceptual framework of the study. The third chapter presents methods of the study where description of the study area, the research approach, the research design, the population, the data sources and type, the methods of data collection and the methods of data analysis are embed in the chapter. The fourth chapter is the results, discussion and interpretation of results. The fifth chapter deals with the summary, conclusion and recommendations of the study.

CHAPTER TWO

RELATED LITERATURE REVIEW

Introduction

In this chapter the researcher deals with the literature review part has theoretical literature review and empirical literature review parts. Under theoretical part different scholars are presenting their thought and the empirical part of the study was cover findings from earlier research to cope up with the scholars.

2.1 Theoretical Literature Review

The theoretical part of the literature covered the topics concept and definition of multimodal and freight transport related experience on rail and the multimodal operator performance.

2.1.1 Concept and Definition of Multimodal Transport

The multimodal transport concept can be defined as the combination of various types of transport mode which includes road, rail and water way that used in national or international transport operation, to provide door to door services, under the responsibility of one single transport operator (UNCTAD, 1995; 2001). The international multimodal transport association defines multimodal transport as the chain the interconnects different links or modes of transport- air sea, and land into one complete process that ensures an efficient and cost effective door to door movement of goods under the responsibility of single transport operator, known as a multimodal transport operator, on single transport document.

2.1.2 Types of Multimodal Transport Operator

Multimodal transport operator could either group based on the organizational capacity and structure. There are four types of multimodal transport operators (UNCTAD, 1980).

The first types of multimodal transport operators are vessel operating multimodal transport operators (VO-MTO); Marine transport could be made either having owning or chartering of ship. The owner is usually limiting the responsibility from the time cargo is reached at port of loading up to the port of where the goods are going to be discharged. If the ship owner is extending his responsibility beyond the port where the goods is discharged and combination of the modes of transportation qualifies the ship owner as vessel operating multimodal transport operator (VO-MTO). Here the vessel operating Multimodal Transport Operator (VO-MTO) is issuing a single Multimodal Transport document and takes uniform liabilities for the entire transport. This could also be done by having or not having other means of transport. Transportation could simply arrange by sub-contracting this activity to those companies having such facilities

The second types of multimodal operators are Non Vessel Operating Multimodal Transport Operator (NVO-MTO) -other transport operator, such as freight forwarder, Stevedoring and tallying companies, Custom brokers who will not themselves have the vessels but they own one of means of transport either Trucks, Airplane or Railways and arrange door to door transport Services by using two or more mode of transport, they simply sub contract the ocean voyage, which they don't own or operate the vessel. These operators more over act as logistics provider value added service such as FCL/LCL, Handling customs formalities and documentation. Also the implementation of Multi modal transport legislation in many region and their flexible operation as well as their accessibility is most of small-scale shipper those especially operated inland locked countries has encourage to take carrier role and get an advantage.

The third type of multimodal transport operators are those who provide services related to transport but without having any means of transport. Those operators are made either by freight forwarders, stevedoring or tallying companies, custom brokers which in addition to their

auxiliary activities extend their services as a multimodal transport operator services. Hence the main feature of this operator is that their main activities are related to transport service.

In addition to above multimodal activities could be carried out by those business entities which do not necessarily own vessels and are established with the exclusive aim of providing multimodal transport service. To sort out above, multimodal transport operator may possess or may not claim means of transport or handling equipment or compartment stop or yards or holder cargo station (CFS) and warehouse. Consequently in order to satisfy their legally binding commitment, some of them enter subcontracting concurrence with individual Unimodal transport providers.

2.1.3 The Use of Multimodal transport

The utilization of multimodal transport infers generally basic changes covering new trade and transport practices. Different measures are expected to execute multimodal transport, from the smoothing out of business guidelines to the development of transport infrastructure. The upgrade of three principle components it's fundamental for an effective and efficient multimodal transport system. These components are commercial practices, administrative requirements and transport infrastructure (Banomyong, 2000).

And also according to Gray and Kim, (2001), consider the five determinants factors to successful multi-modalism. These are standardization, expenditure, interchange points, types of carrier, organizational coordination and role of government-deregulation and other encouragement.

Several literature have explained this multimodal/intermodal transport as useful, cost effective, time management, efficient, and play a great role to port performance and regional economic developments. As per Foolchand, (2006), the effectiveness of activities decides the adequacy of infrastructure that is given. For its successful demand the technological improvement in shipping particularly through containerization, ship design, cargo handling equipment, multimodal facilities, road and rail transport, port structure, port investments and inland transportation.

According to Dewan, *et al*, (2006) described successful implementation of multimodal transportation requires government coordination, technology, infrastructure, information system and knowhow of logistics management theory and practices.

There are rich theoretical explanations concerning transport infrastructure especially in dry port and railway transport.

2.1.4 Transport infrastructure

Transport infrastructure and services, including shipping, ports, roads and railways are essential for global merchandise trade and related supply chains. Cargo transporting financial matter with specific inclusion of maritime transport, including trends and developments in inter alia, world merchandise trade, shipping, seaborne trade, port-related issues, transport costs, cargo freight rates, as well as sea transport availability and access to advance the effective transport networks and transport corridor development, Transport and logistics of the landlocked developing countries (LLDCs) and the small island developing states (SIDS), multimodal and transit transport, Enabling sustainable freight transport systems, including through carbon emission reduction in freight transport, enabling practical cargo transport frameworks, including through carbon outflow decrease in cargo transport, increase vehicle network and progress towards vitality proficient, clean, and ecologically amicable freight transport system and financing sustainable freight transport systems. Freight transport economics spans a broad range of areas which are of relevance to UNCTAD's work in the field of transport and trade logistics. Key issues secured as a major aspect of this work, incorporate demand and supply, markets (e.g. freight and charter), transport costs, network, infrastructure framework (for example ports), as well as logistics. Cross-cutting issues of pertinence incorporate privatization, infrastructure management, innovation, vitality and transport-related externalities. With maritime transport being the foundation of international trade and globalization, specific consideration is paid to the sea transport sector. Bearing in mind the special needs of the small island developing States and the landlocked developing countries as well as the ever growing demand for door-to-door transport, the issues of multimodal transport, transit transport and transport facilitation are also key areas of relevance (UNCTAD, 2015).

2.2 The role of transportation in supply chain management

This refers to the movement of everything from raw material to finished goods between different facilities in supply chain. In transportation, the tradeoff among responsiveness and efficiency is manifested in the choice of transport mode. Fast modes of transport, for example, planes are exceptionally responsive yet additionally increasingly exorbitant or costly. More slow modes, for example ship and rail are cost effective yet not responsive. Since transportation costs can be as much as third of the operating cost of supply chain, decisions made here are very important (Ashish Bhatnagar, 2009).

2.2.1 Mode of transportation

There are six basic modes of transport. Each mode of transportation has key operational and commercial advantages and properties (Jean Paul Rodrigues, 2018). However, contemporary demand is influenced by integrated transportation systems that require maximum flexibility in responsive use of each mode. As a result, modal competition exists at various degrees and takes several dimensions. Mode cans can compete or complement one another in terms of cost, speed, accessibility, frequency, safety, comfort, etc.

Ship transport: This is very cost efficient but also the slowest mode of transport. It is limited to use between locations that are situated next to navigable waterways and facilities such as harbors and canal.

Rail transport: This is also very cost efficient but can be slow. This mode restricted to use between locations that are served by rail lines.

Pipelines: Can be very efficient but are restricted to commodities that are liquids or gases such as water, oil, and natural gas.

Road/Trucks transport: are relatively quick and very flexible modes of transport. Trucks can go almost anywhere. The cost of this mode prone to fluctuation though, as the cost of fuel fluctuates and the condition of roads varies.

Airplanes: are very fast mode of transport and are very responsive. This is additionally the most costly mode and it is some degree constrained by the accessibility of suitable airport facilities.

Electronic transport: is the fastest mode of transport and it is very flexible and cost efficient. However, it may or must be utilized for development of specific sorts of items, for example, electric vitality, information, and items made out of information, for example, music, pictures, and text.

2.2.2 Transportation performance measure

The saying “what gets measured gets done” illustrated the importance of the right thing being measured and inappropriate things being left out. If transport organization does not measure that it values it will end up valuing what can be measured. The selection of indicators would have been on the operation and direction of the organization behavior and affecting performance along these lines become crucial Margareta Isoreita, (2005). Factor to consider while choosing the most appropriate mode of transport as follows: (Wisner et al., 2005: 300).

2.2.3 Financial metrics of freight transportation

Transportation financial metrics should include total transportation costs and related ratios, as well as economic values for fleet assets. Total transportation cost and cost ratios- a detailed estimate of total transportation cost incorporates the following expense and capital elements: (Wisner et al., 2005:300)

Freight cost per unit shipped: Calculated by dividing total freight costs by number of units shipped per period. Can likewise be calculated by mode (barge, rail, sea, truckload, less-than-truckload, small bundle, air freight, intermodal, and so forth), Adam Robison, (2020).

Outbound freight costs as percentage of net sales: Calculated by dividing outbound freight costs by net sales. Most accounting systems can isolate "cargo in" and "cargo out." Percentage can fluctuate with sales mix, but is an excellent indicator of the transportation financial performance, Adam Robison, (2020).

Inbound freight costs as percentage of purchases: Calculated by dividing inbound freight costs by purchase dollars. It is imperative to comprehend the underlying detail. The estimation can shift broadly; contingent upon whether raw materials are purchased on a delivered, prepaid, or collect basis, Adam Robison, (2020).

Mode selection vs. optimal: This is calculated by dividing the number of shipments sent through optimal mode by the absolute number of shipments for the period. To measure this, each traffic path should have an assigned or optimal mode, based on freight costs and client requirements, Adam Robison, (2020).

Truck turnaround time: This is calculated by estimating the average time passed between a truck's arrival at your premises and its departure. This is an indicator of the productivity of your parcel and dock door space, receiving processes, and delivery forms. This moreover genuinely impacts cargo transporter benefits on your business, Adam Robison, (2020).

Shipment visibility/traceability percent: Calculated by parceling without a doubt the quantity of shipments by methods for transporters with demand following systems, by the full scale number of shipments sent during a period. This is a marker of the general progression of your bearer base, and one extent of the non-esteem regard open from your transporter base, Adam Robison, (2020).

Number of carriers per mode: Calculated by counting the total number of freight carriers used in a given period, by mode (ocean, barge, rail, intermodal, truckload, LTL, small package, etc.). This means that your volume influence and control over the transportation work, Adam Robison, (2020).

On-time pickups: Calculated by dividing the quantity of pick-ups made on-time (by the freight carrier) by the total number of shipments in a period. This means that the freight carrier performance, and carriers' effect on your shipping operations or transportation and customer service, Adam Robison, (2020).

Transit time: Measured by the number of days (or hours) from the time a shipment leaves your facility to the time it arrives at the customer's location. It frequently estimated against a standard transit time quoted by the carrier for each traffic path. Except if you are integrated into your client or customers' systems, you will have to rely on freight carriers to report their own

performance. This is often a significant segment of lead time. Transit times can shift considerably, based on freight mode and carrier systems

Claims free as percentage of freight costs: Calculated by dividing total loss and damage claims by total freight costs. Generally measured in total and for each carrier and a high number generally indicates packaging problems, or process problems at the carrier, Adam Robison, (2020).

Accessorial as percent of total freight: Calculated by dividing accessorial and overcharges by total freight expenditures for the period. Many cargo transporters will charge additional charges for trailer detention/demurrage, re-delivery, fuel increases, and different costs or extra services. Frequently, these are additional expenses acquired because of wasteful procedures, Adam Robison, (2020).

Percent of truckload capacity utilized: Generally utilized for shipments more than 10,000 lbs. Determined by dividing the absolute pounds transported by the hypothetical most extreme. For instance, expect your trucks can hold 40,000 lbs. of item. During the earlier month, there were 675 shipments totaling 22.95MM lbs. The rate usage was 85%. The 15% unused limit is an open door for more efficient.

Transportation Asset Economic Value Added Analysis – private fleet operators often underestimate the capital consumption and economic value generation potential of the fleet. To help monitor the capital consumption and value creation potential of logistics asset, a logistics asset, a logistics financial, Matiwos Ensermu, PhD, (2018).

Transport Cost of Service: The cost of transportation adds to the cost of the goods so it ought to consistently be remembered. Rail transport is relatively a less expensive mode of transport for carrying heavy and bulky traffic over significant distances. Road transport is most appropriate and economical to carry small traffic over short distances. Road transport saves packing and handling costs. Water transport is the least expensive or the cheapest mode of transport. It is reasonable to carry only heavy and bulky goods over long distances where time is not a significant factor. Air transport is the most costly mode of transport however is especially appropriate for carrying perishable, light and valuable goods which require quick delivery, RC Agarwa, (2014).

Speed of Transport: Air transport is the quickest mode of transport however, it is costliest of all. Motor transport is quicker than railways over short distances. In any case, the speed of railways over significant or long distances is more than that of other modes of transport with the exception air transport and is generally appropriate for long distances. Water transport is moderate and in this manner inadmissible where time is a significant factor.

Flexibility: Railways, water and air transport are inflexible modes of transport. They operate services on fixed routes and at preplanned time schedules. The goods must be conveyed to the stations, ports and air terminals and afterward taken from that point. Road transport provides the most flexible service because it is not tied to fixed routes or time schedules. It can operate at any time and can reach the business premises for loading and unloading.

Regularity of Service: Railway service is more certain, uniform and regular as compared to with some other mode of transport. It is not much affected by weather conditions. On the other hand, road transport, sea transport and air transport are influenced by terrible climate, for example heavy rains, snow, fog, storms so forth.

Safety: Safety and security of goods in transit also influence the choice of a suitable means of transport. Road transport might be preferred to railway transport because losses are generally less. Water transport exposes the goods to the perils of sea and, hence from safety point of view, ocean transport is thought of it all else fail.

Nature of Commodity: Rail transport is generally reasonable and most suitable for carrying cheap, mass and substantial goods. Perishable goods which require quick delivery might be carried through road transport or air transport keeping in mind the cost and distance.

Other Considerations: various special services such as warehousing, packing, loading and unloading are also taken into consideration while choosing mode of transport. From the above discussion it is clear that each mode of transport is suited for a particular type of traffic. The rail transport is especially appropriate for carrying heavy and bulky goods over significant distances. Road transport is suitable for carrying small consignments over short distances. Air transport is suited to light and precious articles which are to be delivered quickly. Ocean transport is appropriate for carrying heavy bulky goods over long distances at the cheapest possible cost.

2.2.4 Productivity metrics of transportation

Transportation productivity metrics fall into two categories: transportation asset productivity and transportation operator productivity (Matiwos Ensermu PhD, 2018).

Transportation asset productivity and utilization: The two main categories of transportation assets are containers and vehicles. Containers include over-the-road containers, ocean containers, air containers, and so on. The utilization of a container must incorporate the weight and cube utilization since container capacity is restricted in both dimensions. Container utilization (CU) is computed as: $CU = \text{Max} \{ \text{cube utilization, Weight utilization} \}$, $\text{Cube utilization} = \frac{\text{occupied cube}}{\text{length} * \text{width} * \text{height}}$, $\text{weight utilization} = \frac{\text{load weight}}{\text{container weight capacity}}$. Transportation vehicle (trucks, airplanes, locomotives, and ocean vessels) consume vehicle operating hours (VOH), vehicle available hours (VAH), and capital investment. The desired outputs for a vehicle include the number of deliveries, pound delivered, cube delivered, dollars delivered, mile travelled, and ton-mile delivered.

Transportation operator productivity: the metrics for transportation operator productivity do not differ that greatly from vehicle productivity because each vehicle is manned by an operator. The most common bases for assessing transportation operator productivity are number of stops, miles traveled, dollars delivered, cases delivered, pound delivered, or pallets delivered per person-hour.

2.2.5 Quality metrics of transportation

Transportation quality and reliability are even as important, if less important, than cycle time.

A shipment delivered quickly to wrong location or with the damage if of no use to the shipper or the shipper's customer. A carrier with average time delivery time of 48 hours who always delivers in 48 hours may be preferred over one with an average of 24 hours if the latter delivers is less than 24 hours a majority of the time, but occasionally delivers in 96 hours. We need just as comprehensive a set of indicators for the delivery quality of our private fleet or carrier base as we do for speed or productivity. We like to recommend the following set of transportation quality indicators tom our clients as a starting point in transportation quality management: claims free percentage, damage free shipment percentage, distance between accidents, on time

arrival percentage, on time departure percentage for each driver, carrier, and lane, perfect delivery percentage and perfect route percentage of route or trips without an imperfect delivery (Matiwos Ensermu PhD, 2018).

2.2.6 Cycle time metrics of transportation

The transportation industry considers literally time is money and quicker transit, loading, and unloading time translate into greater asset utilization, which translate into leveraging of the corporation capital. Cycle time metrics are the foremost natural indicators of transportation performance. Some of the most popular cycle time indicator for transportation include: point to point in transit time variability by driver, carrier, land and location and vehicle load unload time, detention time spent waiting for loading at a pickup/delivery location due to dock congestion and/or delays caused by shipper or consignee. It is not uncommon in cycle time analyses to learn that large percentage of operating time of any vehicle is spent waiting or in delays (Matiwos Ensermu PhD, 2018).

2.2.7 Transportation liability and insurance performance

A key issue within the context of establishing the liability of the MTO for loss of, or damage to, goods the selection between the “uniform” or “network” system of liability. Under the “uniform” system an equivalent liability regime is applied to the whole multimodal transport, regardless of the stage at which the loss or damage occurred. Under the “network” system, the liability of the MTO for localized damage (i.e. damage known to possess occurred during a selected stage of transport) is decided by regardless to the international convention or national law applicable to the ‘unimodal stage of transport during which the damage occurred (UNCTAD, 2001). Different modes have different causes to influence safety, so safety measures are different according to the mode for different modes in the literature (Mullen and Mon sere, 2010). In general, accident rates, fatality rates, and injury rates are directly related to the loss due to accidents. The figures of these rates directly reflect the safety performance of a transportation system. Accident rates at major intermodal terminal s are a subset of the total accident rates, and they should not be a

direct reflection of the whole transportation system performance. These measures represent the speed of response for any accident. Since a delay caused by an accident could heavily affect the economic value corresponding with it and, as a result, the customer satisfaction will be harmed by the sluggish service by the system, a transportation system needs to be very responsive. The number of accidents, fatalities, and injuries are some appropriated performance measures to evaluate the safety of a transportation system Ming Zhou and Haiyuan, (2004).

2.3 The role of transportation in logistics

The role that transportation plays in logistics system is more complex than carrying goods for the propriety. Its complexity can take effect only through highly quality management. By means of well-handled transport system, goods could be sent to the right time in order to satisfy customer demands. Transportation is base of efficiency and economy in business logistics and expands other functions of logistics system performing in logistics activities brings benefits not only to service quality but also to company competitiveness Wen long Yue, (2014). Transportation service plays a central role in seamless supply chain operation, moving inbound materials from supply sites to manufacturing facilities repositioning inventory among different plant and distribution center and delivering finished product to consumers.

2.4 Land freight logistics

Land logistics may be a vital link in logistics activities. It extends the delivery services for air and sea transport from airports and seaports. The most positive characteristic of land logistics is that the high accessibility level in land zones. The main transport modes of land logistics are railway transport, road freight transport and pipeline transport. Railway transport has advantages like high carrying capacity, lower influence by weather, and lower energy consumption while disadvantages as high cost of essential facilities, difficult and expensive maintenance, lack of elasticity of urgent demands, and time consumption in organizing railway carriages. Road freight transport has advantages as cheaper investment, high accessibility, mobility and availability. Its disadvantages are low capacity, lower safety, and slow speed. The advantages of pipeline transport are high capacity, less effect by weather, cheaper operation fee, and continuous conveyance; the disadvantages are expensive infrastructures, harder supervision, goods

specialization, and regular maintenance needs. The excessive usage of land transport also brings many problems, like traffic jams, pollution and traffic crashes. In the future, to enhance the land transport in transport efficiency and reliability, a revolution of transport policies and management is required, e.g. pricing. As the increasing demand of your time accuracy and decentralization of production, the necessity to scale back stock costs has led to the Just-In-Time (JIT) delivery principle, which involves more frequent delivery of materials at the proper time and at the proper place within the production process. The characteristics of expedited delivery are: (1) door-to-door service; (2) efficiency; (3) traceability; (4) Just-In-Time (JIT); (5) growing various delivery demands (Proceedings of the Eastern Asia Society for Transportation studies, Vol.5, pp.1657-1672, 2005).

2.4.1 Purposes of Dry port for multimodal operation

The purpose of dry port and multimodal transport document is to reduce transshipment with the its attendant handling cost and a minimum and a dry port can reduce empty rail wagon or truck movement by acting as a consolidation center for return loads of export cargo. The consignment increase in load factor may enable some saving to be made in overall transport costs. Dry port encourages the operation of units of train. The major sources of benefits of introducing units train operations in place of traditional goods trains are that shunting costs at the terminals and at the intermediate marshaling yard can be avoided and higher wagon and locomotive utilization rate achieved. The introduction of units is most appropriate when freight flows between two points are substantial, fairly continuous and relative balanced. If substitution use of long distance road haulage by rail transport can be encouraged, there may be saving to be gained in transport costs. This possibility can be assessed by finding the difference between rail and road through transport cost. Third, national planning will assist to implement, monitor and optimize investment strategies for ports which may only afford to put in low volume equipment. Where national resources are limited the trend should be to develop specialized high-throughput in container terminals.

2.4.2 Dry port in Ethiopia

Ethiopia, which is land locked developing country, was continuously facing the challenge of physical isolation, supply chain related barriers from sea port and the high costs of trading with the rest of the world since the withdrawal of Eritrea. In order to counter those challenges associated with land connection (landlocked) Ethiopia (ESLSE) established several dry ports to take the advantage of inland port. These dry port have been benefiting the country in saving foreign currency from sea port expenses at Djibouti, minimize transit time and ease of cargo flow. Such port providing services such as customs inspections, documentation of cargo, load/unload, stuff/unstuffed and handling (storage) of import and export cargos (UNDP, Ethiopia, 2017).

Dry port service enterprise was established by council of ministry regulation no.139/2007 with the objective of facilitate the country import and export and minimize the congestion at the port of Djibouti. A dry port is and inland intermodal terminal directly connected by road and rail to sea port and operating as center for transshipment of sea cargo to inland destination. In addition to their role in cargo transshipment, dry port may also include facilities for storage and consolidation and deconsolidation of goods, maintenance of road or rail carriers and customs clearance service. The location of these facilities at dry port relieves competition for storage and customs space at the seaport itself. Container transported from Djibouti port and unloaded to dry ports namely Modjo, Kality, Gelan, Kombolcha, Mekelle, Semera and Diredawa and got services on inland port have been increasing from 19,629 in 2004 to 170,833 in 2011 E.C.

2.5The role of rail transport on the performance of Multimodal Transport Operator

2.5.1 International freight transportation

Bektas, (2007) he puts clear that in today's world, intermodal transportation forms the backbone of world trade. It aims at integrating various modes of services of transportation to improve the efficiency of the whole distribution process. It is documented that parallel to the growth in the amount of transported freight and the changing requirements value (supply) chains, intermodal transportation exhibits significant growth. It is said that volumes of containers would be

consolidated by land transportation, barges and small feeder vessels. Bektas, (2007) concludes that ports that possess efficient cargo handling systems and intermodal connections are more competitive than competing ports in terms of attracting business. Some shipping lines have equity in companies that provide rail services especially in the United States and Canada. Because of the large distances between the west and east coasts of these countries, rail trucks were designed to carry containers that are double-stacked in an attempt to significantly reduce unit transportation costs to and from their vast inland destinations. In general it can be said that all major ports have dedicated rail and road terminal facilities in the vicinity of the dockside to facilitate the efficient transfer of goods to and from ships.

According to US Department of transport (2006), the value of multimodal transportation like port, rail and roads increased from about \$662 billion to about \$1.1 trillion in the period of nine years from 1993 to 2003. This is because all organizations move materials. Manufacturers build factories that collect raw materials from suppliers and deliver finished goods to customers; retail shops have regular deliveries from wholesalers; a television news service collects reports from around the world and delivers them to viewers; most of us live in towns and cities and eat food brought in from the country Waters, (2003). On a national scale, logistics involves a huge amount of effort. The USA has a gross domestic product (GDP) of US\$10 trillion, so its population of 280 million produces and consumes an average of US\$36,000 of goods and services. This implies that logistics is essential features of all economic activity Christopher, (1986). Similarly, Shapiro and Heskett, (1985), there are few aspects of human activity that do not ultimately depends on the flow of goods from point of origin to point of consumption. That means without logistics no material move. In fact, logistics is one among the aspect that give value the dry port and railway intermodal. As a matter of fact organizations are not supposed to work not in isolation.

As in the US, in India, too, the long distances involved make the rail option financially viable and attractive. In recognition of this, the Container Corporation of India (CONCOR) was established in 1989 as a wholly government owned undertaking, to set up and operate ICDs and to operate block train services between major ports and ICDs. The organization has been successful, both financially and operationally, and has given a tremendous impetus to the process

of transport networking. It has pursued an aggressive policy of expansion to cater to hinterland demands for both international as well as domestic traffic. ICDs are currently operational at several places - Delhi, Bangalore, Ludhiana, Coimbatore, Ahmedabad, Hyderabad, Guwahati, Guntur, Pune and Varanasi. New facilities are planned at 16 inland destinations including Nagpur, Gwalior, Rewari, Agra, Aurangabad and Balasore. CONCOR has also initiated plans for setting up an ICD in Nepal in collaboration with the Nepali government, since India is that country's main gateway to international trade. ("Intennodal Opportunities", April 1996). However, despite its undoubted success, CONCOR has not been able to rise above the inherent inefficiencies of the country's transport system. A telling comment was made during discussions with Maersk officials when they spoke of the delays suffered in transporting containers from INP to ICD New Delhi. They remarked that their experience in multimodal transport in India had been far from satisfactory and that they had no plans at present for direct involvement in its development. They are also not involved in the joint venture that their global shipping partner, Sea-Land, is planning with an Indian company, Mahindra & Mahindra, in this field. Even more telling is the report of the Indian Ministry of Commerce on this subject, which states emphatically that Indian inefficiencies in this area have resulted in raising inland transportation costs ("Indian Inefficiencies Raise Costs", January 1996).

Freight transport is the alliance between middle-small size delivery companies is an important trend in the future. The strategy could help to expand service areas and increase service quality, and meanwhile raise the loads of single trips to reduce delivery costs. However, the convergence of various mode of transport went together with planning and management of port development. The United Nations Conference on Trade and Development (UNCTAD) have published a handbook on Port Development (1985) for international port development based on best practices that are economically and technically sound.

Rail freight has an important role to play in improving the resource efficiency and sustainability of freight transport within the supply chain. The British rail network has seen considerable growth of freight and passenger activity in the last 20 years, leading to concerns about its capacity to absorb continued growth. A number of infrastructure initiatives focused on increasing capacity and reducing conflicts have been implemented Woodburn, A.G., (2007).

Another expressions show that, railway intermodal is said to be cost effective. It raises tonnages transported since various means of transport converge to facilitate the distribution of goods and services. Resultant outcomes have said it raises revenue, creation of good asset utilization that helps to deliver a reliable and cost competitive service.

2.5.2 Rail cargo transportation in Ethiopia

Ethiopian Rail way Corporation: The project budget was around 4\$ billion, with the Ethiopian section costing 3.4\$ billions of which 70% was financed through Export Import Bank of China and 30% of by government of Ethiopia. The cost of the Djibouti section was 878 million, with the money coming from the government of Djibouti. The railway line has double track from 115km from Addis Ababa to Adama, and single track for the remaining 600km to Djibouti. Power supplied through 20 distribution station 17 km, in Ethiopia and 3km in Djibouti World Bank, (2018).

Ethiopian government has taken several steps to improve the transport infrastructure. Ethiopian railway Corporation (ERC) recently completed the first phase of an extensive railway development program to build modern railway development program to build a modern railway network extending over 5000km. The priority route and the first one to be built is a line linking Addis Ababa to Djibouti, stretching some 752km in total of which 82km are Djibouti. International railway shipments can be fast and efficient especially designed operational practices at both ends of the line, simple transit procedure and efficient logistics facilities and service supporting the line. It is expected that the investment in rail transportation will provide significant economies of scale which result in lower transportation costs, less accident and fewer environmental emissions World Bank, (2018).

2.5.3 Freight transportation in Ethiopia

Ethiopia is a land locked country in East Africa Since, the independence of Eritrea in 1993; a key factors shaping the external environment in which Ethiopia export and imports. The Ethiopia-Djibouti corridor linking Ethiopia to the port of is now the dominant gateway for the country with over 95 percent Ethiopia imports and export using this route. Recent investment in road and

rail along the Djibouti corridor have the potential to significantly reduce transport costs and time and are a key element encouraging greater interest from investor in opportunities to develop manufacturing export capabilities in Ethiopia. With projections that imports and export will more than double under growth transformation plan two by 2020 (relative to base 2012) the performance of this corridor will be paramount importance. This has been recognized by the government which is paying special attention to logistics performance and has developed national logistics strategy World Bank, (2018).

Ethiopia's Growth strategy has been driven by massive public investment program which reached almost a quarter of country's gross domestic product in 2014 and has accounted for around half all growth in the economy since 2011. Spending on roads has been about 4% of GDP every year over the last five years, and the Addis Ababa – Djibouti railway has cost Ethiopia about 3.4\$ billion. However, without this expenditure on infrastructure there would be limited scope for improving logistics, and without such progress. Ethiopian manufacturers and other producers will not be price competitive in most regional and international markets.

The Ethio-Djibouti corridor provides Ethiopia's only significant commercial access to the sea. The port of Djibouti has, since 1998, handled almost all of Ethiopia maritime traffic. To accommodate this, the port has invested in providing improved trade and transit facilities. Djibouti has invested just under \$900 million in portion of standard gauge railway connecting the port with Addis Ababa. It also has invested heavily in new port infrastructure as it is a shareholder and manager of the Dorale Container Terminal (DCT) and the main shareholder and manager of Dorale Multi-Purpose (DMP) port. With the railway and these new port facilities in Djibouti, Ethiopia will be able to channel more cargo through Djibouti and Djibouti will able to handle this additional traffic World Bank, (2018).

2.6 Empirical literature review

As previously stated due to the newness of the research topic in Ethiopia perspective there is no work made prior to this study which the researcher could easily find and use as an empirical evidence for this research. In spite of the fact, the researcher has been forced to focus on the research made on multimodal transport in general several literatures have been search and

performed during the time research project. Thus, the selection of articles presented below represents but a small part of the theory studied and used as a foundation of this thesis.

2.6.1 Multimodal Transport performance

Some the researcher has done on researches and case studies on multimodal transport system. According to Amentae,T.K. and Gebresenbet,G., (2015) Customer satisfaction level were measured with five parameters, delivery, liability and insurance, documentation, cost and facilitation on multi modal service performances. The result indicated that majority of the customers were not satisfied with many of the service performances. The top three key challenges of Multimodal Transport System were the challenges of network connectivity, the problem of ICT usage at each and challenges of railways physical infrastructure ranked first, second and third respectively the research held by Lemmi T.,Bogale M., (2016) But the study was on perception of customers, therefore, it need checking with different time because there may be change of service quality persons may change their perception in different time and environment. But, internationally have done different research on the topic rail performance of intermodal transport operation. In addition, one can get objective measurements; it's good to verify with data.

2.6.2 Transportation cost effectiveness

There are also several studies in the literature regarding external costs of transportation. For example transportation modes should be evaluated for several aspects in order to define the total costs extensively. In this context, technical, economical, and operational parameters and externalities such as the costs of the accidents, emissions, and noise should be set clearly for each type of mode considering the probable price escalations during the lifetime of a certain transportation system. For this purpose, in this study, a more realistic cost analysis method, called “the leveled cost analysis method,” is used. Leveled costs are the “ratio of total lifetime expenses versus total expected outputs, expressed in terms of the present value equivalent” according to Nuclear Energy Agency and International Energy Agency. This issue analyses port-

rail integration as a factor of competitiveness in Latin America's port industry. While the developed world are encouraging the improvement of port/railway linkage Africa and Tanzania in particular little effort is made to ensure the efficiency of this connectivity especially in its role on port performance, regional economic growth and development Bahri Sahin *et al.*, (2014).

2.6.3 Transportation liability

Branch (1994), Safety of goods is equally important with its security. Any loss or damage, because of theft, mishandling, poor quantity packaging or physical damage caused by accident will result in the non-availability of the goods at the expected time and place, and in expected conditions. In relation with the safety of product my finding indicate that due to shortage of warehouse materials are inspected on field which has a consequence of damage to products that are to be inspected in warehouse.

Bubbico *et al.*, (2006), focused on assessing the risk of road and rail transportation cases of hazardous materials transport in Sicily. For each transportation mode, changing route and/or transport modalities and all the combinations of road, rail, and intermodal (road-rail) transport have been calculated and that minimizing the risk has been identified with the aid of the transportation risk analysis tool. Transport cost is also a significant factor for intermodal transportation for competitiveness of shippers. Calculation and minimization of total transportation costs are required to determine an effective, efficient, and economical transportation system. Unit cargo cost per route length is generally accepted as an indicator of economics.

Spiekermann and Neubaer, (2002) gave practical application of transport infrastructure. The study noted that the task of transport is to enable interaction that is the mobility of person and goods for social, cultural or economic activities. In the context of spatial development, the quality of transport infrastructure in terms of capacity, connectivity, travel speed determines the quality of location relatives to other locations that is the competitive advantage of locations, which is usually measured as accessibility.

2.6.4 The role of rail transport

According to Indian inefficiency raise costs, January, 1996 report, the total cost of shipping a container from ICD Delhi to Europe is USD 1760; of this, inland haulage from the ICD to the gateway port, Mumbai, alone accounts for 30%. The total transit time is 28 days, of which inland haulage accounts for 10 days or almost 36%. For a similar shipment on the ICD New Delhi/Singapore route, the inland haulage accounts for 45% of the total cost and 10 days (62%) of the total 16 days transit. The concept of 'liner trains' implies synchronization of vessel and train schedules to avoid idling of the boxes. This has not been built into the system. The rail car fleet stands in urgent need of modernization to accommodate linertrains and double stack carriage. The present fleet is restricted to a payload of 16 tons per axle due to track and bridge limitations. Outdated vacuum car brakes limit train length and speed - the average flat car has a payload capacity of 42 tons and the average train length is 32 to 45 FEUs. Overhead clearances pose another problem Sinha, (1994).

In spite of the obvious difficulties involved, perhaps sensing the tremendous potential available in this field, the private sector has responded with alacrity to the recent liberalization of rail transport. Mahindra & Mahindra has entered into a joint venture with US intermodal giant, CSX Corporation to provide road haulage and container block train services, focusing initially on the ICD Delhi/Mumbai route. It also plans to be involved in setting up ICDs and in port management. Since the Sea-Land/Maersk alliance has recently launched a WCI/Europe direct shipping service, for the US Company at least, the two moves are probably planned on a "mutual benefit" principle. Kirloskar, another Indian industrial group, is proposing to set up a Road Rail service, again on the ICD Delhi/Mumbai route, in association with Wabash National Corporation of the US. ("Intermodal Opportunities", April 1996). The RPG group has started container leasing activities in India through its financial services arm, Ceat Financial Services Ltd (CFSL). It will concentrate on the finance and long term leases in the domestic and overseas market. By joining forces with large established transport companies in India, CFSL plan to establish a chain of depots with state of the art handling, repair and communication facilities along major transport corridors thus facilitating efficient distribution and transshipment "Container Leasing in India", and (1996). As mentioned earlier, rail is of prime importance in India because of the vast

distances involved. At.62, 400 kilometers, India has the third largest rail network in the world Drewry, (1996), page 71. It is also the more economical and environment friendly option. However, as is the case with most developing countries Indian railways consider the passenger segment their primary service target. They therefore have limited rail space or rail time to spare for freight traffic. Massive investment is required in laying new tracks, acquisition of equipment and setting up of facilities in in order to fortify rail as an effective contributor to the multimodal experiment.

Likewise, (Schumann and Talat, 2000) described a transport and regional development modal. In his study it is shown that the relationship between regional development and transport can be seen as a self-reinforcing positive feedback loop in which regional economic growth creates more traffic and vice versa, transport opportunities generate regional economic growth. The findings of his study concludes that the use of inter-modal transport facilitate this explained economic growth. However, his study is based on Australian experiences in which the country is one among the developed nations. In Africa and Ethiopia in particularly the situation is different. It is noted that, globally port performance is closely linked with rail efficiency. For instance Amsterdam port has such good rail connection although most of the cargo is flowing by road and budes (EU, 2013; Enrico, 2015). The port of Amsterdam is well served with rail connections. Because of this, Europe as a whole is very accessible. The port has its own marshaling yards and connections to main lines. If there is no railway connection up to a company site, then this can be created in cooperation with Port of Amsterdam. From Amsterdam there are international rail connections to Belgium, France, Germany, and Switzerland and beyond. Four million tons of goods are transported by train in the Amsterdam region each year. Products vary from oil, steel and coal to waste, cars and general cargo. The expectation is that rail transport will grow healthily in the future. Rail is an excellent alternative for road transport over long distances (European Union, 2013).

In Africa East Africa, Kenya is trying to dominate the port business. Kenya had managed to revive the rail connection linking with Mombasa Port, intending to enhance port performance and dominate the trade. The China-financed Mombasa-Nairobi rail link that is under construction is facing competition from Africa's largest private equity firm that has invested \$70 million in a

competing rail connection that will also link the two cities. Egypt Exchange listed Qalaa Holdings is the majority shareholder of Rift Valley Railways (RVR) that operates the Mombasa-Uganda train service. The managing director at Qalaa Holdings said in a statement the company had overhauled the key railway network and was “investing heavily in a new subsidiary that would complement RVR by handling cargo at the port of Mombasa in Kenya Cooksey, B. (2016).

However, the Export-Import Bank of China (Exim Bank) has also started work on a \$3.8 billion railway connecting east Africa’s busiest container port with Kenya’s capital and beyond. It will take just over three years to complete and will eventually give the landlocked African nations of Uganda, Rwanda, Burundi and South Sudan vital access to the sea via the port of Mombasa. Rival rail networks from the port city will certainly be welcomed by shippers. More than 90 percent of cargo travels by road between Mombasa and Nairobi, which is wreaking havoc on the highway network and adding time and cost to the transport of cargo Evaristus M, (2001). At a ceremony to celebrate the first year Mombasa has handled 1 million containers, Kenya Ports Authority (KPA) managing director said container dwell time in 2014 had been reduced to 3.7 days from 5.8 days in 2013. Truck transit time was reduced from an average of 7 days to 4 days, while average vessels turnaround time was at 3.4 days, the same as in 2013 despite the port handling more ships and container volumes.

2.7 Conceptual Framework from Different Literature

Today, rail transport and multimodal transport in particular, is acknowledged as a sub-function of logistics, which itself is part of supply chain management. Multimodal transport decisions have an impact on the feasibility and reliability of supply chains. Shippers and consignees are more interested in supply chain performance than on the actual multimodal transport operations. They require efficient and reliable door-to-door service offered by transport/logistics service providers, who may be multimodal transport operators, Ruth Banomyong, (2000).

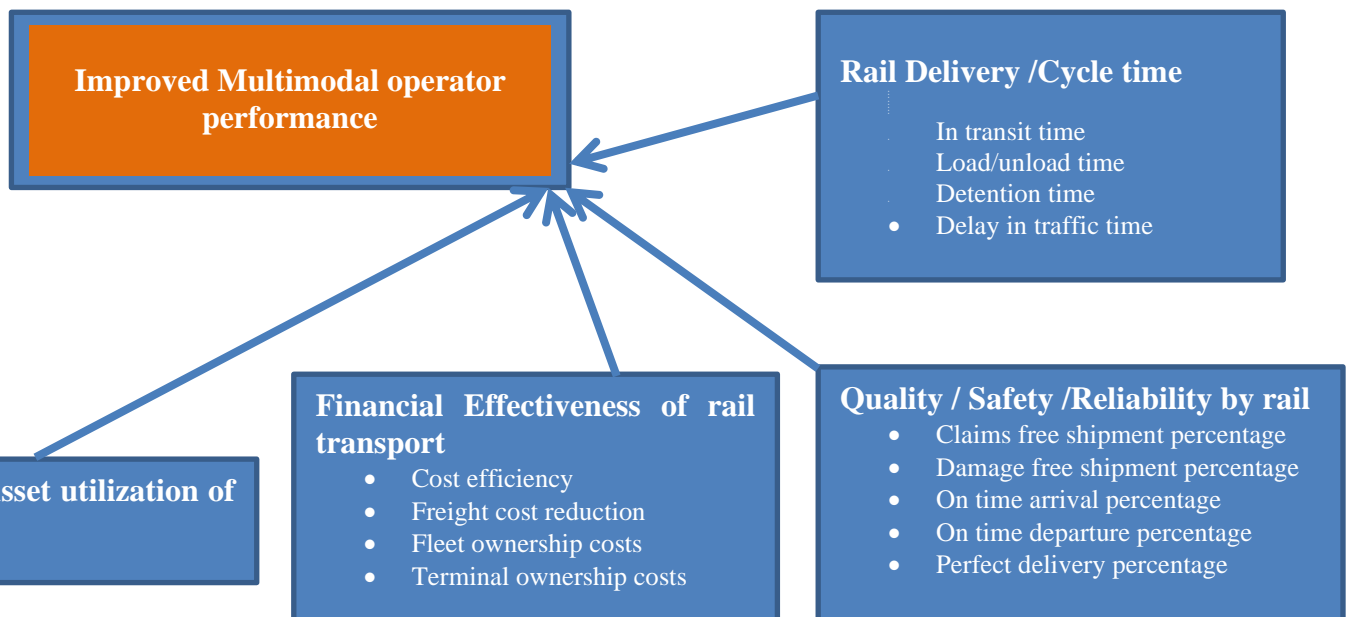
2.7.1 Conceptual Framework of the study

The conceptual framework lays a foundation for empirical study to find out the influence of rail transport on multimodal transport system performance at Modjo dry port. It is expected that the findings of this study were used and applied or lay a foundation for other similar studies in future, also will be a useful tool in policy formulation by relevant stakeholders in future. It is evident that multimodal transport system and rail transport has important role in enhancing port performance, and for economic development and taking into account of the growing needs of our country for improvement of international trade. It is imperative to study how rail transport influence multimodal transport performance so to address them in line with country’s economic development goals and policies.

Figure 1. 1Conceptual framework of rail delivery performance

A. Dependent variable

B. Independent variable



The conceptual framework shows that to execute freight transport problems like lack of adequacy freight transport, damage and theft of goods. Rail transportation plays a great role in

logistics chain in the form of connecting links and nodes.0 The problems solving policy play a and it determine transport performance indicators like the cost effectiveness of transport, quality, safety, reliability and rail transport might reduce the transit time and productivity of the operator. Due to this reason the connection role of transport is that the flow of inputs to the improvement of multimodal operator performance.

2.8 Literature gap

There are few studies in Ethiopia the significance of railway systems in an economy is paramount. That has led the government to see railway transport as an important alternative in the country's transportation system. First, railways are better suited for serving bulk freight on long distance over 250-300 km and above. Secondly, rail mode of transport is cheaper at critical traffic figure of up to one million tons per year carried for over 1000 km and can be economically sustaining without government subsidy. The estimated cost for the construction of one kilometer railway in Ethiopia is expected to be three million USD.

A review of available resources suggests that little research has been conducted on the multimodal transport system in the context of Ethiopia. In particular, none of the above research works focused on identifying the performance rail transport dimensions of Multimodal Transport system. Therefore, this study is expected to fill the gap mentioned.

CHAPTER THREE

METHODS OF THE STUDY

Introduction

Since the objective of this study is to assess the role of rail transport for multimodal transport operator performance in ESLSE, both descriptive and explanatory type of research design is more appropriate. The researcher chooses the descriptive and explanatory design because the nature of the designs is helpful in describing the current situation of the multimodal performance in detail. Therefore, the research design of this study was both descriptive and explanatory type of research design.

3.1 Description Study Area

The study area was on the role of rail to the multimodal operation performance ESLSE at Mojo dry port (MDP). MDP is the largest Port in Ethiopia and currently handles rail transport operation is operating by multimodal operation. Among imported 90% containerized cargo from Djibouti is loaded to Modjo dry port which also by now the rail transport operation is started from Djibouti to Modjo. In 2018/2019 fiscal year, ESLSE MDP handled in excess of 10 million tons of cargo.

The line is dual track between Addis Ababa and Adama and it is electrified, except for the stretch inside the port area (13km). The railway designed to have an operational speed of 120km/hour which could in theory reduce transit time between the ports to Addis Ababa to about six (6) hour compared to 3 days by road. ERC currently owns a fleet of 32 locomotives and close to 1100 wagons. About 990 wagons are designed for different kind of cargo while only to transport fuel. The success of this large scale investment depends on connectivity to efficient hinterland logistics nodes to which the railway essentially serve as conveyor while the port and the dry port act as a valves. In addition, the operational success of a new railway depend on its ability develop an intermodal freight business as an economics of transportation favor movement through central consolidation facilities that generate economies of scale. The new railway line should have significant economic impact through

- An ability to move large volumes of cargo import and export of the port in one movement (up to 180 Twenty Equivalent Unit (TEU) or 3500 tons of goods per train)
- Potentially reducing transit time to a quarter of what it is through road transport
- Reducing the amount of container demurrage payable to the container owner; and
- Reducing some of the steps needed to clear transit movements through the border between Ethiopia and Djibouti.

3.2 Research Approaches

In order to address the objectives of the study mixed research approach (both qualitative and quantitative research approach) is used. The researcher interested in both numerical data such as trend of revenues, level of performance but also opinions, perception with respect to about the efficiency of rail transport for multimodal operator in port logistic management and transportation. Hence, by utilizing a qualitative approach a better understanding of the issues related to the efficient functioning of rail transport to multimodal operation on the port and rail interface can be obtained through semi structured interviews.

3.3 Research Design

The study adopted both descriptive and explanatory research design. The researcher chooses the descriptive and explanatory research design because the nature of the designs are concerned with describing the characteristics of a particular individual, or group, whereas diagnostic research studies determine the frequency with something occurs or its association with something else. Therefore, the research design of this study was descriptive and explanatory.

3.4 Population and sampling technique of the study

Polit and Hungler, (1999) refer to the population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. The total population of the study comprises the entire number of Modjo dry port operation as multimodal transport operator of ESLSE. Therefore, in this study 614 target population constituted Modjo Dry port operation and multimodal department staffs directly related to the multimodal transport operation were

represented by the sample group, with that of all age groups, educational status and socio-economic who were knowledgeable with issues related for the study.

3.4.1 Sampling Techniques

In this research work may be understood as concerning the subjects or data items that could be included in the study, given the relevant specific circumstances (Polit & Hungler, 1999, p. 37). In the study of interest, there are two relevant populations. To determine on this study opted for purposive sampling techniques to analyze the topic under study. Purposive or judgmental sampling is a strategy in which particular settings persons or events are selected deliberately in order to provide important information that cannot be obtained from other choices (Maxwell, 1996).

3.4.2 Sample size determination

The other important task in scientific research is the estimation of sample size and its selection. However, the purpose of the study and the population size, three criteria usually were need to be specified to determine the appropriate sample size: the level of precision, the level of confidence or risk and the degree of variability in the attribute being measured Miaouslis and Michener, (1967). There are several approaches to determining the sample size. This includes using a census for small population like that of Modjo dry port operation imitating a sample size of similar studies, were used published table and formula applied to calculate the sample size. Therefore the researcher was select sample size through formula developed by Krejcie and Morgan, (1970).
$$\text{Sample size} = \frac{X^2 NP (1-P)}{d^2 (N-1) + X^2 P (1-P)}$$

Where X^2 the chi-square value for the 1 degree of freedom at some desire probability level 3.841, N = is the population size, that is the total number of Modjo dry port and multimodal operation staffs, which is 614, P is the population proportion (assumed to be 0.50 since this would provide the maximum sample size), and d^2 is the confidence interval 0.01 or 10% level of precious. From the above formula the calculated sample size is 84. The sample size calculated by randomly selected; this procedure was increase the likelihood that the data collected and it was representative of the whole population of interests.

3.5 Method of Data Collection

3.5.1 Data Collection

Both Primary and secondary data was used and employed. For primary data collection purpose, structured survey questionnaires were used. Data was collected from ESLSE management multimodal transport system and dry port also employee. The evaluation survey was conducted through personally distributed survey.

Secondary data gathered by reviewing different reports of the ESLSE, financial statements, manuals, policy documents, brochure and journals relevant with the study were interpreted and analyzed to assess the role of rail transport for multimodal operator performance.

The questionnaires contained two section and two parts. The first section is designed to collect respondents' demography and general information, the second section is structured question design to measure the variable of the multimodal transport operator performance in each dimension and with five points Likert scale (1=strongly agree, 2=disagree, 3=neutral, 4=agree and 5=strongly disagree) and part two open ended question to ensure the maximum response rate of the respondent.

3.5.2 Data Processing and Analysis

In this study, data and the information collected that related to the topic understudy were summarized and analyzed by software Statistical Package for Social Scientist (SPSS) Version 20. In doing so, Correlation Coefficients and Multiple Regression Analysis were used to analyze the data. Content analysis used to obtain descriptive statistics (including mean, standard deviation and variance) to draw conclusion for the study. The research findings were organized and presented in form of words and numbers by using frequency tables, histogram, charts and simple percentage method. In addition to the inferential analysis were used statistical tools such as coefficient of correlation, multiple linear regression analysis, sample T-test, and ANOVA (analysis of variance). To summarize and create a clear picture for the reader to understand the result of the study figures, tables, and other tools were used.

3.5.3 Document Review

In this study the documentary review was used as a source of secondary data. Several documents are reviewed ever since it is impossible to review all of them. The review involves reports carried out by individuals and organizations on the problem understudy. The purpose is to generate concepts and theoretical knowledge available and to prepare research instrument and field observation.

3.6 Data validity and Reliability Analysis

3.6.1 Data Validity

Validity is defined as a measure of truth or falsity of the data obtained through using the research instrument. It is classified as internal and external validity of the measuring instrument (Burns & Grove 2001). In this study validity refers to the measure of truth or falsity of the assumption in the role of rail transport to multimodal operator performance. Data not need to be only reliable but also true and accurate. If a measurement is valid, it is also reliable (Joppe, 2000). In an attempt to ensure the content validity, the questionnaires were developed on the basis by reviewing of the existing literature on the area of the study with little modification. In addition, the same set of questions was administered to the respondent so that responses would be similar to facilitate comparison.

3.6.2 Reliability test

According to Nunn ally (1978) reliability is used to check measurements are reliable to the extent that they are reputable and that random influence which tends to make measurements different from occasion to occasion or circumstance to circumstance is a source of measurement error. Reliability test has been done to check whether the scale used questionnaire consistently reflect what it intends to measure or not. For the test of reliability Cranach's Alpha is used as a measure of internal scale consistency. Cronbach's Alpha, (1990) is most commonly used to assess the internal consistency of questioner made up of multiple likert type of scales and items. Cronbach's Alpha ranges 0.00 up to 1.00, a negative alpha means you probably need to reverse some items. Reliability coefficient 0.70 or higher is considered or acceptable is most social

research situations. Cronbach's is often used in assessing the reliability of tests with question that have more than two possible Sapp and Jensen (1997). The alpha value is range 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 and Berry (2010) exhibiting a coefficient of alpha between 0.80 and 0.96 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. To ensure reliability, it is important to have an appropriately sized to achieve statically significant and reliable results.

Table 3. 1 Cronbach's Alpha Reliability Statistics

Variables	Cronbach's Alpha	N of Items
Cost /Financial Metrics	.917	10
Transit time /Cycle time Metrics	.915	10
Reliability /Quality Metrics	.899	10
Productivity Metrics	.922	10

Source: own survey questionnaire, 2020

As per the result and purpose of questionnaires were developed and distributed to the Multimodal department and Modjo dry port operation staffs 84 found that 84 questionnaires are returned and were responded. This makes the response rate 100%. At the time of data screening for accuracy and completeness of all questionnaires were used.

3.7 Ethical consideration

The researcher was considered every requirement of research ethics to establish trust with the respondents and approached also informed about the aim of the research. Furthermore the respondents were informed that their response would have been kept confidential and used for academic purpose only, in verbal communication and in writing. After getting the consent of the respondents, they were provided with a self-administered questionnaire designed for the purpose of this study, so that they complete and return it back. The researcher did not force customers to participate without their willing.

CHAPTER FOUR

DATA ANALYSIS, FINDING AND INTERPRETATION

Introduction

This chapter deals with analyzing and presenting the fact collected by questionnaires and it was the main data collection tool used to assess the role of rail transport for multimodal operator performance. The data collected were summarized, organized and analyzed using Statistical Package for Social Science (SPSS) software. In this study both descriptive statistics and inferential analysis were used to analyze the data. Descriptive statistics method was mainly used to analyze the data and the findings are presented in percentages and frequency distribution, mean and standard deviations.

4.1. The Demographic Data and Characteristics of the Respondent

Data related to their profile was collected and analyzed to know the respondent's sex, level of education, position and their work experience. A percentage and frequency characteristic of the respondents is presented in the following table.

Table 4. 1 Demographic profile of the respondent

Demographic profile of the respondent	Dimension	Frequency	Percent
Gender	Female	25	29.20%
	Male	59	70.80%
Work Experience	Less than 2 years	5	6%
	Above 2 up to 5 years	18	21.40%
	From 6 up to 10 years	52	61.90%
	Above 10 years	9	10.70%
Educational Background	Diploma	3	3.60%
	BA Degree	63	75%
	Masters	18	21.40%

Job Position			
	Directors	4	4.80%
	Management level	15	17.90%
	operation level/Coordinator	15	17.90%
	Senior experts	31	36.29%
	Officers	19	22.60%

Source: own survey questionnaire, 2020

According to table 4.1 below shows that among 84 respondents valid 70.2 percent of the respondents were male and 29.8 percent of the respondents were female. This implies that the study consists of more male than female respondents because, during data collection the researcher may meet more male than female or the enterprise has lesser female employee at Modjo dry port. Out of the total respondent 6 percent of the respondent worked less than 2 years, 21.4% worked above 2 up to 5 years, 61.9% worked from 6 up to 10 years and lastly 10.7% of respondent worked above 10 years. So that, the overall work experience shows that, above 73 percent of the respondents were worked for 5 up to 10 years in the enterprise. The educational backgrounds of the responds are 21.4 percent have been graduated and holds their second degree, 75.5% were responded as bachelor degree holder and the rest 3.6 % only have diploma. From this we can conclude that above 75 % of the respondents have bachelor degrees and above qualified. Lastly, among the total respondent 4.8 % serve the enterprise at director level, 17.9% of the respondent work on management and operational level,36.9% out of all respondent senior experts and 22.6 % work in officer. This implies that the majority of the respondents were senior expert.

4.2. Analysis of Descriptive Statistics

In order to analyze, the study report was conducted on data gathered from 84 respondents to assess and measure the role of rail transport for multimodal operator performance in four indicator or metrics was presented. Descriptive statistics (Mean, percentage and standard deviation) was used to analyze the data in this study. The research design was used to point out the degree of variability and percentage share in the questioner. It is taken into account that

numbers Likert scale 1, 2, 3, 4 and 5 represent strongly disagree, disagree, neutral, agree and strongly agree, respectively.

4.2.1 Delivery Performance of Rail transport

Table 4. 2 Descriptive statistics of rail delivery performance

Variable	SD		DA		Neutral		Agree		SA		Mean	St. deviation
	F	%	F	%	F	%	F	%	F	%		
Delivery performance of the multimodal transport operation on accuracy of departure time and promising time by rail transport	1	1.2	4	4.8	10	11.9	54	64.3	15	17.9	3.93	0.773
Rail delivery operation performance in container terminals improve cargo handling at the port	-	-	4	4.8	11	13.1	37	44	32	38.1	4.15	0.829
Rail delivery operation performance in container terminals reduces port congestion.	-	-	4	4.8	17	20.2	40	47.6	23	27.4	3.98	0.821
Rail delivery in container terminals raises dry port revenues	3	3.6	3	3.6	19	22.6	38	45.2	21	25	3.85	0.963
Rail delivery reduces detention time spent idling due to loading and unloading times at each pickup in container terminals.	2	2.4	3	3.6	15	17.9	43	51.2	21	25	3.93	0.889
Rail delivery in container terminals improves lowering the cost of logistics.	1	1.2	5	6	11	13.1	29	34.5	38	45.2	4.17	0.955
Rail delivery reduces in transit time point to point variability	1	1.2	4	4.8	10	11.9	25	29.8	44	52.4	4.27	0.936
Rail delivery quicker transit, loading and unloading time.	1	1.2	5	6	8	9.5	44	52.4	26	31	4.06	0.869
Rail delivery in container terminals improves customer satisfaction.	2	2.4	3	3.6	14	16.7	36	42.9	29	34.5	4.04	0.937
Rail transport increase deliveries per operating hour and ton-mile /km	1	1.2	3	3.6	15	17.9	23	27.4	42	50	4.21	0.945
Average mean = 4.06 and Average standard deviation = 0.8917												

Source: own survey questionnaire, 2020

Delivery performance of the rail transport to multimodal operator was assessed on the accuracy of departure time and promising time, efficiency on cargo handling, port congestion, and detention time spent idling due to loading and unloading, transit time, customer satisfaction and overall deliveries per operating hour. The results on the assessment are presented in table 4.2.

According to the result the average mean 4.06 which shows that the respondents were agreed on the indicator above mentioned. All variable mean and standard deviation are presented respectively what the respondent were responded. They were agreed that mean of the delivery performance 4.27 and 0.936 delivery performance rail transport reduces in transit time point to variability, 4.21 and 0.945 increase deliveries per operating hour and ton-mile, 4.17 and 0.955 improve lowering cost of logistics, 4.15 and 0.829 improve container cargo handling at dry port, 4.06 and 0.869 quicker transit in container loading unloading time, 4.04 and 0.937 improve customer satisfaction, 3.98 and 0.821 reduce port congestion, 3.93 and 0.773 accuracy of departure and promising time, 3.93 and 0.889 reduce detention time spent idling due to the time of container loading unloading at each pick up, 3.85 and 0.963 raise dry port revenues.

In summary the average mean shows 4.06 and 0.8917 standard deviation of the rail delivery performance highly important for multimodal operator. So that as multimodal operator ESLSE has to focus and recognize on this positive implication that the rail transport. As the secondary data shows that the enterprise was mainly focused on the road transport, congestion had a major impact on scheduling truck fleet. Time also lost, efficiency went to down, and costs rose at the pick time when container lying at Djibouti port. Now these issues were critical for the national logistics strategy to build the rail infrastructure in year of 2018 and after two years somehow resulted in more flexible, customer oriented and cost effective also raises the revenues of the operator because of the rail infrastructure.

4.2.2 Financial Metrics /Cost effectiveness

Table 4. 3 Descriptive statistics of financial metrics of multimodal

Variable	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	St. deviation
	F	%	F	%	F	%	F	%	F	%		
Rail transport reduce transportation cost for multimodal operator	3	3.6	6	7.1	17	20.2	23	27.4	35	41.7	3.96	1.113
Cost of multimodal transport is reasonable	2	2.4	8	9.5	14	16.7	46	54.8	14	16.7	3.74	.933
Rail transport reduce terminal ownership costs	1	1.2	4	4.8	27	32.1	36	42.9	16	19	3.74	.866
Rail transport decrease container dwell time and increase volume of cargo traffic	2	2.4	4	4.8	9	10.7	43	51.2	26	31	4.04	.911
Transportation computing infrastructure ownership costs	2	2.4	5	6	30	35.7	32	38.1	15	17.9	3.63	.929
Reduce customs brokerage and freight forwarding fees	2	2.4	7	8.3	18	21.4	37	44	20	23.8	3.79	.983
Infrastructure of multimodal operation have enough dry Port machinery for the service	5	6	25	29.8	25	29.8	16	19	13	15.5	3.08	1.164
Lack of an efficient railway system and limited financial resource to get the infrastructure	-	-	11	13.1	39	46.4	22	26.2	12	13.1	3.42	.895
Cost of ownership for asset like leasing of rail wagon	2	2.4	8	9.5	37	44	24	28.6	13	15.5	3.45	.949
Rail transport increase weight utilization of containers	4	4.8	4	4.8	14	16.7	31	36.9	31	36.9	3.96	1.080
Average mean and standard deviation											3.68	0.982

Source: own survey questionnaire, 2020

The cost effectiveness of rail transportation with the relationship between terminal ownership statuses adds to the cost of the goods so it should always be kept in mind. Rail transport is comparatively a cheaper mode of transport for carrying heavy and bulky traffic over long distances. In the following table respondents were asked to evaluate the cost effectiveness of multimodal transport system and rail transport with the relationship between terminals ownership

status or dry port and container dwell time presented. The assessment was prepared in ten financial metric indicators these are, cost of multimodal operator and reasonability, terminal ownership cost, container dwell time, infrastructure ownership cost, customs brokerage and freight forwarding fees, dry port machineries for the service, efficiency of the rail way system, financial resource limitation, cost of leasing rail wagons and weight utilization of containers.

The table 4.3 shows that among 84 respondents the 69.1 % of the respondents were strongly agreed and agreed on the cost reduction of multimodal by transporting through rail transport highest mean and standard deviation 4.04 and 0.911 response were responded agreed on the rail transport decrease container dwell time and increase volume of cargo traffic 3.96 and 1.113 and 3.96 and 1.080 the second highest mean and standard deviation respectively shows that the role of rail transport reduce the transportation cost and increase weight utilization for the multimodal operator agreed, third mean of the respondent with standard deviation 3.79 and 0.93 reduce customs brokerage and freight forwarder fees, 3.74 and 0.933 and 3.74 and 0.866 agreed on that rail transport reduce terminal ownership cost and the cost of multimodal is reasonable, 3.63 and 0.929 transportation computing infrastructure ownership cost, 3.45 and 0.949 cost of ownership for asset like leasing of rail wagon, the rest respondents were neither agreed nor disagreed by mean value 3.42 and 0.895 standard deviation responded on the lack of an efficient railway system and limited financial resource to get infrastructure and 3.08 and 1.164 infrastructure of multimodal operation have enough dry port machinery for the service. As per secondary data shows that cost of rail transportation per ton/ per km has been reduced from average birr 64000 to 32844 Ethiopian birr per FEU so when we calculate the difference birr 9000 per TEU time per year of imported total container in 2018 and 2019 it is huge amount difference gained from rail transport on average it reduce by 50% of transportation cost to multimodal transport operator.

4.3.3 Quality Metrics /Liability and insurance performance indicator

Table 4. 4 Descriptive statistics of quality metric/ liability and insurance performance

Variable	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	St. Deviation
	Fr	%	Fr	%	Fr	%	Fr	%	Fr	%		
Reliability of the multimodal transport operation provide service promised	1	1.2	1	1.2	14	16.7	37	44	31	36.9	4.14	.823
Cargo safety and liability, notice on time while the cargoes damage and good claim handling on multimodal transport operation	1	1.2	5	6.0	22	26.2	39	46.4	17	20.2	3.79	.879
Tendency of claims free shipment percentage of multimodal operation with rail transport and pace of accident	1	1.2	4	4.8	31	36.9	33	39.3	15	17.9	3.68	.867
Damage free shipment percentage of rail transport as compared to road	1	1.2	18	21.4	13	15.5	28	33.3	24	28.6	3.67	1.144
High distance between accident of multimodal transport for each driver	3	3.6	11	13.1	36	42.9	17	20.2	17	20.2	3.40	1.066
On time arrival percentage of rail transport is higher than road transport for each shipment	2	2.4	5	6	9	10.7	38	45.2	30	35.7	4.06	.961
Perfect delivery without defects, including damage, documentation, loss, accidents and claims of any kind for each delivery, driver and carrier is rail transport	4	4.8	3	3.6	31	36.9	24	28.6	22	26.2	3.68	1.055
There is on time insurance coverage during cargo damage	6	7.1	22	26.2	32	38.1	11	13.1	13	15.5	3.04	1.145
There is a clear procedure for practical situation when the accidents or losses happen	2	2.4	20	23.8	27	32.1	21	25	14	16.7	3.30	1.084
Rail transport decrease security risk and theft of multimodal shipment	2	2.4	5	6	6	7.1	23	27.4	48	57	4.31	1.006
Average mean and standard deviation											3.71	1.003

Source: own survey questionnaire, 2020

In order to evaluate the service quality of rail transport for multimodal operation liability and insurance performance during damage occur and loss of goods while in transit the questionnaire were distributed for Modjo operation dry port staff and multimodal department. The results of this survey are presented in table 4.4.

According to the results of survey average mean of 3.71 and 1.00 standard deviation shows that the respondent were agreed on the indicator what the researcher as a measurement factor. The

highest mean for this factor is 4.31 and 1.00 respondent were agreed on rail transport decrease security risk and theft of multimodal shipment, secondly mean of 4.14 and standard deviation of 0.823 of were agreed on the rail transport reliable for multimodal operation to provide service promised are considered as the most important factor, on time arrival percentage of the rail transport is higher than the road transport operation were agreed by the mean 4.06 and standard deviation 0.961 respectively. The respondents were also agreed by the mean and standard deviation 3.79 and 0.879, 3.68 and 0.867, 3.68 and 1.055 and 3.67 and 1.144 respectively rail transport has the most important factor on cargo safety and liability, notice on time while the cargoes damage occur and good claim handling on multimodal transport operation, damage free shipment percentage of rail transport as compared to the road transport and rail transport contextually has a perfect delivery without defects, including damage, documentation, loss, accident and claims of any kind for each delivery, driver and carrier is rail transport operation for multimodal cargoes. On the other hand the remaining three mean resulted neither agree nor disagree on the factor that high distance between accidents, on a clear procedure for practical situation when the accidents or losses happen and on time insurance coverage during cargo damage of multimodal transport operation. In fact multi modal operator the responsibility to provide insurance coverage on cargo damage until the cargo reaches customers premise. Clearly, service providers that have the responsibility for the cargo along the transport chain, such as multimodal transport operators, will access to the information at an early stage and will be able to comply more easily (UNCTAD, 2003). For damage, liabilities differ depending on the construct understudied. According to UNCTAD, (2001) article 1, the liability of multimodal transport operator for loss, or damage to goods as well as delay is based on the principle of “presumed fault or neglect.”

4.3.4 Role of rail transport for multimodal operator

Table 4. 5 Descriptive statistics of overall performance

Variable	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean	St.deviation
	Fr	%	Fr	%	Fr	%	Fr	%	Fr	%		
Cargo handling system for multimodal operation	2	2.4	2	2.4	11	13.1	48	57.1	21	25	4.00	.836
Tonnage of cargo trafficking when transported by rail as compared to truck	2	2.4	4	4.8	20	23.8	31	36.9	27	32.1	3.92	.984
Efficient Time used in rail for multimodal operation	4	4.8			10	11.9	29	34.5	41	48.8	4.23	.998
Increases in cargo flow transporting rail transport in multimodal operation	4	4.8	1	1.2	8	9.5	33	39.3	38	45.2	4.19	1.000
Rail transport improves port operational performance	1	1.2	6	7.1	12	14.3	31	36.9	34	40.5	4.08	.972
Rail transport increases productivity in cargo handling in the port	1	1.2	3	3.6	14	16.7	33	39.3	33	39.3	4.12	.897
Rail transport reduces port congestion	-	-	8	9.5	20	23.8	31	36.9	25	29.8	3.87	.954
Rail transport increases volume of cargo traffic	3	3.6	7	8.3	15	17.9	24	28.6	35	41.7	3.96	1.124
Rail transport increases fleet management/ round turn	2	2.4	8	9.5	11	13.1	41	48.8	22	26.2	3.87	.991
Adequate rail and other mode of transportation	2	2.4	5	6	16	19	42	50	19	22.6	3.85	.925
Average mean and standard deviation											4.01	0.968

Source: own survey questionnaire, 2020

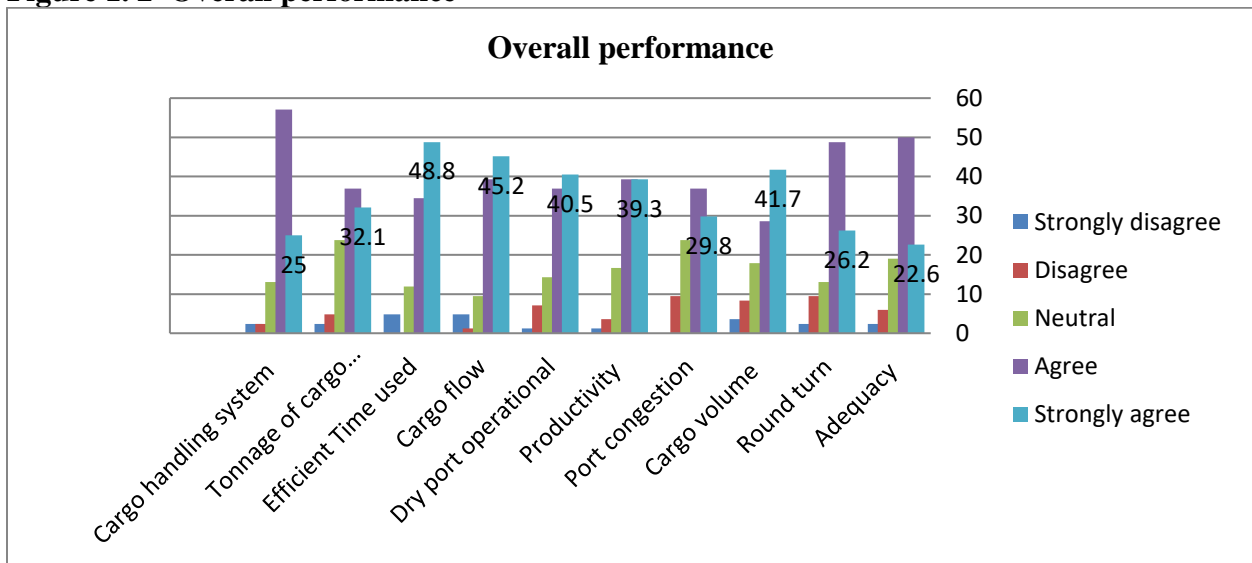
The rail freight transport is important to economic development because of its comparative advantage in serving certain forms and flows of freight. Countries with well-functioning freight railways are more competitive and reap wider benefits of balanced transport systems in which the right moves on the right mode (World Bank, 2009). In order to analyse the role of rail transport for multimodal operator the questionnaire are distributed to the respondent. The results of this survey are presented in table 4.5.

Among the description, it found the average mean and standard deviation 4.01 and 0.968 respectively shows that the respondent were agreed above all of factors as the most important factor that determine the role of rail transport for multimodal operator. The respondents were agreed by mean and standard deviation of 4.23 and 0.998, 4.19 and 1.00, 4.12 and 0.897, 4.08 and 0.972, 3.96 and 1.124, 3.92 and 0.984, 3.87 and 0.991 and 3.87 and 0.954 and 3.85 and 0.925 respectively shown as the role of rail transport has positive impact to efficient utilization of time

used, increase cargo flow, increase productivity, increase port operational performance, increases volume of cargo traffic, tonnage of cargo trafficking , increases fleet management or round turn, reduces port congestion and adequate rail and other mode of transportation to multimodal operator. The study revealed that the role of rail transport is an important tool for logistics performance and it can increase the economic integration by providing access to international and regional market and connecting landlocked countries like Ethio-Djibouti corridor.

Freight railways also deliver benefits that are increasingly valued by policy makers, particularly in the areas safety and the environment. As a result, countries increasingly include freight rail on the critical path to decarbonizing and achieving commitments toward sustainable development. Many emerging economies identified modal shift from road to rail.

Figure 1. 2 Overall performance



Source: own survey questionnaire, 2020

4.4 Inferential analysis

Inferential statistics are the statistical procedures that are used to reach conclusion about associations between variables. This chapter provides a short primer on only the most basic and frequent procedures: readers are advised to consult a formal text on statistics or take a course on statistics for more advanced procedures (Bhattacharjee A. (PhD.), 2010).

4.4.1 Test of Regression Assumption

Regression is a technique that can be used to investigate the effect of one or more predictor variable on an outcome variable. Regression allows you to make statements about how well one or more independent variables will predict the value of a dependent variable (Statistics data sciences, 2012). In order to make regression analysis the researcher was conducted test of normality, test of multicollinearity, test of autocorrelation, and test of correlation.

4.4.1.1 Testing for Normality

Table 4. 6 Normality test

Variable	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error2
Cycle metrics/ Delivery performance	4.06	0.912	-1.012	0.263	1.012	.520
Financial metrics /Cost Effectiveness	3.68	0.982	-.520	.263	.257	.520
Quality Metrics	3.71	1.003	-.511	.263	.212	.520
Overall performance	4.01	.968	-1.046	.263	1.132	.520

Source: Own survey, 2020

The normality tests are used to determine whether a data set is modeled for normal a distribution is normal or nearly normal. There are both graphical and statistical methods for evaluating normality: Graphical methods include the histogram and normality plot,

Statistically, two numerical measures of shape – Skewness and excess kurtosis- can be used to test for normality. If Skewness is not close to zero, then the data set is not normally distributed and if Skewness less than – 1 or greater than 1, the distribution is highly skewed (Good Data Corporation, 2007).

The normal probability plot (Chambers et al., 1983) is graphical technique for assessing whether or not a dataset set approximately normally distributed. The data plotted against a theoretical normal distribution in such a way that the points should from approximate straight line.

According to above table 4.10 depicted result shows that all variable are under acceptable range for normality.

4.4.1.2 Test of Multicollinearity

Table 4. 7 Multicollineariry analyses

	Collinearity Statistics	
	Tolerance	VIF
Delivery performance	0.748	1.583
Financial Metrics	0.655	1.218
Quality Metrics	0.823	1.527
Overall performance	0.632	1.338

Source: own survey, 2020

In regression you always check for correlation between your predictor variable because it has negative implications on your inference later (Asel Mendis, 2019). Multicollinearity occurs when independent variables in a regression model are correlated. This correlation is a problem because independent variables should be independent. If the degree of correlation between variables high enough, it can cause problems when you fit the model and interpret the results (Jim Frost, 2020). There are two types of multicollinearity: Data-based multicollinerarity which occurs because of the researcher, when the experiment is poorly designed or the collected data are purely observational and Structural multicollinearity which occurs when the researcher generates new independent variable from one or more existing variables (Jamal I, 2017).

To assess multicollinearity by examining tolerance and Variance Inflator Factor (VIF) are two collinearity diagnostic factors it helps to identify multicollinearity. Tolerance is a measure of collinearity reported by most statistical programs such as SPSS; the variable s tolerance is $1-R^2$. A small tolerance value indicates that the variable under consideration is almost a perfect linear combination of the independent variables already in the equation and that it should not be added to the regression equation. All variables involved in the linear relationship have a small tolerance. Some suggest that a tolerance value less than 0.1 should be investigated further. If a

low tolerance value is accompanied by large standard errors and non-significance, multicollinearity may be an issue (Jeffery W. *et al*, 2007).

As per the result shown on table 4.7 VIF values less than 10 so it indicate that multicollinearity is not a problem. In addition to VIF value, tolerance value for each variable should be less than 1. The value above shown multicollinearity statistics tolerance of quality metrics (0.823), delivery performance (0.748), financial metrics (0.655) and overall performance (0.632). And VIF value 1.527, 1.583, 1.218 and 1.338 respectively. The output above shows that the VIF may be moderately correlated. Therefore, diagnosing the VIF and tolerance values, multicollinearity is not a problem and this would tell us there is an opportunity to overcome the overall regression analysis.

4.4.1.3 Test of Autocorrelation

Table 4. 8 Autocorrelation test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.895 ^a	.800	.793	3.05007	.800	106.927	3	80	.000	.083

a. Predictors: (Constant), Overall performance, Quality metrics, Financial Metrics

b. Dependent Variable: Delivery performance

Source: own survey questionnaire, 2020

Autocorrelation is important because (a) it can affect the validity of inferential statements associated with conventional hypothesis test and confidence intervals (e.g. Positive autocorrelation leads to underestimated p values and confidence intervals that are too narrow), (b) knowledge of its presence can lead a researcher to select a more appropriate statistical analysis, (c) the precision of prediction made using regression equations can be improved using information regarding autocorrelation (Bradley Huitema, *et al*.2006). Durbin-Watson test, published in 1950, is probably the best known test for autocorrelation. This assumption requires that the errors terms over time is zero. If the errors are correlated with one another, it is stated

that they auto correlated value greater than 2 indicates a negative correlation, whereas the value below two indicates a positive correlation (Andy F., 2009). In order to perform the test, the researcher used Durbin-Watson in SPSS.

As per table 4.8 in the output shown, includes information about the quantity of variance that is explained by predictor variables (delivery performance, financial metrics (cost effectiveness), quality metrics and overall performance). The first statistic, R, is the multiple correlation coefficients between all of the predictor variables and the dependent variable. In this model, the value is 0.895 (89.5%), which indicates that there is a great deal of variance shared by the independent variables and the dependent variables. The next value, R Square, is simply the squared value of R. This is frequently used to describe the goodness-of-fit or the amount of variance explained by a given set of predictor variables. In this table, the value is 0.800, which indicates that 80% of the variance in the dependent variable is explained by the independent variables in the model. Thus, the result shows that the predictors identified in this study were factors that high the measure the performance of rail and multimodal operation.

4.4.2 Correlation analysis

Table 4. 9 Correlations Matrix

	Delivery performance	Financial Metrics	Quality Metrics	Overall performance
Delivery performance Correlation Coefficient		.631**	.651**	.854**
Financial Metrics Correlation Coefficient	.631**		.718**	.650**
Quality Metrics Correlation Coefficient	.651**	.718**		.672**
Overall performance Correlation Coefficient	.854**	.650**	.672**	

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

Source: Own survey, 2020

Correlation analysis is statistical method that is used to discover if there is a relationship between two variables or datasets, and how strong that relationship may be. The relationship between variables is detected with correlation coefficient. A correlation coefficient expresses quantitatively the magnitude and direction of the relationship between two variables. As per Pearson correlation any score from + 0.5 to +1 indicates a very strong positive correlation which means that they both increase at the same time, any score from -0.5 to -1 indicates strong negative correlation which means that as one variables increase the other decrease proportionally and the score of 0 indicate that there is no correlation, or relationship between the two variables. According to M.M Mukaka, *et al*, 2009 correlation coefficient of zero indicates that no linear relationship exists between two continuous variables, and a correlation coefficient of -1 or +1 indicates a perfect linear relationship. The strength of relationship can be anywhere between -1 and +1. The stronger the correlation, the closer the correlation coefficient comes to ± 1 . Therefore, this output give us a correlation matrix for four correlation requested above table 4.9 shows that result four unique correlation coefficient there is a positive correlation coefficient number the variables are directly related. The highest positive correlation detected between overall performance and delivery performance, quality and financial metrics (0.854) and (0.718) respectively and moderate positive correlation detected between overall performance and quality metrics by coefficient value (0.672), quality metrics and delivery performance (0.651), overall performance and financial metrics (0.650) and delivery performance and financial metrics by (0.631) correlation coefficient.

4.4.3 Discussion Regression analysis

This section presents the result of inferential statistics analysis on measuring the role of rail transport for multimodal operator performance which was tested. The summary table 4.10 shows in the output is an ANOVA table that describes the overall variance accounted for in the model. The F statistic represents a test of the null hypothesis that the expected values of the regression coefficients are equal to each other and that they equal zero. Put another way, this F statistic tests whether the R square proportion of variance in the dependent variable accounted for by the

predictors is zero. If the null hypothesis were true, then that would indicate that there is not a regression relationship between the dependent variable and the predictor variables. But, instead, it appears that the four predictor variables in the present example are not all equal to each other and could be used to predict the dependent variable, delivery performance, as is indicated by a large F value and a small significance level (Andy F.2018).

4.4.4 Multiple regressions

Table 4. 10 Analysis of regression

ANOVA ^a						
Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	3828.818	3	1276.273	135.846	.000 ^b
	Residual	751.599	80	9.395		
	Total	4580.417	83			

a. Dependent Variable: Overall performance

b. Predictors: (Constant), Quality metrics, Delivery performance , Financial Metrics

source: Own survey,2020

Multiple regressions generally explain the relationship between multiple independent or predictor variables and one dependent or criterion variable. A dependent variable is modeled as a function of several independent variables corresponding coefficients, along with constant terms and it requires two or more predictor variables that’s why it is called multiple regression.

The multiple regression equation explained above takes the following form:

$Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n + c$. where a is constant Here, b_i 's ($i=1, 2, 3 \dots n$) are the regression coefficients, which represent the value at which the criterion variable changes when the predictor variable changes (Hair et al., 2010).

Multimodal operator performance = $a + b_1$ (delivery performance) + b_2 (financial metrics (cost effectiveness)) + b_3 (quality metrics) + b_4 overall performance + $\epsilon = 1, \dots n$

According to table 4.10 the output shows reports an analysis of variance (ANOVA). The summary table shows the various sums of squares described and the degrees of freedom associated with each. From these two values, the average sums of squares (the mean squares) can be calculated by dividing the sums of squares by the associated degrees of freedom. The most important part of the table is the F-ratio, which is calculated by using equation and the associated significance value of that F-ratio. For these data, F is 135.85, which is significant at $p < .001$ (because the value in the column labeled Sig. is less than .001). This result tells us that there is less than a 0.1% chance that an F-ratio this large would happen if the null hypothesis were true. Therefore, we can conclude that our regression model results in significantly better prediction of overall performance. In short, the regression model overall performance predicts significantly well.

4.4.5 Distribution Coefficient

Table 4. 11 Distribution coefficient

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.282	2.085		-.135	.893
1 Delivery Performance	.650	.086	.587	7.593	.000
Financial Metrics	.323	.102	.323	3.175	.002
Quality metrics	.057	.097	.055	.583	.562

a. Dependent Variable: Overall performance

Source: Own survey, 2020

The table of coefficient above measures the individual contribution of each independent variable change in the dependent variable. This represented by the coefficient Betas (β) for each predictor. Table 4.11 distribution coefficients model number of scored unstandardized coefficient B and Std. Error, Standardized coefficients Beta, t and significance (Sig.): (Constant).

The model shows a strong and most statically and most significant positive relationship between Delivery performance ($\beta=0.650$, $t=7.593$, $p=0.000$), Financial metrics (cost effectiveness) ($\beta=0.323$, $t=3.175$, $p=0.002$) and Quality metrics ($\beta=0.057$, $t=0.055$, $p=0.562$). All the dependent variables were significant predictors of the role of rail transport for multimodal operator performance since their significance value less than 0.05. Overall, the consistency of regression coefficients on the selected indicators (delivery performance, financial metrics (cost effectiveness), quality metrics and overall performance) suggests that these variables are important factors influencing multimodal operational efficiency although at different degrees to the multimodal operator performance. The predictive model by the study is Overall performance (Y) = 0.282+0.587+ 0.323(financial metrics) equation for regression output (Standardize Beta Coefficients used).

Summary of interview

As per the interview conducted the performance of rail transport and multimodal transport operation at Modjo container terminal?

The interviewee were answered this question rail transport performance is a good beginning for multimodal operator performance in terms of effective delivery and assisting the transport operator for cargo handling, utilizing time efficiency, decrease transit time which takes from Djibouti by trucks to be on hours and decrease container dwell time, loading and unloading time were decrease, reduce port congestion and its effective mode of transport for multimodal as compared to truck. However, majority of the respondents were responded on positive side but, some of the respondents are emphasis multimodal operator should take an account regarding the adequacy of wagon is less. So that the major factor for delivering containers and customer satisfaction were the role of rail transport is important to the profitability multimodal operator.

Q#2.Which mode of transportation is cost effective between multimodal transport operation and rail transport with relationship between terminal ownership status and container dwell time?

As some respondent replied the cost effectiveness of rail transport is obvious but, with regard to the container ownership status it reduce different costs like Djibouti port cost by delivering goods with grace period, decrease storage fee by transport to dry port by transporting good with

quick transit it will increase the flows of cargo for dry port.as far as the rail transport is part of multimodal transport without any distinction it is reasonable as compared to the other mode the cost and easy for container operation in loading unloading cost.

Q#3. What is the rail transport and multimodal transport operation liability and insurance performance during damage or loss of goods while in transit?

As per the respondent answer internationally both governed with separate rule for multimodal transport but, the multimodal operator fully liable for any damage or loss. However the ESLSE procedure is not clear for handling of accident it needs further direction from the concerned and by this beginning of the rail transport it is less occurrence of damage on delivery.

Q#4. What is the role of rail transport on the performance of multimodal transport operation?

Majority of respondent were answered for this question positive implication of role of rail transport significance role to multimodal operator performance and it has a huge impact for delivering containers from Djibouti with quick transit and reducing the container dwell time, increase heavy weight lifting to minimizing the customer dissatisfaction by lying their containers at Djibouti port for long period, increase cargo flow and increase profitability of the operator by minimizing cost and increase productivity of multimodal transport service .

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECCOMENDATION

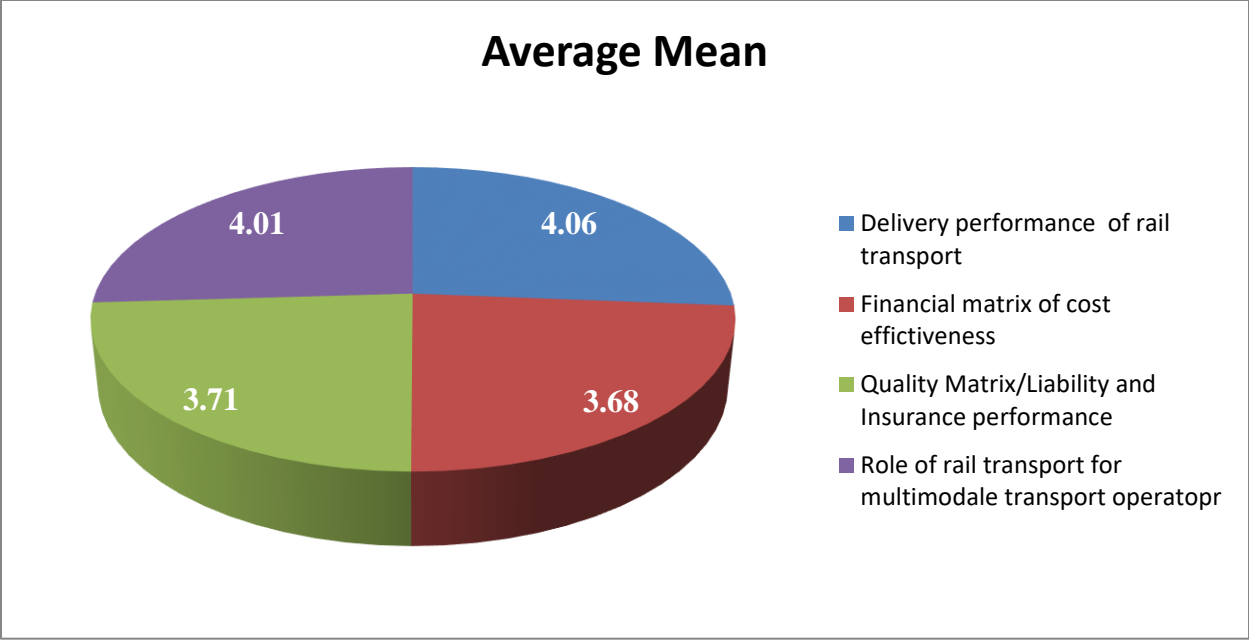
Introduction

In this final chapter of the study presents the summary of findings, conclusions and recommendations to make help and improve the rail transport for multimodal operator performance measure based four critical indicators presented in relation to the pre stated on the objectives of the study.

5.1 Summary of finding

In order to ensure the achievement of the study objectives, the summary of the study findings presented and it is important to draw some interpretation between underlying descriptive statistics were used to analyze the data collected from the respondent. Frequency, percentages, mean and standard deviation were used to analyze the data of demographic, educational level, work experience, position of the respondents and the indicator factors also analyzed by descriptive analysis. The respondent of the enterprise (Ethiopian Shipping and Logistics Enterprise operation staffs) of 70% were male and 30% female, among this majority have first degree and above 75% and 21.4%. The rest 3.6% of the respondents were only have diploma. The analysis result of work experience indicate that 62% of the respondents were from 6 years up to 10 years experienced and regarding the experience on multimodal transport and exposure of the position to respond the raised question, they were highly skilled that shows 77.4% above senior level and rest 22.6% officer level of the operational works.

Figure 5. 1 Summary of descriptive analysis



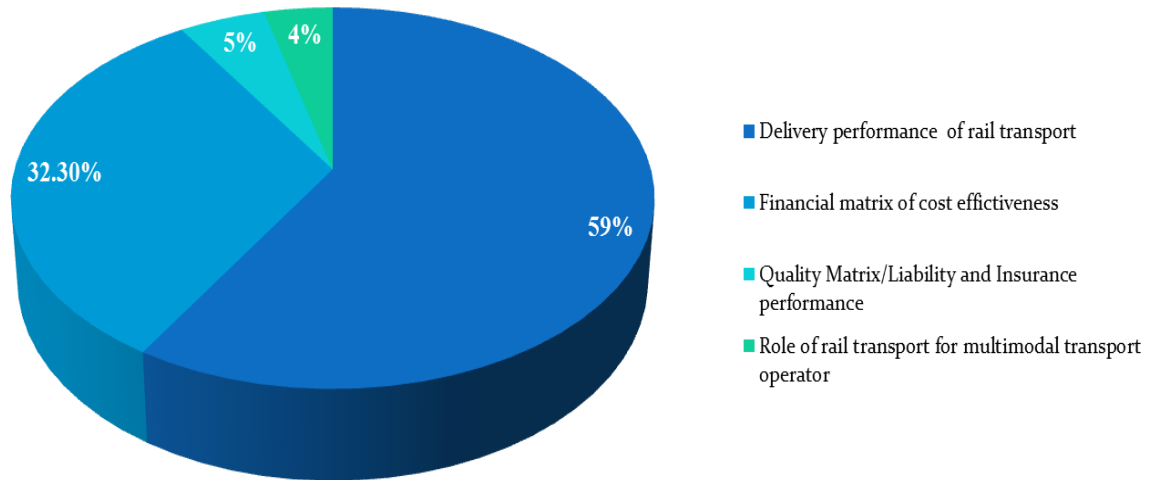
Source: Own survey, 2020

The result found from descriptive statistic presents, delivery performance and overall performance of the rail transport were scored the highest mean 4.058 and 4.083, the financial metrics or cost effectiveness and quality metrics were scored mean 3.680 and 3.706 respectively. According to the respondent they were agreed on the factors that were played a great role on the measurement of performance of rail to the multimodal operator.

On Delivery performance metrics of rail transport to the multimodal operator performance was evaluated based on the accuracy of departure and promising time, reduce transit and detention time spent idling due to loading/unloading time, increase deliveries per operating hour, improve cargo handling at dry port and raises dry port revenue, reduce port congestion and lowering the logistics cost and improve customer satisfaction. As per the data analysis the result showed and indicated by average mean and average standard deviation 4.06 and 0.892 that majority of respondents were agreed on the delivery performance of rail transport are accurate and responsive.

Figure 5. 2 Summary of regression percentage

Summary of Regression Percentage



From regression model the coefficient delivery performance of rail transport 0.650 means that 65% of variation shows to the multimodal operator performance. Thus, the operator focus should be on the delivery performance metrics.

Financial metrics/ cost effectiveness of the rail transport to multimodal operator performance with relationship between terminal ownership status and container dwell time was evaluated based on the rail transport reduce transportation cost, reduce terminal ownership cost of Djibouti port, decrease container dwell time and increase volume of cargo traffic, reduce customs brokerage and freight forwarding fees, efficient railway system , increase weight utilization of containers and overall measurement of financial performance. According to the assessment result showed the average mean and standard deviation of the total items represents 3.68 and 0.982 respectively, this implies that majority of the respondents were agreed. Thus the cost effectiveness or financial metrics is suitable for the multimodal operator performance.

From regression model the coefficient of financial metrics 0.323 or 32.3% of variation implies that the improvement of cost effectiveness and terminal ownership cost of rail transport for the

multimodal operator performance as critical factor to the overall performance of enterprise productivity.

Quality metrics in relation to the performance of multimodal operator and service quality of rail transport were measured and analyzed operation liability, insurance performance during damage or loss of goods while in transit, the reliability of service provided, on time notice while the cargoes damage, perfect delivery without defect and claims handling procedure for multimodal transport operation. As per the result showed and indicated on the factors to determine the quality metrics the respondents were agreed on average result mean 3.71 and average standard deviation 1.003 which means that deviated slightly from the mean.

From regression model coefficient of quality metrics 0.057 implies that 5.7% of variation to multimodal operator performance.

Overall performance of multimodal transport operation were used to identify and measure the role of rail transport on the performance of multimodal operator based on overall cargo handling system, tonnage of cargo trafficking, efficiency, increase cargo flow and volume of cargo traffic, improve dry port operational performance, increase productivity in cargo handling and increase fleet management of round turn. According to with the result average mean 4.01 and 0.968 standard deviation most of the respondents were agreed. Thus shows that factors were convinced as measurement of the overall performance of rail transport to multimodal operator.

5.2 Conclusion

This study overriding purpose was to examine the role of rail transport in improving the multimodal operator performance. In its specificity, the researcher wants to examine also the current rail delivery operation at Modjo dry port container terminal. Additionally, the study explored the relationship between the rail transport and operational growth of the Ethiopian Shipping and Logistics Service Enterprise as sole multimodal operator in the country.

In order to conclude there are number factors to measure the performances those are delivery performance metric, financial metrics or cost effectiveness, quality metrics and productivity or asset utilization to answer the subjected research question. Among these noted by study was the rail delivery performance metrics in terms of accuracy of departure and promising time, reduce

transit time , reduce detention time ,improve cargo handling, reduce port congestion and raises dry port revenue to the overall multimodal operator performance.

The cost effectiveness that among them as noted by this study include reduction in port congestion, improve dry port cargo handling system and rail transport increase the multimodal operator revenues, reduce terminal ownership cost, decrease container dwell time by lifting volume of cargo trafficking, tonnage of cargo while transporting weighted containers and quality metrics of the rail transport incorporate with perfect delivery without damage is less occurrence of accident while transporting imported goods, cargo safety and decrease security risk and theft of multimodal transport shipment. Beside this the respondents neither agreed nor disagreed on the factors that determine cost effectiveness of the rail transport the enterprise has a problem on issue of like lack of efficient rail system and limited financial resource to get the infrastructure, cost of ownership for asset like leasing of rail wagon and poor emphasis of in rail multimodal transport and inadequate number of wagons. Secondly, on the quality metrics the respondents are neutrally responded that a high distance between for accidents multimodal transport each driver, there is on time insurance coverage during the cargo damage and there is no a clear procedure for practical situation when the accident of loose happen. Moreover, the study found the rail mode of transport would boost the economic performance of the Enterprise.

Therefore, the conclusion of this study are that railway performance meet the expectations of the operator and most rail transport in emerging economies was developed to move container from Djibouti port to Modjo dry port reduce freight transport cost, reduce transit time, decrease dwell time, which means that improves dry port operation and increase productivity of the operator.

5.3 Recommendation

As per the finding of the study, the researcher has forwarded the following recommendation.

Rail freight transport is important to economic development because of its comparative economic advantage in serving certain forms and flows of cargo in which for import and export to the country benefits of balanced transport system. The government of Ethiopia should give attention to promote railway sector and infrastructure in order to improve the multimodal operation delivery performance, railway system should be efficient to reduce the dwell time of

containers and multimodal operation accident handling, on time insurance coverage should be set a clear procedure for practical situation when accidents happen. However, the multimodal operation by rail may be efficient and least cost mode of transport for the country. It is important for emerging economic growth of the country by reducing the transportation cost, container demurrage and other costs of for import and export cargo to the port of Djibouti the enterprise will save foreign currency of the country.

As a result successful railways have benefitted the Enterprise and regulatory reforms that enabled quality service and tariff flexibility to meet customer satisfaction. Customer orientation should be a priority for any railway that aspires to regain modal share and railways have a competitive advantage to carry bulk products over long distances at relatively low price, provides better risk management for customers. The benefits to society and environment often justify the simulation of rail transport play a key role to promote multimodal transport; strategically selected simulation ESLSE should be inclined to adopt rail based solutions.

5.4 Future research forward

1. Multimodal operator performance measurement with respect to importers and exporters to multiple destination including Kombolcha, Wereta and Mekelle.
2. The integration of railway with other mode of transport to multimodal performance
3. An assessment of customs procedure for multimodal transport by rail mode of transport

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Appendix



**Addis Ababa University
School of Commerce
Department of Logistics & Supply Chain Management**

Dear Respondent, I am Sirak Menberu, conducting a research on *“The Role of Rail transport to the multimodal operator performance of Ethiopian Shipping and Logistics Service Enterprise.”* This research is being conducted in the partial fulfillment of the Masters of Art in Logistics and Supply Chain Management, Addis Ababa University School of Commerce.

I would like to thank you in advance and for assisting me in answering the question follow below. The answers provided with you will remain confidential between you and the researcher.

For any enquiry about this survey: Please feel free to contact me via email sirakmen2000@gmail.com

Your Sincerely,

Sirak Menberu

sirakmen2000@gmail.com

Phone#0911263860

Section A: General Questions

Respondent Gender:

A) Male B) Female

Education level of Respondents

A) Diploma B) Bachelor Degree C) MA/MSC D) Doctorate (PHD) E)

Other (specify) _____

Position

- A) Executive officer/Director B) Management level /Middle level C) Operational level
 D)Senior Expert E) Other (specify) _____

How many years you have worked in ESLSE

- A) Less than 2 years B) 2 – 5 years C) 6-10 D) Above 10 year

Section B: Measuring the role of Rail transport on Multimodal operator of Dry Port performance

Part I. when do you agree or disagree with the following statements?

Where 5=Strongly agree, 4=Agree, 3= Neutral, 2=Disagree, 1=Strongly disagree

Performance of rail transport and multimodal transport operation at Modjo container terminal

S.No.	Delivery performance (Cycle Metrics)	5	4	3	2	1
1	Delivery performance of the multimodal transport operation on accuracy of departure time and promising time by rail transport					
2	Rail delivery operation performance in container terminals improve cargo handling at the port.					
3	Rail delivery operation performance in container terminals reduces port congestion.					
4	Rail delivery in container terminals raises dry port revenues					
5	Rail delivery reduces detention time spent idling due to loading and unloading times at each pickup in container terminals.					
6	Rail delivery in container terminals improves lowering the cost of logistics.					
7	Rail delivery reduces in transit time point to point variability					
8	Rail delivery quicker transit, loading and unloading time.					
9	Rail delivery in container terminals improves customer satisfaction.					
10	Rail transport increase deliveries per operating hour and ton-mile /km					

B. The cost effectiveness of multimodal transport operation and rail transport with relationship between terminal ownership status and container dwell time.

S.no	Financial metrics	5	4	3	2	1
1	Rail transport reduce transportation cost for multimodal operator					
2	Cost of multimodal transport is reasonable					
3	Rail transport reduce terminal ownership costs					

4	Rail transport decrease container dwell time and increase volume of cargo traffic					
5	Rail Transportation computing infrastructure ownership costs					
6	Reduce customs brokerage and freight forwarding fees					
7	Infrastructure of multimodal operation have enough dry Port machinery for the service					
8	Lack of an efficient railway system and limited financial resource to get the infrastructure					
9	Reduce Cost of ownership for asset like leasing of rail wagon					
10	Rail transport increase weight utilization of containers					

C. Analyzing the rail transport and multimodal transport operation liability and insurance performance during damage or loss of goods while in transit

S.No.	Quality metrics	5	4	3	2	1
1	Reliability of the multimodal transport operation provide service promised					
2	Cargo safety and liability, notice on time while the cargoes damage and good claim handling on multimodal transport operation					
3	High Tendency of claims free shipment percentage of multimodal operation with rail transport and pace of accident					
4	Damage free shipment percentage of rail transport as compared to road					
5	High distance between accident of multimodal transport for each driver					
6	On time arrival percentage of rail transport is higher than road transport for each shipment					
7	Perfect delivery without defects, including damage, documentation, loss, accidents and claims of any kind for each delivery, driver and carrier is rail transport					
8	There is on time insurance coverage during cargo damage					
9	There is a clear procedure for practical situation when the accidents or losses happen					
10	Rail transport decrease security risk and theft of multimodal shipment					

D. To identify the role of Rail transport on the performance for multimodal operator

S.no.	Overall performance of multimodal	5	4	3	2	1
1	Cargo handling system for multimodal operation					
2	Tonnage of cargo trafficking when transported by rail as compared to truck					
3	Efficient Time used in rail for multimodal operation					
4	Increases in cargo flow transporting rail transport in multimodal operation					
5	Rail transport improves port operational performance					
6	Rail transport increases productivity in cargo handling in the port					
7	Rail transport reduces port congestion					
8	Rail transport increases volume of cargo traffic					
9	Rail transport increases fleet management/ round turn					
10	Adequate rail and other mode of transportation					

Part II. Please specify your opinion on the listed issues

Q1. What is the performance of rail transport and multimodal transport operation at Modjo container terminal?

Q2. Which mode of transportation is cost effective between multimodal transport operation and rail transport with relationship between terminal ownership status and container dwell time?

Q3. What is the rail transport and multimodal transport operation liability and insurance performance during damage or loss of goods while in transit?

Q4. What is the role of rail transport on the performance of multimodal transport operation?

Comments if any

THANK YOU