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**DETERMINANTS OF MULTIMODAL TRANSPORT**

**EFFECTIVENESS:**

**THE CASE OF ETHIOPIAN SHIPPING AND LOGISTICS**

**SERVICES ENTERPRISE**

**By**

**AKLILE MULUGETA**

**A Thesis submitted to Addis Ababa University School of Commerce  
in Partial Fulfillment of the Requirements for the Award of Master  
of Arts in Logistics and Supply Chain Management**

**June, 2017**

**CANDIDATE'S DECLARATION**

I do hereby declare to the senate of Addis Ababa University School of Commerce that the work which is being presented in this thesis entitled “**Determinants of Multimodal Transport Effectiveness The Case of Ethiopian Shipping and Logistics Services Enterprise**” with the guidance and support of the research advisor is my own original work, that it has not been submitted partially; or in full, by any other person for an award of a degree in any other university or institution and that all sources of material used for the thesis have been duly acknowledged.

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**APPROVAL**

This is to certify that this thesis has been submitted in partial fulfillment of the requirements for the award of master in Logistics and Supply Chain Management with my approval as Advisor and Examiner.

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External Examiner	Signature	Date

**ACKNOWLEDGEMENTS**

First and foremost, I want to thank the Almighty God and his beloved mother St. Virgin Mary for abundant Love, every blessing, protection, and provision of good health and for granting me the gift of life.

I would like to express my deepest gratitude to my advisor, Matiwos Ensermu (PhD) for his unreserved guidance, advice, critical comments, persistent help and constructive suggestions. Besides, his diligent, fascinating guide, good advice, constructive criticism, support, and flexibility are learnable.

I feel honored to acknowledge here tireless effort of all my family specially my mother Belete Yigletu. In addition, I am so thankful to my Brothers and Sisters for all the love that we shared together in our life. Life would be difficult without our unity, love and support to each other, my debts are innumerable. I love you all!

My sincerest appreciation and gratitude goes to Almaz H/mariam and little Tsion whose all-embracing support and encouragement gave me inspiration and generated confidence in my life.

I am also thankful to my friends Wondewossen G/Tsadik, Adane Alemu, Tewodros Feleke, and Goshu Tadesse who always support and show me their concern for my success.

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## **ACRONYMS AND ABBREVIATION**

ESLSE Ethiopian Shipping and Logistics Services Enterprise

FCL Full Container Load

FOB Free On Board

GDP Gross Domestic Product

GTP Growth and Transformation Plan

ICC International Chamber of Commerce

IMO International Maritime Organization

LCL Less Container Load

MoFED Ministry of Finance and Economic Development

MT Multi Modal Transport

MTO Multimodal Transport Operator

NVOC Non-Vessel Operating Carriers

TEU Twenty Foot Equivalent Units

WTO World Trade Organization

UNCTAD United Nations Conference on Trade And Development

VO-MTO Vessel operating multimodal transport operators

## **Abstract**

*Multimodal transport system is modern transport and freight distribution system all over the world is tending towards the adoption of best practices, those are reliable, timely and cost effectively. Multimodal transport between sea, road and rail, has received a large interest in recent years. Hence, this research focused on the determinants factors of multimodal transport effectiveness. And then how these factors affect multimodal effectiveness. Primary data were collected with a structured questionnaire and interview as a data collection instrument was used and supported by secondary data. Out of the 228 questionnaires distributed only 200 were successfully returned back. Descriptive and inferential statistics analysis method were used to analysis the outputs (i.e. mean, ANOVA, t-tests and regression) using SPSS Software. Five determinant factors of multimodal effectiveness (i.e. transit cost, transit time, logistics infrastructures, services reliability and cargo safety and liability) were analyzed. Based on the findings of the research most of the respondents were dissatisfied on fairness of transit cost, moderately agreed on the infrastructures, service reliability and transit time, and agree on the cargo safety and liability. Hence, based on the findings of the research it is possible to conclude that shortages of logistics infrastructures which result in increased transit cost and time. It also indicate that transit cost, transit time, logistics infrastructure and service reliability have significant impact on multimodal effectiveness. In addition, least square regression showed that 65 percentage of the variability of multimodal effectiveness was explained by the independent variables. Lastly, the researcher recommends Ethiopian Shipping Logistics Service Enterprise, should improve information technology infrastructures and equipped all the ports and terminals latest machineries and facilities in the future. Furthermore, remove double costs and should provide one stop services for the effectiveness of multimodal transport system.*

**Key Words:** *Multimodal Transport System, transit cost and time, dry Ports,*

# CHAPTER ONE

## 1. INTRODUCTION

In this chapter the researcher deals with the general over view of the international logistics and Ethiopian Shipping and Logistics Enterprise. Multimodal transport (also known as combined transport) is the transportation of goods under a single contract, but performed with at least two different means of transport. The carrier is liable (in a legal sense) for the entire carriage, even though it is performed by several different modes of transport by rail, sea and road. According to (UNCTAD, 1981), the concept of international multimodal transport covers the door to door movement of goods under the responsibility of a single transport operator. According to the information revealed by the Ethiopian Shipping and logistics Service enterprise, Ethiopia as one of IMO members, multimodal transportation system has been implemented since 2012 and currently near to 70 percent of imported cargoes are transported through multimodal transportation system, (ESLSE, 2016).

This research is basically focused on the topic of determinants of multimodal effectiveness in the case of Ethiopian Shipping and Logistics Services Enterprise.

### 1.1 Background of the study

Numerous scholars define logistics in different ways. According to the definition given by council of logistics management, logistics is the process of planning, implementing & controlling the efficient, effective flow and storage of raw materials, in process inventory, finished goods, services and related information from point of origin to point of consumption (including in bound, out bound, internal & external movements) for the purpose of confirming to customer requirement by (Councilil of Logistics Management Definition of Logistics, 1991).

Logistics has been forced to accommodate many more operational activities of business in the supply chain management process. Due to this fact, the controlling and

management endeavor in logistical operation become a key and an essential element for the successful completion of the missions of logistics activities in a supply chain process. (BowerSox,J.D. and Closs,J.D., 2000)Furthermore, the same authors explain the activities involved in logistics management in a more systematic way as: “Logistics involves the integration of information, transportation, inventory, warehousing, material handling, and packaging”. In order to provide effective and efficient logistics services, the operational areas stated in the definition must be interlinked and work as one and the same. The Inefficient logistical operation will result in delivery delay, high cost of logistics, loss of customers, poor quality of service and discrepancy on quantity delivered, production interruption and extension of lead time(Agrawal,k.D., 2003)

Well-functioning logistics, both domestically and internationally, is a necessary precondition of national competitiveness (Arvis,F.J and Ojala,L., 2014). Global production networks depend on transport operations. This dependency affects a wide array of value-added activities along supply chains, from suppliers of raw materials to the end-user, as well as the recycling of materials after use. According to a recent estimate by (Ferrantino, 2013), the combined impact of improving border administration, and upgrading transport and communications infrastructure would increase global Gross Domestic Product (GDP) by 4.7 percent.

Sea transport is the backbone of international trade and the global economy. According to (UNCTAD, 2015), around 80 per cent of global trade by volume (and about 90 per cent of developing countries“ volume of international trade is seaborne) and over 70 per cent of global trade by value are carried by sea and are handled by ports worldwide. This indicates that countries, particularly developing countries, spent about 70 percent on maritime transport for in international trade (i.e. import and export). In the pass time, this international trade on the other hand brings huge paybacks for shipping company and it could be true to claim that costs involved to operate in shipping and logistics sector were modest when compared with the revenue side.

Globally, there are different transport systems in function, such as unimodal, intermodal, bimodal and multimodal transport. In some part of the world, to alleviate the logistics

problems, international trade has returned unimodal to use multi modal transport to its known benefit in lowering transport costs and transit time (UNCTAD, 1994).

History has shown that the first multimodal transport system were developed in Western Europe, America and Canada and it is extended to Asia. In the 1960s and 1970s multimodal transport did not have any chance to develop because of limitations in technological conditions, organization and especially in regulation among countries and regions. However, in the 1980s when the United Nations Convention on the International Multimodal Transport of Goods was adopted, there were more and more actors joining international Multimodal Transport Operators, train stations, port authorities, institutes and insurance companies. From that time, there were many conferences and workshops about the development of multimodal transport. In spite of various attempts to establish a uniform legal framework governing multimodal transport no such international regime is in force. The multimodal transport Convention has failed to attract sufficient ratifications to enter into force. Only 11 countries signed on the convention, these are Burundi, Chad, Liberia, Malawi, Mexico, Morocco, Rwanda, Senegal, Zambia, Lebanon and Georgia. The UNCTAD/ICC Rules for Multimodal Transport Documents, which came into force in January 1992, do not have the force of law. They are standard contract terms for incorporation into multimodal transport documents. The rules, being contractual in nature, will have no effect in the event of conflict with mandatory law. Then Implementation of Multimodal Transport Rule was prepared in January, 2001.

Ethiopia's economy is showing remarkable progress for the last ten years with a double digit growth. In 2013/14 fiscal year, real GDP augmented by 10.3 percent compared to the Growth and Transformation Plan (GTP) target of 11.2 in the same year (National Bank of Ethiopia, 2013/14). To facilitate the growth of the economy, logistics sectors should be efficient. According to World Bank report, the logistics performance index (LPI) of Ethiopia out of 160 countries ranked 126 in 2016, 104 in 2014 and 141 in 2012 average of the three years is 125. The figure shows that the logistics efficiency still at low level. Ethiopia government has been taking different measure to improve it. Some of these are implementing multimodal transport at the beginning of 2007. In addition, Ethiopian Shipping and Logistics Service Enterprise (ESLSE) was established in 2012 by merging

three, independent, but related logistics enterprises and later on the fourth company i.e. Comet transport S.C was added . Hence, the enterprise became giant national logistics company.

Some researchers have been done on multi modal performance, for example, level performances under the “multimodal” freight transport service; (Amentae,T.K and Gebresenbet,G., 2015) .

In this research thesis attempt will be made to see the relation between performance factors and effectiveness multi modal transport, and by how much these factors effects effectiveness of the multi modal transport services.

## **1.2 Background of the Organization**

The Ethiopian shipping and logistics enterprise (ESLSE), a state owned company, as a carrier, render to its esteemed customers sea freight transport, stevedoring (at port of Djibouti), multimodal transport service, freight forwarding and clearing, dry ports, full-fledged services and warehousing etc. For providing all the services mentioned earlier, the enterprise spends huge amounts of money in foreign and local currency.

The Ethiopian Shipping and Logistics Service Enterprise (ESLSE) is a new enterprise established in November 2011 by the council of ministers regulation No 255/2011 merging the then Ethiopian Shipping Lines Share company, the Ethiopian Maritime and Transit Service Enterprise and the Ethiopian Dry Port Service Enterprise. According to a document obtained from the Enterprise, considering the similar line of operations and the interdependent nature of their functions, the Ethiopian Government has taken a strategic decision of merging those public enterprises in order to maintain the commendable economic growth that has been registered over the last several years. “The former truck operating company; known as Comet Transport SC, which was responsible for transportation of goods to and from ports, has been transferred to the ESLSE by a government decree issued in mid-2014.

The objectives for which ESLSE is established include the following:-

- ❖ To render coastal and international and internal water transport services;

- ❖ To render coastal freight forwarding Service, multimodal transport, and Shipping Agency;
- ❖ To provide the services of stevedoring, shore handling, dry port warehousing and
- ❖ Other logistics services for import export goods ;
- ❖ To provide container terminal service;

The Ethiopian Shipping and Logistics Services Enterprise was established with the total capital of Birr 3.7 billion. Now, its capital reached to 22 billion. Currently, the enterprise has a total of 11 vessels /9 of them general purpose and two of them are tanker vessels, about 492 heavy trucks and dry port equipment.

Regarding the human resources, the organization has chief executive officer /CEO/ and four sectors led by the four deputy CEO's, namely: Shipping sector, freight forwarding sector, port & terminal sector and corporate services sector.

The following table shows the human resource of the enterprise (2014-2016)

Table 1. Manpower of ESLSE

Years	2014/15	2015/16	2016/17
manpower	3134	3178	3565

Source ESLSE, Ethio- Logistics yearly Abstract (May, 2017)

Ethiopian Shipping and Logistics Service Enterprise is the sole multimodal operator. Multimodal transportation is organized as a sequence of modes, often known as an intermodal transport chain. The dominant modes supporting intermodalism are trucking, rail, barges and maritime. The emergence of multimodal transport has been brought about in part by technology and requires management units for freight such as containers, pallets or semi-trailers. Better techniques and management units for transferring freight from one mode to another have facilitated intermodal transfers. The advantages of each mode could be exploited in a seamless system, which created multiplying effects.

The most important feature of multimodal transport is the provision of a service with one bill of lading. This has necessitated a revolution in organization and information control. At the heart of modern multimodal transport are data handling, processing and distribution

systems that are essential to ensure the safe, reliable and cost effective control of freight movements being transported by several modes.

Intermodal transport is transforming a growing share of the medium and long-haul freight flows across the globe where large integrated transport carriers provide door to door services, such as the high degree of integration between maritime and rail transport/Truck.

As it is indicated in table 2 below, the three consecutive years of operational performance of Ethiopian Shipping and Logistics Service Enterprise (2014-2016) imported goods are increasing from time to time. For instance, 2.7 million tons of goods were imported in 2014 and 3.3 million tons in 2015. In the year 2016, it raised to 4.9 million tons.

Table 2 ESLSE Operational performance

Service type	measurement	Years		
		2014	2015	2016
Imported goods by ESLSE	Ton	2,767,053	3,340,135	4,966,265
Imported goods by ESLSE vessels	Ton	1,104,813	998,597	952,628
Proportion ( ESLSE vessels/ total import)	%	39.93	29.90	19.18
Imported containers by multimodal transport	TEU	88,559	120,404	175,672
Imported vehicles by multimodal transport	Unit	4,225	10,636	14,736
containers served at dry port	TEU	84,869	114,369	162,047
vehicles served at dry port	Unit	4,183	8,275	13,224

Source ESLSE report (2016)

As it is clearly observed in the above table, the share of ESLSE vessel is decreasing from 40 percent (2014) to 19 Percent in 2016. This is due to economic scale of the ship, low performance of the vessels and lack of good management skill.

Transported goods by multimodal transport system have increased 88,559 containers in 2014 to 175,672 containers in 2016. Imported vehicles also increased dramatically from 4,225 units in 2014 to 14,736 units in 2016. It is obvious that dry port services increase according to the increment of multimodal imports. This implies that the need for multimodal transportation is to increase in higher rate in incoming years. Therefore ESLSE should be capacitated to handle these volumes of cargoes.

### **1.3 Statement of the Problem**

Access to logistics and multimodal transport services is an increasingly important prerequisite for competitiveness in a globalized economy, and many developing countries, especially landlocked and least developed ones, are precluded from such access. At the same time, the requirement that operators be able to provide adequate logistics and multimodal services is growing in line with increasing demands for faster, more frequent, reliable and secure deliveries(UNCTAD, 2003).

A current research conducted by (Amentae, T.K and Gebresenbet,G.et al, 2015), under the title “the evaluation of performance of multimodal import-export freight transportation system in the case of Ethiopia”, which uses the five factors of delivery, that comprises documentation, liability and insurance, cost, convenience and facilitation, it had been clearly revealed a higher level of dissatisfaction of customers with the multimodal service offered by the enterprise.

Further, based on the World Bank Logistics Performance Index (LPI) which provides a comprehensive measure of the state of trade logistics in a country and facilitates comparisons among countries, Ethiopia ranks at the lower end of the surveyed countries, the rank shows a relative deterioration between 2010 and 2016. The rank is updated every two years and thus, in 2010 and 2012 Ethiopia were placed 123 and 141 from a total of 155 countries respectively. In the recent version of 2014 and 2016, the country was ranked 104 and 126 out of 160 member countries. The average of LPI in four years is 123.5. The report by the enterprise has shown that, most of multimodal cargoes do not loaded within the given grace period. In 2014/2015 the average dwell time of containers were 9 days which is almost about 53 percent of the cargoes and it has been subjected to storage cost.In2015/2016 average dwell time of multimodal containers were about 10 days and thus 40 percent of multi modal containers had paid storage cost at Djibouti port. This could severely harm the competitive ability of the enterprise significantly.Hence, this research was designed to find out factors which determine multimodal transport effectiveness and the relationship between them. These factors were investigated to check multimodal effectiveness and which determinants are strongly affect the effectiveness of multimodal transport and to give priority for the solution.

In addition ESLSE has the advantage that the FOB- directive of the government is stipulating that by proclamation an importer should use ESLSE Bill of lading. It gives monopoly power for the enterprise. However, it is a disadvantage for the customers because they cannot get any other competitive services.

## **1.4 Research Question**

The main research question of the study is “What are the major determinants of multi modal transport effectiveness in Ethiopian shipping and logistics services enterprise?”

Particularly this study attempted to answer the following specific research question:

1. How is the relationship between multimodal determinants and its effectiveness?
2. Which variable determines the effectiveness of multimodal in ESLSE?
3. Is there significant difference in dwell of cargo among customers’ warehouse ownership?
4. Does educational background affect dry port dwell time?
5. Do multimodal containers transported with grace period from Djibouti?

## **1.5 Objective of the study**

### **1.5.1 General Objective**

The general objective of this study is to identify the determinants of multimodal transport in ESLSE and to analysis the practice and effectiveness of multi modal transport in Ethiopia.

### **1.5.2 Specific Objectives**

Specifically the research aimed to

- To assess the relationships of determinants with multimodal transport effectiveness
- To find out the determinants of multimodal transport effectiveness in ESLSE.
- To see the relationship between educational background and dry port dwell time
- To identify the relationship between warehouse ownership status and dry port dwell time.

- To check whether multimodal containers picked up from Djibouti within grace period.

## 1.6 Significant of the study

The study has examined the determinants of effectiveness of multi modal transport service in Ethiopia, which possibly benefits the organization in many ways.

1. The study helps to understand the level of effectiveness of multimodal transportation system which will in turn helps to facilitate decision in the future.
2. And further it explains the priority factors that determine the multimodal effectiveness and their relative relationship from the perspective of transit time, cost, infrastructures, reliability and safety & liability. Therefore, the research may be used as a stepping-stone for managers of the enterprise as well for researchers those may focus on similar topics.

## 1.7 Definition of Terms used in the Research

The commonly used concepts and terms are defined as follows and are used within the context of the defined meaning unless and otherwise stated.

**Multi modal transport** means the carriage of goods by at least two different modes of transport on the basis of the multimodal transport contract from place in one country at which the goods are taken in charge by the multimodal transport operator to the place designated for delivery situation in a different country.

**Dwell time** the time cargo remains in a terminal's/port in- transit storage area while awaiting shipment.

**Grace period** free time cargoes remain in the port without paying storage cost

## 1.8 Scope and Delimitation of the Research

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 exports. The government of Ethiopia has been committed to implement multimodal transport system since 2012 to

realize the millennium development goals. Ethiopian shipping and logistics service enterprise has taken this national responsibility to manage the system efficiently and effectively. Therefore, the research is limited itself in assessing the determinant factors in challenging the system. And also the secondary data utilized was limited to imported containerized cargo transported through the multimodal transport system.

## **1.9 Organization of the Research Report**

This thesis will have five parts and the report will be organized in the following manner. First, the introduction will highlight the nature of the research and background information; the second part, the literature review is going to assess relevant literatures that are essential to the research. The third part will present the detailed methodology of the research. The fourth part will analyze the research problem using the specified methodology. Lastly, still important, the fifth part will put forward plausible concluding and recommendations.

## **1.10 Ethical Consideration**

Regarding the research ethics, the author has kept the research ethics. Data providers, organizations and institutions were properly acknowledged and the information collected from them is used for the purpose of the research objective and the researcher will respect issues related to confidentiality.

## **CHAPTER TWO**

### **2. REVIEW OF RELATED LITERATURES**

In this chapter the theoretical and empirical evidences obtained from different scholars. The United Nation conference on trade and development (UNCTAD), organ of united nation is primarily mandated to promote international trade and economic development especially for developing countries. Apart from this involvement in international legal regulation of maritime activities, it has currently expanded its scope of competence to embrace the entire spectrum of transport sectors involved in multimodal transport operation and in the standardization of containers. Theresearch based the above frame work and other scholar researches.

#### **2.1 Theoretical Literature Review**

The theoretical part of the literature covered topics like definition of Multi modal transport and related terms like transportation, effectiveness of multimodal transport.

##### **2.1.1 Definitions**

The „Multimodal Transport“ concept can be defined as the combination of various types of transport modes used in a national or international transport operation, which provides door-to-door services, under the responsibility of one single transport operator (UNCTAD, 2001). The „Multimodal Transport“ terminology was first coined by the United Nations Convention on Trade and Development (UNCTAD) on International Multimodal Transport of Goods in 1981, which authoritatively defines the term as: “... 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, 1981).

Transportation is glue that attaches supply chain participants. It provides two functions product movement and storage. As the movement of people, animals and goods from one

location to another and as storage goods stay there until unloaded. Transportation is an important supply chain driver because products are rarely produced and consumed in the same location. To practice effective, cost efficient Logistics Management, an organization must lay the foundation for a responsive, economical transportation network. With a responsive, economical transportation network, an organization is able to implement major strategic changes to reduce costs and increase customer service levels with very little disruption to the overall supply chain flow. A responsive transportation network begins with end-to-end network visibility. Visibility allows the business to centralize production operations to lower-cost areas without impacting customer service levels, because any uncertainty within the network can be monitored and appropriately managed to keep inventory levels as low as possible. An economical transportation network actually begins with a shift in attitude. Businesses are often trapped in the traditional view that transportation is a necessary evil – an inevitable source of cost and risk. And who can blame them? Transport is by far the largest component of the cost structure of a business' logistics. According to sector research (Chang, Y.H., 1998), transport accounts for as much as 30 percent of the total cost of logistics operations.

**Modes of Transport:** it is a term applied to distinguish substantially different ways to perform transport or the method of transport used for the apparent motion of goods such as road, sea, air, rail and pipeline.

**Means of Transport:** it defines as the vehicle that uses for transportation such as vessel, barge, truck, aircraft etc.

There are other types of transport systems: these are Unimodal transport, Intermodal transport, and Bimodal. Brief definition is given below:

**Unimodal Transport:** which the goods are carried by purely one single mode of transport is so called Unimodal transport, namely by road, rails, sea, inland waterway, air, space and pipeline. In short, it is known as Carriage of goods by only one mode of transport.

**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.

### **2.1.2 The concept of multimodal transport**

The introduction of containers had enabled global reach through an increase in trade volume with increase of operational efficiency, which ultimately enables Multimodal Transport to be applied in most international transport operations (Cullinane KPB, Wang TF, Song DW, Ji P.A, 2005). Thus, according to (Dinwoodie, 2000), developments of standardized units, including containers, with the characteristic of ease of transfer, favor Multimodal Transport. In international trade, multimodal transport has been identified as an efficient way of transporting international cargo. In this system of transportation, one transport document, one tariff rate and a single through-liability are applied. The principle aim of multimodal transport is to make the movement of goods from seller to buyer more efficient, through faster transit times and reduce costs. During multimodal transportation, the responsibility and liability is concentrated in one entity known as Multimodal transport operator (MTO), who organize all transport systems in the transport chain between countries (Godfrey O. Wandera, 2001).

The terms of logistics and supply chain management are highly correlated with the transportation of goods. Freight transportation is an important component in today's economy. It is the physical process of transporting commercial goods, commodities and cargo. It is a key supply chain component used to ensure the efficient movement and timely availability of finished products and raw materials (Crainic, T.G, 2003). In order to do so, several types of vehicles like trucks, ships and trains are used, as well as, relative components including trailers, containers or pallets. The economic crisis in 2008 led many companies to reevaluate their processes in order to reduce costs and increase productivity. The transportation cost accounts for almost 10% of the final price of the product (Rodrigue, P.J., Comtios, C. and Slack, B., 2006). But the figure is differ countries development level, it rise up to 50 percent.

According to (Caris,A.,Macharis,C. and Janssen,G.K., 2008)multimodal transport has a benefit of enhancing competitiveness of the freight industry as a whole through use of most efficient mode of transport at each stage. The author explained the benefit of multimodal transport from legal point of view and claimed five major benefits of multimodal transportation arrangements. These are: avoiding of separate arrangements of contracting with many transporters, avoiding the hassle of the shipper for placing goods at the right place at the right time for each of the contracting transporting segments, avoiding the inconvenience of storing goods between different segments of the transport stages when the segments don't fit seamlessly, the negotiability of bill of lading of multimodal transport arrangements to acquire a documentary credit from banks contrary to other consignment notes such as road carriers notes which are not negotiable, and finally avoiding the difficulty of assigning responsibility/liability in case of damage which may be complex under segmented arrangements with difficulty of identifying at which stage of the segment the damage occurred.

### **2.1.3 Types of Multimodal Transport Operator (MTO)**

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

1. 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 menace of transport.

Transportation could simply arrange by sub-contracting this activity to those companies having such facilities.

2. 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. Here the operator instead of subcontracting the inland or air leg 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 and could provide value added services such as FCL/LCL., handling customs formalities and documentation, etc.

NVO-MTO is not a capital intensive and hence they are facing less risk. 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.

3.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.

4. 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 organize above, multimodal transport operator may own or may not own means of transport or handling equipment or container depot or yards or container freight station (CFS) and warehouses. Hence so as to fulfill their contractual obligation, some of them enter subcontracting agreement with individual Unimodal transport providers.

#### **2.1.4 MTO and LIABILITY**

Unimodal transport is governed by respective international conventions: for ocean - the Hague / Hague Visby / Hamburg Rules, for air - the Warsaw Convention, for road – TheCMR, for rail - The CIM etc. These transport conventions may apply to individual segments of multimodal transport of goods,(UNCTAD, 1988).

Damage to the goods can either be localized (it is possible to determine on which mode of transport the damage occurred) or concealed (it is impossible to determine where the damage occurred).

Based on the definition of MTO, an MTO assumes responsibility (is liable) for the performance as a carrier for more than one mode of transport. As such the MTO is bearing the liability for the entire transport according to the contract with the merchant.

The advantages to the merchants are obvious. The merchant is much better protected. In case of segmented transport (nonmultimodal transport) the merchant must often claim against sub-carriers whom he does not know, rather than against the carrier with whom he has made the transport contract.

In many events, it is not possible to pinpoint where the damage took place, since loss or damage are normally not discovered before the goods arrive at their destination. At that stage, there will be practical difficulties to localize loss or damage to a responsible party. This is particularly true with respect to cargo handling in the intermediary stages between precarriage, main carriage and on-carriage. Hence, it might be impossible for the merchant to obtain compensation for the damage or loss occurred.

#### **2.1.5 The Effects of Transportation on Logistics Activities**

According to(Sreenivas.M and Srinivas.T, 2001),transportation plays a connective role among the several steps that result in the conversion of resources into useful goods in the name of the ultimate consumer. It is the planning of all these functions and sub-functions into a system of goods movement in order to minimize cost maximize service to the customers that constitutes the concept of business logistics. The system, once put in

place, must be effectively managed. Traditionally these steps involved separate companies for production, storage, transportation, wholesaling, and retail sale, however basically, production/manufacturing plants, warehousing services, merchandising establishments are all about doing transportation. Production or manufacturing plants required the assembly of materials, components, and supplies, with or without storage, processing and material handling within the plant and plant inventory. Warehousing services between plants and marketing outlets involved separate transport. Merchandising establishments completed the chain with delivery to the consumers. The manufacturers limited themselves to the production of goods, leaving marketing and distribution to other firms. Warehousing and storage can be considered in terms of services for the production process and for product distribution. There have been major changes in the number and location of facilities with the closure of many single user warehouses and an expansion of consolidation facilities and distribution centers. These developments reflect factors such as better transport services and pressures to improve logistics performance.

## **2.1.6 Driving Forces of Multimodal Transportation**

### **A. Globalization**

The global economy is becoming more integrated. As nations throughout the world increasingly embrace free market economics, trade policies are likely to become even more liberalized in the year ahead. Increased open trade has served as an “engine of growth” among trading partners and has been accelerated through the establishment of the world trade organization and associated trade agreements of the America’s and increasing liberalization of trade in (Rahall transportation Institute, 2004).

Four major trends are driving demand for intermodal logistics: (1) economic globalization, (2) speed-to-market product delivery, (3) agile manufacturing and business practices, and (4) integrated supply chain management. Since the early 1980s, international trade and investment have been growing rapidly(Rahall transportation Institute, 2004).

From the demand perspective, transport is a derived demand. This implies with certainty that existing demand for transport is due to the existence of other economic activities that

require movement. According to (World Bank Report Review, 2009), globalization of the world's production and trade, the speed of economic activity, productivity improvement and lower costs of production are inevitably connected to the developments in the transportation system.

The Study was made on landlocked at Zimbabwe, faces challenges with access to maritime transport. The primary challenge is that Zimbabwean shippers travel long distances in order to reach seaports in neighboring countries. Long distances to seaport result in high transport costs driven by complex logistics. Consequently, high transport costs have negative impacts on shippers in both export and import businesses as fewer traders will be able to operate. This results in reduced trade-led economic growth (Blessing Charuka, 2014).

## **B. The Rise of Containerization**

Cargoes are categorized into two major groups, liquid and dry. Dry cargo divided into two namely, bulk and general cargoes. Bulk cargoes include bagged, wheat, sugar, cements, fertilizer and coal. General cargo again divided into three, these are containerized, RORO/ Roll on/ Roll off/ which is motorized cargo and break bulk. Break bulk includes palletized, in box, steel etc. Nowadays for handling efficiency containerization rate increases, it reaches about 60% of dry cargoes. (UNCTAD, 2012)

According to UNCTAD report (2012), the emergency of the container technology and of the multimodal transport concept came from and facilitated growing international trade. Trade and transport are inextricably linked: efficient transport services are a requisite to successful trading. Notably, international trade consists of using more than one mode of transport for many interfaces and modes are created in the process of moving goods from one country to another.

Global trade requires an intermodal transportation network due to the containerization of cargoes. As imports and exports continue to increase in their relative importance to total GDP, the need for intermodal container distribution hubs capable of supporting trucking, rail, air cargo, and potential inland navigation service will increase. Containerization is the largest form of unitization. Containers are loaded with products at shipper's premises

and sealed, and then they are carried over to the consignee's premises intact, without the content being taken out or re-packed en route. Therefore containerization contributes to a higher efficiency in the development of multimodal transport operation.

Containerization contributes to a higher efficiency in the development of multimodal transport operation. In order to achieve efficient multimodal transport, intensive cooperation and co-ordination among transport modes are essential (Joshua A.Odeleye, 2015)

### **2.1.7 Multimodal Transport and trade facilitation**

Coherent trade and transport facilitation measures are necessary for the development of international logistics and multimodal transport services. The international movement of cargo and vessels involve a potentially large number of controls and inspections about security concerns, and to the extent that such controls take too long, or their duration varies arbitrarily, this becomes an impediment to the planning and operation of services. Improvements depend on investments and reforms at the national level, and also on concerted efforts by international organizations such as the World Trade Organization and the World Customs Organization. With regard to customs, a successful example of trade facilitation is the introduction of an Automated System for Custom Data. At the bilateral and regional levels, there are successful experiences concerning information sharing. Common customs posts, for example, or the sharing of information related to the port state control of maritime vessels, reduce the need to assign personnel and improve the quality of controls(XU GUIBIN, 1999).

Multimodal transport is a service innovation by which the MTO assumes a contractual responsibility to move goods from a point of origin to a destination under a transport contract, for an agreed price with a time-limit for the delivery. This service innovation ensures that the goods will move to their destination as fast and securely as possible, at a cost known in advance. This further reveals the following features of multimodal transport, which might be the most striking ones by (XU GUIBIN, 1999)

(i) Reduce Door-to-door Transport time:

Multimodal transport, transport operations are always carried out at a faster speed, which reduces the total transit time. One of the major reasons for this is that since there is only one operator, i.e. MTO, in charge of the whole transport, he is capable of intercepting the cargo whenever there is a change of mode and ensuring that this change is affected without delay. There is also another reason which might account for the fastest possible delivery by the MTO. He wants the container to come back as soon as possible after the delivery of cargo so that he can have a higher utilization ratio of the container and eventually earn more freight(UNCTAD, 1997).

(ii) Cost-effectiveness. By utilizing multimodal transport, both MTO's and shippers will be able to have an idea about the total transport cost before the transport actually commences. This will ensure an effective control of transport cost. The reduction of transit time by multimodal transport will also lead to a reduction of financing costs, simply because the interest payment period will be made shorter after the transit time is shorter.

(iii) Reliability. Since being closely controlled by a single operator, i.e. MTO, seamless transport is guaranteed at each stage of the multimodal chain. The transport process is thus made more reliable. As a result, breakdowns in the supply or distribution process are reduced to a great extent, which will lessen the need for safety or buffer stocks for shippers or consignees (UNCTAD, 1994B).

### **2.1.8 The Requirements of International Multimodal Transportation System**

The adoption of multimodal transport system needs various structural changes in the economy. All way round infrastructural developments and liberalization of trade policies, rules and regulations to make it compatible with the international standards would be the vital improvements needed. That is the main reason that many authors in field advise the development of infrastructure and liberalization of trading policies and regulations in addition to increment of trade volume. Since the cost of multimodal infrastructural development is very expensive. In this regard (UNCTAD, 2003) noted five

very essential areas to be seriously considered to improve the service quality and accessibility level of multimodal transport and logistics services.

#### **2.1.8.1 Infrastructure and Technologies**

In multimodal transport, the transport chain is usually containerized. Containerized cargo also requires less but better qualified personnel in ports, where reforms are still pending in many developing countries. It further requires port, rail and road infrastructure, as well as the corresponding regulations and labor regimes. In many developing countries, particularly least developed countries, these inland links are often incomplete and poorly maintained. This is one of the main practical obstacles to transport providers offering multimodal transport. Electronic means of communication are used to exchange information, enter into trace goods during transit. Transport users and providers are using them internally and also to exchange information among them. Again, as with containerization in the past, there is a risk that developing countries are late in the introduction of these new technologies, which require investment in equipment, as well as the corresponding legislation, regulation and capacity building. A successful example of the use of ICT in developing countries is the advance Cargo Information System (ACIS). (UNCTAD, 2003)

#### **2.1.8.2 Security and Safety**

In the case of transport and international logistics, corruption, theft and accidents not only imply a direct cost, but also reduce the competitiveness of exports. Especially at ports and other nodes where cargo is shifted from one mode to another, security risks are particularly high. Uncertainty and also weak legal systems are thus particular obstacles to multimodal transport, where often an original carrier located in a foreign country is supposed to cover the entire risk of the entire transport chain. Fear of terrorist attacks is leading to new regulations and legislation, which add further obligations to shippers and transport providers, especially for exports to the United States. These obligations imply additional risks for those who have to provide more detailed and timely information.

Shippers have to guarantee to the carrier that the information given to him about the goods is accurate and that the carrier can use this information without risk of suffering a penalty or delay.(UNCTAD, 2003)

### **2.1.8.3 Legal Aspects**

While much of international trade is now carried out on a door-to-door basis, under one contract and with one party bearing contractual responsibility, the current legal framework governing multimodal transport fails to appropriately reflect these developments. No international uniform regime is in force to regulate liability for loss, damage or delay arising from multimodal transport. Instead, the present legal framework governing multimodal transport consists of a complex array of international conventions designed to regulate unimodal carriage, diverse regional/sub regional agreements, national laws and standard term contracts. As a consequence, both the applicable liability rules and the degree and extent of a carrier's liability vary greatly from case to case and are unpredictable.(UNCTAD, 2003)

Over the years several attempts have been made at drafting a set of rules to regulate liability arising from international multimodal transportation, but none of these has brought about international uniformity. In view of the absence of international uniform regulation of liability, there has been a proliferation of diverse national, regional and sub-regional laws and regulations on multimodal transport. The lack of a global uniform regime has obliged developing countries to resort to solutions at the regional and/or sub regional level, such as the laws and regulations prepared by the Andean Community, the Latin American Integration Association (ALADI), the Southern Common Market (MERCOSUR) and the Association of South-East Asian Nations (ASEAN). While these laws and regulations are often based on the 1980 MT Convention and/or the UNCTAD/ICC Rules, significant differences on key issues among the different sets of rules create a trend of further “dis unification” at the international level(UNCTAD, 2003).

#### **2.1.8.4 Market Access**

With regard to market access, regional organizations in particular have a potentially important coordinative role to play, which would complement the region's investments in physical infrastructure. At the multilateral level, negotiations in the WTO on maritime transport will certainly be broadened to include other aspects of door-to-door operations. Developing countries will need to participate more actively in the negotiating process, and the international community should be encouraged to provide assistance particularly in assessing the impact of different negotiating options. Technical cooperation and capacity building are particularly important with regard to the strengthening of local transport providers, and also shippers' associations. Joint ventures and cooperation between national and global operators should also be encouraged,(UNCTAD, 2003).

#### **2.1.8.5 Facilitation**

There is a perceived lack of coordination in the international organizations dealing with trade facilitation. Much preliminary groundwork has been done by business around the world on standards, certification and risk management. At the Second International Forum on Trade Facilitation organized by the Economic Commission for Europe in 2003, the view was expressed that without a rules-based system with global applicability the full potential of these initiatives will never be realized. An UNCTAD Expert Meeting on Efficient Transport and Trade Facilitation in 2002 highlighted the fact that many developing countries would need assistance in determining their needs and priorities and implementing any new rules, and that there was considerable debate about the modalities of any possible trade facilitation agreement. A consensus emerged on the need to help developing countries improve their participation in international trade through the application of already agreed and existing standards.

### **2.1.9 Multimodal transport in Ethiopia**

An effective multimodal transport system will bring short-term benefits to local traders and transport operators, as well as longer-term consequences in the structural changes of a country's transport and international trade development.

Ethiopia implemented multimodal transport to minimize the transit complexity and auction of cargoes. The law of Ethiopian multi Multimodal transport has been adopted (Proclamation No.548/2007). The major objectives were to minimize transit time and cost. It is believed by the government that international multimodal transport is one means of facilitation efficiency and cost effective transit logistics service. This led the government of Ethiopia to use multimodal transport law.

(Blessing,Charuka, 2014)on logistics problem of landlocked countries discussed the logistics and supply chain reliability aspects of being landlocked and established that despite the tremendous reduction in maritime transport cost and advancement logistics technology that reduces transport costs, lack of direct sea-access is a major challenge for the growth and development of Land locked developing countries(LLDCs)

Charuka also explained the detrimental effect of high logistics costs to the competitiveness of developing landlocked countries in world markets. The authors clarified that the combination of long distances and poor logistics systems is unattractive for trade. To compound this, rent-seeking activities along the corridors make logistics highly complex and unpredictable. Like other land locked countries, these problems also common in Ethiopia.

Before 2009, Ethiopia has been used only unimodal transport, as a result most of import and export cargoes were unstuffed and stuffed at Djibouti. Thus, the port of Djibouti was not only used as get way to Ethiopia's cargoes, but also point of destination. It has been identified that, port congestion, long transit time for import transit cargoes and timely unavailability of empty containers for export transit cargoes were the adverse effects of unimodal transport system. Due to the fact that ports are cargoes and vessel interface points where cargoes stayed reasonable period of time and are not meant to serve as storage places, currently containerization of the world trade is in the order of the day;

just-in-time delivery of goods is the basis to satisfy customers; and hence the arrangement of multimodal transport adopted to solve these problems.

#### **2.1.9.1 Freight Vehicle Fleets**

The inland transport is one of the important segments in the entire logistics chain necessary for the flow of the import trade. According to studies conducted under the sponsorship of the Ministry of Revenue and Customs of the (2003), 85 % of the cargo is destined for Addis Ababa and about 300 trucks enter the Ethiopian border on a daily basis through the border town of Galafi Addis Ababa-Djibouti-Addis Ababa round trip takes a minimum of seven days.

Availability of technical assistance in the event of a breakdown of the trucks during passage is not adequate either. The drivers are not equipped with the necessary training or tools and spare parts to take care of even simple forms of breakdowns, nor are mobile garages available/accessible to the drivers. In the event that breakdowns do occur, the drivers will have to wait until technical assistance is made available. When such breakdowns occur in the remote part of the Corridor, it may take days to avail the technical assistance (Elias W., 2011).

Availability and Utilization of vehicles are the key characteristics of efficient and effective management of the transport system. Vehicles are very costly and ideally should be available for 95% of the time and used for paid work over 80% of this available time. But due to many factors such as delays through bad roads, border delays, weighbridge checks, customs delays at roadside and at destination, poor scheduling for loading and unloading, road accidents, single driver operation and congestion all reduce utilization (Elias W., 2011).

The total road freight traffic increased continuously but without satisfying all the demand. Actually the supply by all these transports companies and others is only 50% of the demand (Asnake, T., 2006).

### **2.1.9.2 Dry ports in Ethiopia**

A Dry port is an inland intermodal terminal directly connected to seaport(s) with high capacity transport mean(s), where customers can leave/pick up their standardized units as if directly to a seaport.”(Leveque, p. and Roso, v, 2002).

Dry port Services enterprise was established by the council of ministry regulation No. 136/2007 with the objective to facilitate the country import/ export and to minimize the congestion at the port of Djibouti. The significant is not only for reduction of costs, but also helps reduce foreign currency paid at the port of Djibouti. Nowadays, there are 7 dry ports, these are Mojo, Kality, Gelan, Semera, Deredewa, Kombolcha and Mekele, the biggest dry port which holds 90% of multimodal cargoes destination at Modjo dry port. The dry ports are equipped with port machinery such as Reach stackers, different capacity and types of forklifts and terminal trailers. The dwell time of cargoes at dry port on average reached 50 days, which is the challenge for the productivity of dry port terminals.

### **2.1.9.3 Technology infrastructures**

In Ethiopian Shipping and Logistics Enterprise, the use of ICT in logistics is almost non-existent. One area bar code is used is at cash register of supermarkets but it is not connected with inventory or warehousing management system. MOT's plan is to introduce tracing and tracking using GPS, and software, databases and other logistics ICT applications.

## **2.2 Empirical Evidences**

Some graduate have done on researches 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. In addition, one can get objective measurements, it is good to confirm with data.

Practices and challenges of Multimodal transport operation in Ethiopian Shipping Logistics Services Enterprise were study by (G.Tagel, 2014),he conclude that customer expectation and the services rendered were not much. Awareness about multimodal transported system has not created to the customers as well as to the new employees.

Transport infrastructure connection and quality are key for fast delivery of goods. In this respect Ethiopia, the Federal and regional road network is about 46,812 kilo meters of which 6,938 Kilo meters are asphalt(Fekadu M., 2013).

This road network density is 0.57 km per 1000 population or 41.4 km per 1000 square km area. These values for the weighted mean of road density in all Africa are 2.6 km per 1000 persons and density of 58km per 1000 square km area. The federal road network gives good connectivity to all regional headquarters. Ethio-Djibouti corridor from Addis Ababa a distance 970 km asphalt, Almost 95 percent of Ethiopia's import has been transported by this corridor, when heavy trucks repeatedly used the road in some places the road have been seen up and down.

A Data from National Freight Logistics Strategy for Ethiopian, (Ethiopian Maritime Affairs Authority , 2016)shows an Empirical Evidence complaining uni-modal and multimodal logistic costs from Shanghai (China) to Djibouti and Modjo (Addis Ababa)

Table 3 Average imported logistics cost, USD (20' Containerized /non IMDG cargo)

Cost component	Uni-modal		multi-modal	
	cost	percent	Cost	percent
Transaction L/C value	1404	27	1404	27
Sea freight	1055	20	1055	20
Port handling & Storage	954	18	600	12
• Port handling	700		600	
• Storage	254		-	
Inland transport from Djibouti to Addis Ababa	1400	26	1237	24
Insurance	200	4	200	4
Scanning	42	1	42	1
Commission and other expense	60	1	100	2
Dry port handling	-		113	2
Container demurrage	150	3	200	3
Dry port storage	-		257	5
<b>Total</b>	<b>5265</b>	<b>100</b>	<b>5208</b>	<b>100</b>

Source: National Freight Logistics Strategy for Ethiopian, (Ethiopian Maritime Affairs Authority, 2016)

The above table indicates that total logistics cost of unimodal transport is USD 5265 and multimodal transport USD 5208. The difference is about USD 57, which is insignificant.

### 2.3 Identified literature gap

From the above literature review section, the student researcher identified that, most of the researches done previously used simple percentage as a tool to analyze their findings. Furthermore, the data provided by these researchers is based on personal perceptions which is not statistically tested and proven. Therefore, this research is intended to fill these gaps by using scientific research tests and with additional supportive secondary data.

## 2.4 Conceptual Frame work

From the above literatures gathered, it is possible to come up with conceptual frame work of the paper. The raw indicates the result from the role or the activity.

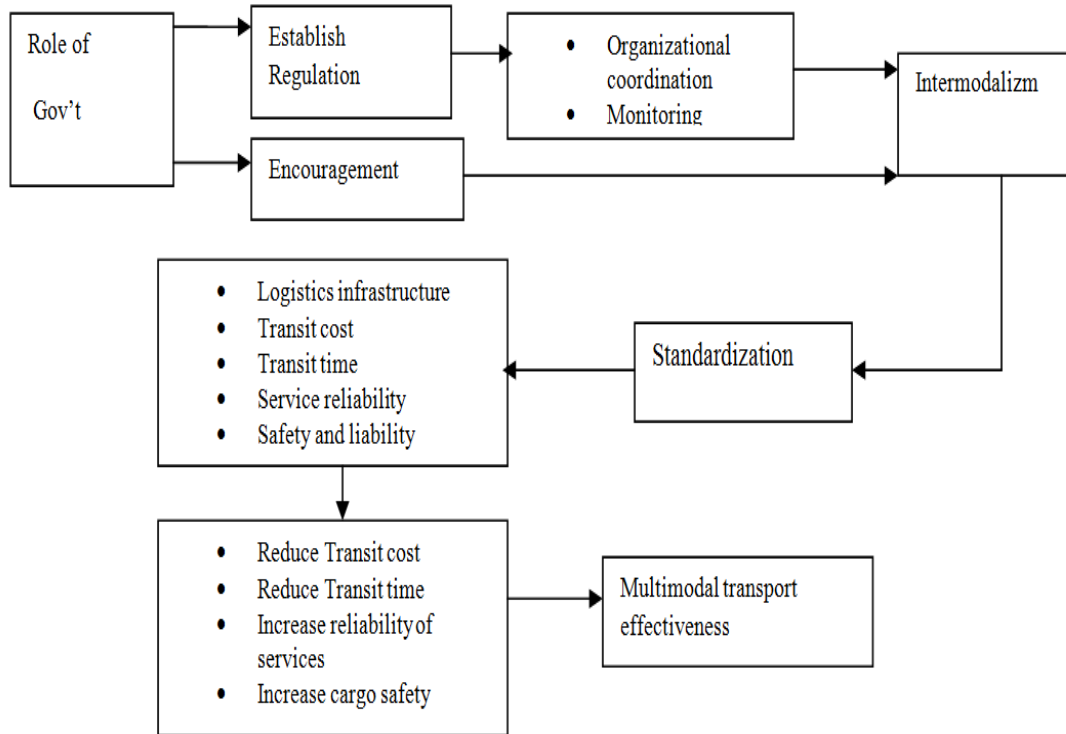


Fig 1. Source Gray and Kim (2001) and Modified by the Author

## **CHAPTER THREE**

### **3. RESEARCH DESIGN AND METHODOLOGY**

This part outlines the methodology that was used in the study and theoretical foundations behind the approaches and their definitions to be understood. It contains research type, research sample and methods, instrument development, instrument validity, instrument reliability, data collection tools and data analysis.

#### **3.1 Research Approach**

Depending on the objectives of the study descriptive or explanatory research design was chosen and used. The research has employed a mixed (quantitative and qualitative) approach so as arrive at the final results. According to (Johan W. Creswel, 2003) states that mixed are the major approaches being used today in the social and human science with their advantages and disadvantages. Employing mixed approach helped the study to neutralize biases of applying any of a single approach as well as ways to balance the weaknesses inherent in a single method with the strengths of the other method. The quantitative and qualitative approach of the study focused on identifying factors affecting multimodal transport system. The primary technique for collecting quantitative data used a self-developed questionnaire, containing items of measured on the 5-point Likert type and the qualitative technique used an open -ended questions. Furthermore, the out puts were supported by secondary data.

Quantitative Research approach has been used to quantify the data to be meaningful statistics. The units of analysis were determinants, which affect the effectiveness of multimodal transport in ESLSE. In terms of time horizon, the study has used both cross-sectional and time series data. a cross-sectional data is a data on a particular phenomenon at a specific point of time. Thereby, in this particular study the cross-sectional data refers to the perception of customers who are using multimodal service in the enterprise.

Furthermore, the time series data applied is composed of the five years trend of multimodal transportation service achievements.

### **3.2 Research Design**

Since objective of this study is to assess the determinants of multimodal transport effectiveness in ESLSE, descriptive and inferential type of research design is more appropriate. The researcher chooses the descriptive and inferential design because the nature of the designs is helpful in describing the current situation of effectiveness in detail.

Therefore, the research design of this study were descriptive and inferential type of research design

### **3.3 Population and Sampling Technique**

In this research study, customers of the ESLSE Multimodal service have been constituted as the study population. According to unpublished data of the enterprise, currently the enterprise has 3,000 multimodal transport customers from which the sample was selected for investigation. Therefore, all the customers of multimodal transport have been regarded as the total population of the study and represented by the sample.

### **3.4 Sampling techniques**

The sampling frame is the list of all customers of multimodal transport from which the sample group will be taken. The sample size by the sampling technique, once the sample size determined the sampling units were chosen by systematic sampling methods from sampling frame.

Sample size was estimated by the following formula (William G.Cochran, 1977)

$$n = \frac{Z^2_{\alpha/2} \sigma^2}{e^2} \dots (1) \text{ Where } e^2 \text{ is marginal error, } \sigma^2 \text{ is population variance}$$

Since population variance is not known use another formula

$$n_0 = \frac{Z^2_{\alpha/2} p q}{e^2} \dots (2)$$

e is the desired level of precision, p is the estimated proportion of an attribute that is present in the population, and q is 1-p. The value for Z is found in statistical tables which contain the area under the normal curve, 95% confidence interval  $Z_{\alpha/2}$ ,  $\alpha=0.05$

From the Z standard table  $Z_{0.025} = 1.96$ , taking p & q equal proportion since the customers are homogenous so that p=0.2 and q=0.8 were applied and the marginal error e was limited to 0.05.

Then using formula 2

$$n_0 = \frac{(1.96)^2 \cdot 0.2 \cdot 0.8}{0.05^2} = \frac{(1.96)^2 \cdot 0.2 \cdot 0.8}{0.05^2} = 246, \text{ since } \frac{n_0}{N} = \frac{246}{3000} = 0.082, \text{ since it greater than 5\% correction is needed is done by}$$

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} = \frac{246}{1 + \frac{(246 - 1)}{3000}} = 228$$

Therefore, based on the above analysis the sample size was determined by 228 customer. Those customers were selected by systematic random sampling technique.

The formulae is taken from (William G. Cochran, 1977) & (Israel, Glenn D., 1992)

### 3.5 Method of Data Analysis

In order to analyze the research data, descriptive statistics, ANOVA, statistical t- tests and regression analysis with multiple variables were used, and it helps to check the relation between dependent and independent variables. And this was done by using SPSS software. In the last section of this research, data each variable was presented and discussed by using descriptive statistics results related with the variables under study followed by analysis of P value to check the significance the explanatory variable on the dependent variable selected for the study.

## CHAPTER FOUR

### 4. RESULTS, DICUSSION AND INTEPRETATION

#### 4.1 General Overview of the Data

The survey was undertaken to examine the determinants of multimodal transport effectiveness in the case of Ethiopian Shipping and Logistics Services Enterprise. To find out the effectiveness of multimodal transport system, 228 questionnaires were developed and distributed to the multimodal transport customers of Ethiopian Shipping and Logistics Service Enterprise. Furthermore the researcher also used secondary data to consolidate the findings.

In this study both descriptive statistic and inferential analysis were used to analyze the data. The descriptive statistics utilized in this research, describe the respondent's characteristics with mean score, mode, median and percentages. Inferential analysis is concerned with the various test of significance about correlation, comparison of variables and regression analysis in order to make conclusions. Furthermore, based on the findings recommendations were forwarded. The discrete variables (dependent and independent) are available in the dataset. Analysis of the data is presented below:

Table 4. Number of questionnaire distributed and collected

Questionnaires	Respondents	
	Number	Percentage
Release questionnaires	228	100
Returned	200	88
Not returned	28	12
Returned but disregarded	0	0

Source: Own computation using survey data

As it is mentioned in the table, for 228 respondents, questionnaires were distributed and 200 were returned. This makes the response rate 88%. The time of data screening for accuracy and completeness no questionnaire was found to be unusable, the reason behind was the respondents were given enough time to reply all parts and items completely. 28 questionnaires were not returned.

## 4.2 Characteristics of respondents

This part discusses characteristics of the respondents“ such as Education level, work Experience and Working Sectors.

**Table5. Educational background of respondents**

Level of education	Respondents	
	Number	Percentage
Master	62	31
Degree	80	40
Diploma	18	9
High school completed	9	4
Under high school	31	16
Total	200	100

Source: Own computation using survey data

The above table, the educational background of respondents and it shows 31 percent of respondents were master degree holders, 40 percent first degree holders, the remaining were diploma, high school completed and primaryschool 9 percent, 4 percent and 16 percent respectively.

**Table 6 Business type of respondents**

Business type	Respondents	
	Number	Percentage
Private importers	142	71
Manufacturing Industry	27	13.5
Other Industry	13	6.5
Government	18	9
Total	200	100

Source: Own computation using survey data

As it is shown in table 6 above 71 percent of the respondents were private importers, 13.5 percent were involving in manufacturing industry, 9 percent public enterprise and the rest 6.5percent in other industries. As 71 percent of respondents were private investors, they can give the required information in detail for they have been the customer of ESLSE for long compared to manufacturing and other industries.

### **Multimodal Transport Experiences of Respondents**

**Table 7. Experience with multimodal transport**

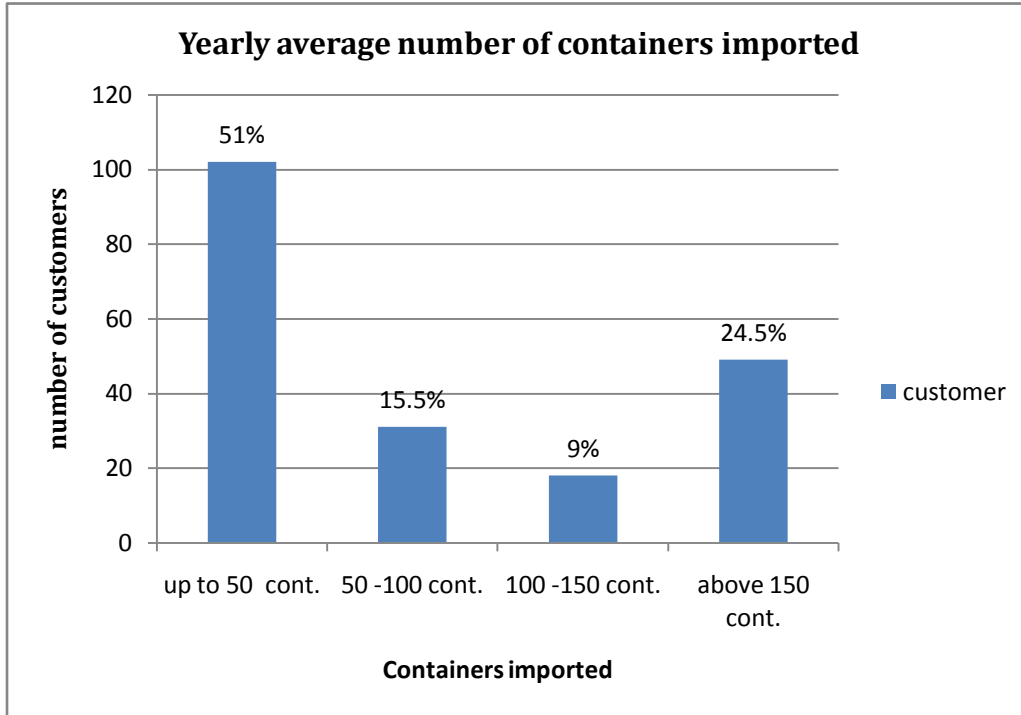
Years	Respondents	
	Number	Percentage
Up to 3 years	62	31
4 up to 5 years	58	29
6 years and	80	40
Total	200	100

Source: Own computation using survey data

Table 7 above shows 40 percent of the respondents said that they have been using the multimodal system for more than 6 years. The rest 60 percent of the respondents used the system for less than 5 years. Since, there are significant numbers of customers less than 3 years“ experience working multimodal transport, which shows there is new entrant. It has been about 7 years since the multimodal transport system adopted. One can conclude that the number of customers is increasing. So it can be concluded that the system is acceptable by trader and manufactures.

## Yearly average number of containers imported

Fig 2. Average number of containers imported in 2016



As It is clearly indicated in figure 1 above, 51 percent of the respondents imported on average 50 containers, 15.5 percent ( 51 to 100 containers), 9 percent ( 101 to 150 containers) and 24.5 percent above 150 containers annually. It can be understood that the majority of the customers (51 percent) imported less than 50 containers per year. This indicates that the importer potential is limited. This in turn put pressure on the service render (ESLSE).

### 4.3 Measurement of Reliability and Validity

Reliability refers to the extent to which your data collection techniques or analysis procedures will yield consistent findings(Saunders, M, Lewis, P. and Thornhill, A., 2007). The data reliability test is measured by using Cranach's Alpha. Cranach's Alpha was also calculated as part of the reliability test to assess how valid the results were and should produce similar generalized results if the sample size were increase (Feild,A., 2006). The Alpha value is ranges from a maximum of 1.0 for a perfect score to minimum

of zero, good measure of the alpha should be 0.70 or higher (Neuman W.L., 2007). According to (William, G. Z. and Barry J. B., 2010) exhibiting a coefficient alpha between 0.80 and 0.96 are considered to have very good reliability, between 0.70 and 0.80 are considered to have good reliability, and alpha value between 0.60 and 0.70 indicates fair reliability and when the coefficient alpha is below 0.60, the scale has poor reliability. Accordingly, the Cronbach's Alpha values of is above 0.7, therefore the survey indicate good reliability and the result are presented in table 5 below.

Table 8. Cronbach Alpha

Variables	Cronbach's Alpha	No Of Items
Transit time	0.830	3
Infrastructure	0.739	5
Reliability	0.788	5
Safety and liability	0.923	3
Multimodal effectiveness	0.750	6

*Source own sample survey, 2016*

On the other hand validity deals with whether an instrument is measuring what it is supposed to measure. According to (Dunn, S.D., 1999), a valid measure is one that truly measures or manipulates the construct of interest. There are several ways to conceptualize validity. Furthermore, (Dooley, D., 2003) explains that construct validity often plays the most important role in social research because it addresses the threat that the measures employed do not pertain to the theory in question. One way of assessing construct validity of a measure uses the statistical procedure called factor analysis. Factor analysis uses the correlations among all the items of a test to identify groups of items that correlate more highly among themselves than without the group. Ideally a measure should consist of items reflecting just one construct (that is uni-dimensional).

#### **4.4 Analysis of Descriptive Statistics**

It is important to analyze the mean score and one way analysis of variance based on respondents characteristics in order to identify which variable rated as very important

compared with the others based on mean score and respondents' variance with regard to predictor factors.

#### 4.4.1 Cost of Multimodal Transport

One of the most competitive areas of any business is cost. Business Company from abroad as foreign direct investment, they want sure that the logistics chain is simple and the logistics costs are not expensive. The major logistics cost components include transactions, warehouse, transport, storage and port handling.

Table 9 Descriptive statistics of transit cost

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. deviation
cost of multimodal	200	2	5	2.07	0.08

For the question whether the cost of multimodal transport is reasonable or not, the mean score of the respondent is 2.07. This implies that the respondents were not satisfied with multimodal transport.

This is also supported by the research conducted by Ethiopian Maritime Affairs Authority, on national freight logistics strategy for Ethiopia, 2016. The cost of sea freight of Djibouti is more expensive when compared with South Africa (Shanghai to South Africa costs USD 805 and Shanghai to Djibouti USD 1055). Regarding Port handling charges for 20 feet containers, Port Sudan costs 127 USD, Port of Berbera 200 USD, Mombasa 157 USD and Djibouti USD 455. Both the sea freight and Port handling cost of Djibouti port are expensive.

The secondary data also proves that the difference between the transit cost of multimodal transport and unimodal is not as expected. The figure is given below

Table 10. Comparison of multimodal transport and Unimodal transport cost /USD/  
From Shanghai to Mojo

Cost components	Multimodal	Unimodal
	20 feet	20 feet
Sea freight to Djibouti	730	730
Insurance	500	500
Djibouti clearance	596	700
Inland transport	1237	1400
Djibouti Storage	-	207
Dry port clearance service	65	
Dry port handling cost	106	-
Container demurrage	150	200
Dry port storage	206	-
Total	3590	3737

Source: National freight Logistics strategy for Ethiopia and my computation, 2016

The above table shows that the transit cost of 20 feet container from Shanghai to Mojo dry port by multimodal transport is about 3,585 USD and 3,737 USD by unimodal transport. The difference between modes of transport transit cost is about 147 USD, which is insignificant. Multimodal transport is designed to bring significant change in logistic costs. But still there are costs paid due to inefficiency and double cost. The double costs include port handling and clearance which are paid two times at Djibouti and at dry port. The inefficiency costs include demurrage and storage.

#### 4.4.2 Transit time of multimodal transport

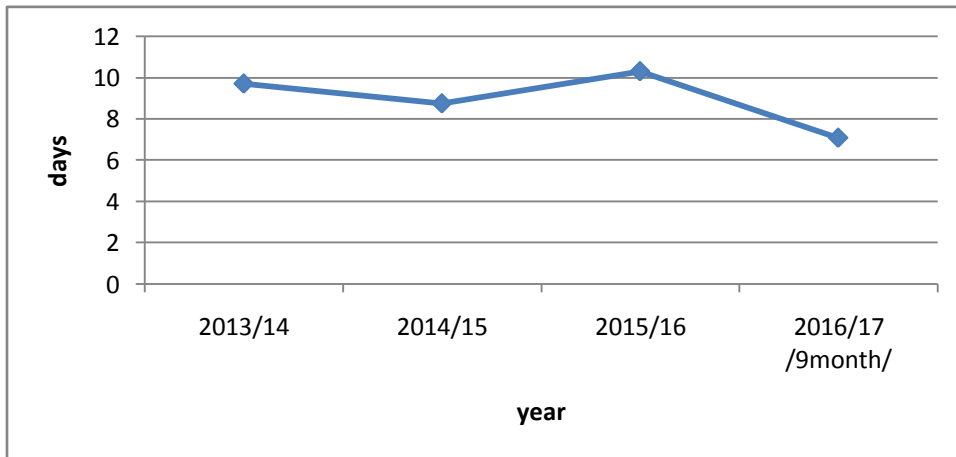
Table 11. Response summary on delivery /transit time/

Descriptive Statistics				
	N	Mean	median	S.deviation
<b>Transit time</b>	200	3.08	3.5	0.6

The transit time is also most important factor for multimodal transport effectiveness is transit time. Transit time takes is the time from cargo discharged at sea up to delivery including customs clearance time at sea port, time taken to get delivery order, port clearance, assigning trucks and gate pass and truck way bill and deliver to dry port.

Two variables included in the questionnaire in measuring the transit time of multimodal transport: accuracy of departure time and promising running time. As indicated in table 8 above, the respondents mean score is 3.08 (moderate). The result is also supported by secondary data from ESLSE. As it is shown in figure 2 below, Djibouti's dwell time shows some improvement year from year but it is not consistently decreasing. The average dwell time of containerize cargo in the year 2013/14 is 9.7 days, 8.74 days in 2014/15, 10.3 days in 2015/16 and 7.07 days in 2016/17. Even though, the average dwell time is improved, still storage cost has been paid at Djibouti.

Fig3. Average Transit time of multimodal containerize cargo



Ethiopian Maritime Affairs Authority study on National Freight Logistics strategy assures that the average dwell time for container at Djibouti is higher as compared to the two East Africa ports (Mombasa and Dares- Salaam, average of 7 days) yet, it is worse from international standards (which is 3 days),(Ethiopian Maritime Affairs Authority,2016).

### **4.4.3 Infrastructure of Multimodal Transport**

The physical and technological infrastructure play important role for the multimodal transport system to be effective and efficient. The physical infrastructure includes road, railway and port equipment. Information technology is one of the basic functions for payment, cargo and trucks tracking and tracing, and information sharing.

Multimodal transport system requires technology friendly environment. The use of modern technology would substantially enhance efficiency of multimodal transport operations. The railways could benefit immensely from the use of articulated flat cars, road-rail equipment and other container hauling technologies. Road transport could also be improved by employing tractors with more powerful engines, which are more reliable and fuel efficient. Regarding container vessels, research needs to be carried out on the economical and practical dedicated vessel types, which could contribute to increasing transport efficiency and reducing transport cost. Container handling facilities and transport equipment at the interior load centers should also be technically upgraded. Infrastructure facilities for multimodal transport, especially in the interior areas, need to be given priority in the municipal transport development plans. Port development should also take into full consideration the integration of multimodal transport facilities, such as the dedicated berths for container barge operations, the rail accessibility in the container terminals, and so on. Container tracking systems should also be introduced with a view to enabling transport operators and trading partners to track containers from their origin to destination and to predict the estimated time of arrival of inbound loads. This technology would play a very important role in promoting multimodal transport.

In order to measure the availability of different infrastructures, the researcher presented four positive statements to the respondents to rank their level of agreement or disagreement based on their evaluation. For all the four variables the respondent answers were summarized below.

Table 12. Response summary of Infrastructure

	<b>Mean score</b>
<b>Online cargo tracking and tracing</b>	2
<b>Payment supported by IT</b>	4
<b>Dry port support by IT</b>	3.13
<b>Enough dry port machinery</b>	2.76
<b>Over all infrastructure</b>	3.1

Source:Survey data

For the question whether there is online cargo tracking and tracing system or not, respondents answer mean score is 2 which indicated most of them disagree, that means there is no online tracking and tracing technology application. The second question focuses on whether payment were supported by information technology or not, the respondent answer mean score is 4 agree which means it is supported by information technology. The third question tries to find out whether dry port activities were supported by information technology or not, the respondents answer mean score is 3.1, which means moderate. The result interpreted as even though, there is no full package IT system in the dry port, some services like payment, release of cargo and arrival notification are supported by networked system. The last question identifies if there were enough port machineries, the mean score is 2.76 (moderate) which means there were not enough. Port requires different types and kinds of port machineries to handle various cargoes. The overall Infrastructure availability mean score is 3.1 (moderate), which means logistics activities were not adequately supported by IT and port infrastructures.

Ethiopia is one of the landlocked developing countries. Road transport plays a significant role in the transit transport. For which, Ethiopia has concluded Road Transport Agreements with Djibouti and Sudan. Recently rail transport has begun along the Ethio-Djibouti corridor. As it is not good enough to facilitate transit trade, the role of rail transport will be significant.

Multimodal transport will continue to increase year by year. There is already a shortage in number of trucks, while there is no special equipment, like for instance bulk trucks, or

container chassis. According to ESLSE'S own calculation there is a requirement for 700 trucks daily just to cope with the volume today (Maritime and Transport Business Solutions, 2013).

Furthermore, ESLSE is a large global operating company with multiple information and communication channels to the outside world - read outside Ethiopia. Too much is handled manually and consequently management information comes available far after an event takes place. Without timely and reliable information ESLSE cannot make the right decisions. Without adequate ICT systems ESLSE is lost. ESLSE was originally a shipping company and that part of the business is covered with Sea liner and Ship expert system, but for freight forwarding, inland transportation and dry ports there is little available and is even neglected after the merger (Maritime and Transport Business Solutions, 2013)

ESLSE has about 492 trucks working in Ethio-Djibouti corridor. The average Monthly round trip of truck is about 3.36 which is below the national 6b standard (4.5). The major reason for lower performance of the trucks is most of them is old for they have been used for more than ten years. Moreover, these trucks stay long at garage; loading/unloading takes long time, road calls and accidents also takes time. Generally, these factors share about half of yearly working times, (ESLSE, 2017).

#### **4.4.4 Reliability of multimodal transport service**

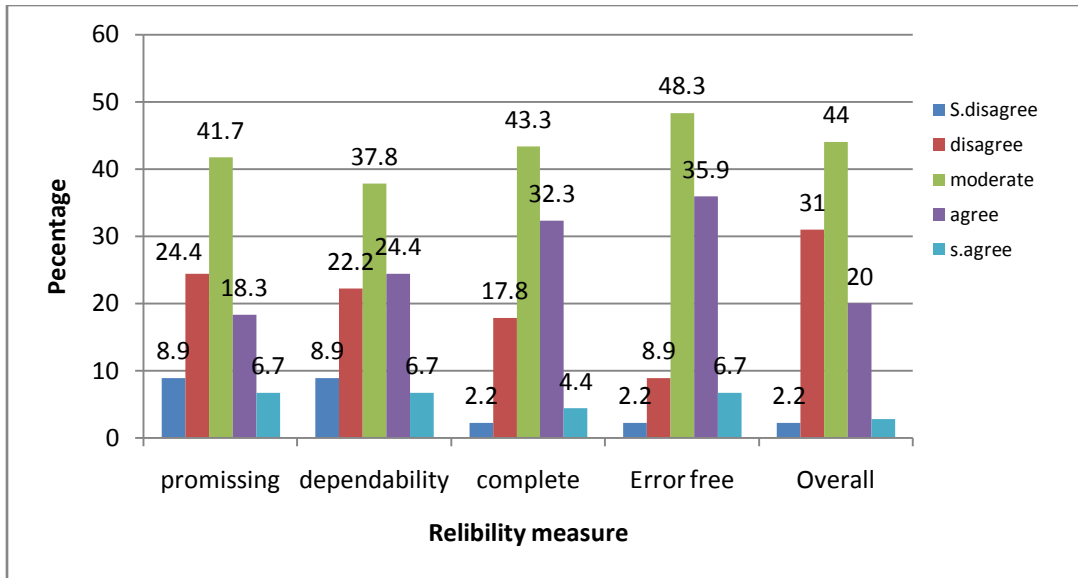
In relation to the reliability of the multimodal transport system, respondents have been given four positive statements: service providing at a promising time, dependability, complete and error free services. Respondents rank their level of agreement or disagreement in the questionnaire. The respondents answers are summarize in the table below.

Table13. Descriptive Analysis Reliability of Service

	<b>Mean score</b>
<b>Providing services at as promised</b>	3.04
<b>Dependability</b>	3.18
<b>Complete service</b>	3.29
<b>Error free records</b>	3.49
<b>Over all</b>	3.25

As shown in the above table, the reliability performance was assessed on four performance indicators. The respondents response about r providing service at promised time mean score is 3.04 (moderate) , dependability for the service mean score is 3.18 ( moderate) , in getting complete service mean score is 3.29 (moderate) and getting error free documents mean score is 3.49 (moderate) and over all mean score is 3.25 (moderate). The result shows moderate value. Even though, multimodal transport transit time promised is5 days,which is indicated by ESLSE charter but it takes on average above 8 days. Moreover,customers do not get onestop service.Sometimes there are document discrepancy .Due to this, storage cost are paid at Djibouti port. This is one indicator of poor reliability of multimodal transport service.

Fig 4.Customer’s responseregarding Reliability Multimodal Transport service



Source Own computation from Survey data

The result which is presented in the above figure shows that significant numbers of customers were not satisfied on reliability of multimodal transport service. overall reliability with the mentioned indicators , 33.3percent of the customers responded that either strongly disagree and disagree , 44 percent moderate and 22.8 percent of the customer agree and strongly agree.

Reliability of service is one of the important measure services qualities. Dimension that measures service quality is from SERVQUAL model. This is aggregated from a composite of indicators such as provision of services as promised including at promised time, dependability in handling customer's service problems, performing services right the first time, and maintaining error-free records. The above graph shows that, about 77 percent of the respondents are not satisfied and only 23 percent agree on the service reliability. Sometime huge amount of cargoes arrived at a time at Djibouti port. When this happened, trucks look for higher service price. They shift to break bulk and bulk cargoes. As a result, multimodal containers take longer dwell time. Moreover, when there are document discrepancies, it takes longer time for correction. Ultimately, all the previously mentioned factors reduce the reliability of the service.

#### 4.4.5 Cargo Safety and Liability

The MTO assumes responsibility (is liable) for the performance as a carrier for more than one mode of transport. As such the MTO is bearing the liability for the entire transport according to the contract with the merchant. It is liable for loss of or damage to the goods or delay in the delivery of the goods if the occurrence causing the loss or damage or delay in delivery took place while the goods were in his charge unless he can prove that no fault or neglect of his own or his servants or agents was responsible for the occurrence or contributed to it.

**Table 14. Response summary of cargo safety and liability**

	<b>Mean score</b>
<b>Claim Handling</b>	4.1
<b>Notice on time reporting</b>	3.7
<b>Over all</b>	3.8

**Source:** Own computation from Survey data

One of the determinant factors of multimodal transport is cargo safety and liability. For the question whether there is handling of cargo safety and liability or not, the respondents mean score for claim handling is 4.1 (agree) and notice on time reporting mean score is 3.7 (agree) and over mean score is 3.8 (agree). The result shows that customers agreed that ESLSE is good at cargo safety and liability handling. Multimodal cargoes have been imported with container the risk of loss and damage minimum that is why most of the respondents agree on safety and liability.

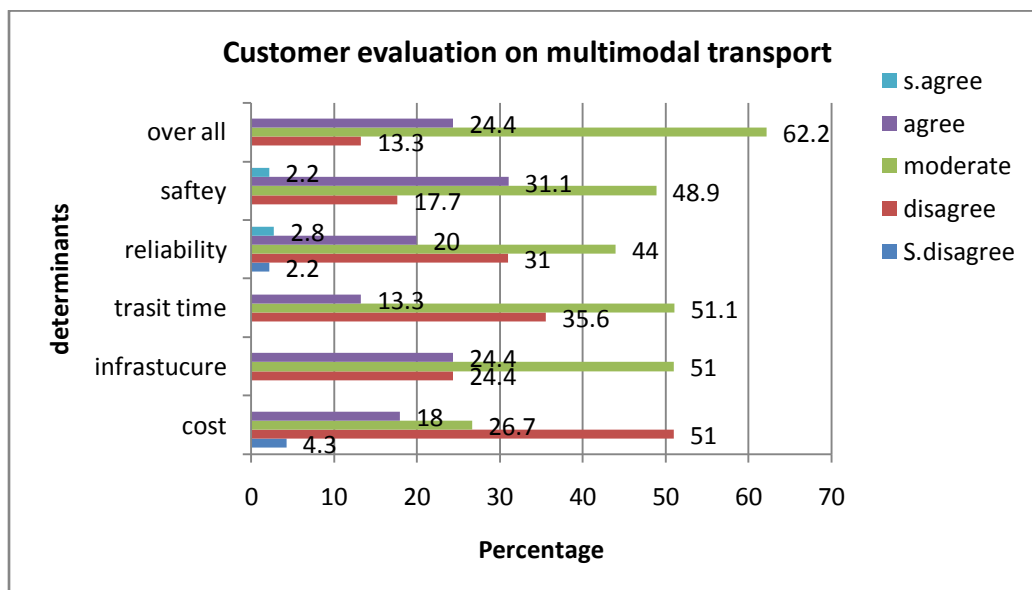
The multimodal operator has obligations to hand over all imported goods as he received. The operator should also provide more detailed and timely information for any damage and risk happened at shipment. Shippers have to guarantee to the carrier that the information given to him about the goods is accurate and that the carrier can use this information without risk of suffering a penalty or delay. (UNCTAD, 2003)

#### **4.4.6 Overall Multimodal Transport Effectiveness**

Logistics cost activities including transportation, customer handling, inventor planning and management, supply handling and relationship and warehousing. Scholar mentioned that from the total cost of logistic cost transportation accounts 1/3-2/3. The world logistics and supply chain operations have grown increasingly complex over the decades. This has drastically altered the dynamics of global freight transport systems. The major changes in global trade that have occurred in the last two decades are part of reflections of innovations in logistics and changes in policies in countries around the world that led to a reduction in transit cost across borders.

For the purpose of this research, the determinant factors for effectiveness of multimodal transport are: logistics cost, transit time, reliability of services, infrastructures and safety of cargoes. The following figure shows customer evaluation on the multimodal transport system.

Figure5. Summary of Respondent evaluation of multimodal transport service



Source: own computation of survey data

As indicated in the above figure, regarding fairness of logistics cost of multimodal transport, 4.3 percent of the respondent strongly disagree, 51 percent disagree, 26.7 percent moderate and 18 percent agree. The mean score is 2.07, which means most of the customer disagree on the fairness of the cost. The second determinant factor is

infrastructure of multimodal transport. The respondents evaluate the existing logistics infrastructures supporting for effective transport system. 24.4 percent of the respondent disagrees, 51 percent moderate and 24.4 percent agree. The mean score is 3.3 which is moderate. The third determinant factor is delivering cargoes with reasonable time, for this question 35.6 percent disagree, 51.1 percent moderate and 13.3 percent agree. The mean score is 3 which moderate. The fourth determinant factor is reliability of the transport service is 33.2 percent disagree and strongly disagree, 44 percent moderate and 22.8 percent agree and strongly agree. The mean score is 3.25, which is moderate. The fifth determinant factor is cargo safety and liability, 17.7 percent of the respondents disagree, 49 percent moderate, 33.3 percent agree and strongly agree. The mean score is 3.8, which is agreed. In measuring the overall effectiveness of multimodal transport with those determinants, 13.3 percent of the respondents disagrees, 62.2 percent moderate and 24.4 percent agree on the service. One can conclude from the overall effectiveness, highest percentage fall at moderate position and the mean score is 3. Generally, respondents evaluate Multimodal transport system in terms of transit cost is not fair, in cargo safety and liability good and on the other determinants in logistics infrastructure, delivery time and reliability gave moderate score. This implies that customers are not satisfied in almost all determinants except cargo safety and liability. This depict that ESLSE should work hard to improve all its services. This is also proved by World Bank research conducted until 2016 as follows.

Ethiopia is ranked 126<sup>th</sup> in 2016 (LPI score is 2.37) and 104<sup>th</sup> in 2014 (LPI score is 2.59) among 160 countries on overall performance with much improvement from 2007-2012. Besides, Ethiopia's LPI score on the six measures shows that the country is lagging behind the average sub-Saharan Africa and low-income countries. Yet, specific indicators for customs and logistics infrastructure have shown steady improvement during this period but, tracking and tracing, international shipment and in particular timeliness show deterioration compared to previous LPI reports. This is implied by higher logistic cost, longer transit time and poor service reliability, (Ethiopian Maritime Affairs Authority, National Freight Logistics strategy for Ethiopia, 2016).

## 4.5 Inferential Statistics Analysis

In this section inferential statistics were used to test the hypotheses and draw general conclusions. The analysis includes ANOVA, correlations, t-tests, regression analysis. Based on the estimate value one can conclude about the population.

### 4.5.1 The One Way Analysis Of Variance /ANOVA/

ANOVA was used to examine a statistical significant difference between and within variables. In this research, analysis of variance was made to check whether dry port dwell time affected by respondent's educational level and warehouse ownership types. This hypothesis can be divided into the following sub hypotheses

1. There is significant difference cargo dry port dwell time due to educational background of customers. The result is given below

Table 15. Analysis of Variance based on education level

	Sum of Squares	Df	Mean Square	F	Sig
Between Groups	162.3603	4	40.59006	0.731462	0.3
Within Groups	1886.717	196	55.49167		
Total	2049.077	200			

Source: SPSS analysis of survey data

Table 11 shows that the P-value (Sig.) is greater than the level of significance  $P=0.05$  the test statistics is not significant. It indicates that, there is no significant difference among the respondents due to their level of education. Education of respondents do not bring short dwell time of cargoes

2. There is significant difference in dwell time of cargo among respondents who have own or rental warehouse.

Warehouse is one component of logistics cost, some customers have own warehouse and other use rental warehouse. So, the hypothesis is to Check whether warehouse ownership and dry port dwell time has relation or not. ANOVA analysis result is given below.

Table 16 One- Way Analysis of Variance based on warehouse ownership

	Sum of Squares	Df	Mean Square	F	Sig.
<b>Between Groups</b>	102.713	1	102.713	1.953	0.171
<b>Within Groups</b>	1946.364	199	52.604		
<b>Total</b>	2049.077	200			

Source: SPSS analysis of survey data

The above table shows that the P-value (Sig.) is greater than the level of significance  $P=0.05$ , The test statistics is not significant, the result interpreted as there is no significant difference in dwell time of containers among the respondents due to ownership of warehouse. Therefore, customer having their own warehouse or rental warehouse does not bring short dwell time cargoes.

#### 4.5.2 Dwell time of multimodal cargo

Cargo port dwelling time represents the days the cargo stayed lying sea port terminal until it is moved inland dry port. One of the importance of multimodal transport is reducing transit time /dwell time/. To get cargo transit permit from Djibouti custom, it requires a lot of procedures: the carrier should give delivery order after checking the customer document /Bill of landing/ with the carrier manifest and payment settled, Djibouti custom has to check the customer documents with its ASYCUDA WORLD system, and after getting cargo release permit, the port authority collected its services cost and give release of cargo. In mean time, if there is discrepancy of documents like consignee name, notify party name, seal number and container number the cargo stays at port until the discrepancy is corrected by different parties, it may be from customer, supplier, carrier and agent.

For the question how long will it take to transport cargoes from Djibouti by multimodal transport system. One sample test is applied and the following result is obtained.

1. Multimodal Containers transported from Djibouti within grace period

To test the above statement one sample t- test is used as follows. The result is given below

Table 17 One sample t test

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
Average dwell time	200	11.3333	10.58462	1.57786

One-Sample Test						
Test Value = 8						
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Average dwell time	2.113	199	.040	3.33333	.1534	6.5133

As it is mentioned in the above statistical test the mean of dwell time is 11.33 days. Since  $\alpha$  significant level is less than 0.05, the test statistics is significant. That is the alternative hypothesis is accepted, the null hypothesis is rejected. Therefore, one can conclude that the dwell time of containers is greater than 8 days. Because of this fact some of the containers loaded from Djibouti more than grace period. Due to this, Storage cost is paid at port. The data is supported ESLSE 2016/2017 nine months report, 131,876 containers (TEU) were handled by Multimodal container clearing and forwarding operation out of the total uplift of 76 percent containers were forwarded within the grace period (8 days) while 24 percent of the containers were uplifted after 8 days stay in Djibouti. The reason for the delay is shown in table below.

Table 18. Major causes of delays of containers (July 2016-March/2017)

Sr.No	Description	Box	Share (%)	Days required
1	<b>Containers Handled on time</b>	<b>73,092</b>	<b>76.57</b>	< 8 days
	Container with less dwell time	33,957	46.46	≤ 5 days
	Container with higher dwell time	39,135	53.54	5 – 8 days
2	<b>Delayed Containers more than 8 days</b>	<b>22,362</b>	<b>23.43</b>	≥ 8 days
	Shortage of Trucks (400 Quintals)	9,560	42.75	7 days
	Late operation generation	2,906	13.00	10 days

	TIN related problems	3,552	15.88	3 days
	Seal related problems	156	0.70	4
	Sea way bill problems	223	1.00	7
	HS Code problems	505	2.26	3
	Manifest related problems	1452	6.49	3
	Transistors inefficiency	3,383	15.13	--
	Clearance stoppage Due to Financial Problem	625	2.79	--

Source ESLSE 2016/17 nine months report

According to the above quantitative data, the dominant factors that affect the MMT dwell time are truck shortage (42.75%) followed by TIN related problem (15.88%), transistor's inefficiency(15.13%), documentation problems such as late coming operations (13%), manifest related problems (6.49%) and HS code (2.2%) problems. Therefore to minimize such problems dedicated online information system must be employed.

### 4.5.3 Regression Analysis

In order to run regression analysis, the following assumptions will be tested.

#### 4.5.3.1 Normality

Normality refers to the distribution of the data for a particular variable. Normality is commonly assumed in many statistical and economics methods. Various descriptive statistics provide valuable basic information about variables that is used to determine appropriate analysis methods to be employed (Park, Hum Myoung., , 2008). Normal distribution is determined based on skewness and kurtosis statistics. Skewness is a measure on the asymmetry of a distribution. Whereas, Kurtosis measure the relative concentration (Flatness or Preakness) of data values in the center versus in the tails of a frequency distribution when compared with normal distribution.

If kurtosis is smaller than 3, the variable has a low peak and thick tails. Accordingly, as depicted in Table 16, all variables are within the acceptable range for normality and their value is below two.

Table 19. Normality Test

Variables	Mean	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
<b>cost of multimodal Infrastructure</b>	3.467	-0.548	0.354	-0.498	0.695
<b>transit time</b>	3.322	0.360	0.354	-0.804	0.695
<b>Reliability</b>	3.089	-0.107	0.354	-1.084	0.695
<b>Safety and liability</b>	3.250	-0.542	0.354	1.109	0.695
<b>Multi Modal effectiveness</b>	3.400	-0.290	0.354	-0.433	0.695
	3.476	-0.156	0.354	-0.632	0.695

Source: Survey questionnaire

#### 4.5.1.2 Normal P-P Plot Test

The Probability-Probability Plot (P-P plot or Percent Plot) compares an empirical cumulative distribution function of a variable with a specific theoretical cumulative distribution function. Normal P-P plot of the regression standardized residual is one way of testing the normality assumptions. The points lie in a reasonably straight diagonal line from left to top right. The figure 6 below depicts the dots are close to the line and the value is distributed along the diagonal line from zero to one. Therefore, the P-Plot reveals no large deviation in the spread of the residuals. This indicates that the relationship between the predictor variables (transit cost, infrastructure, transit time, reliability and cargo safety and the dependent variable (Multimodal transport Effectiveness) are linear.

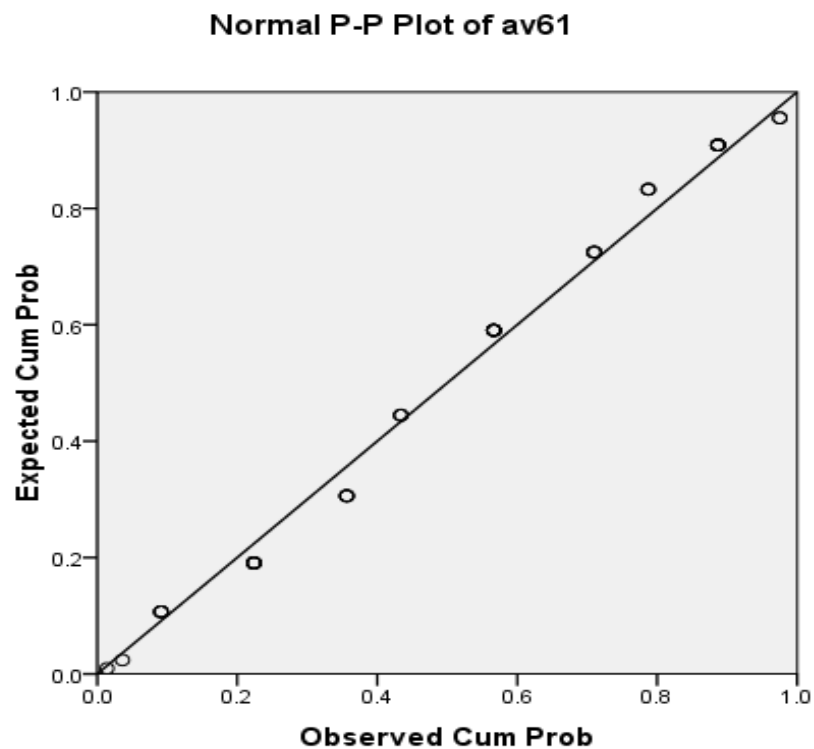


Figure 6: Normal P-P Plots

### 4.5.3.3 Multicollinearity

Multicollinearity is a technique used for identifying groups or clusters of variables as well as existence of high correlation among the predictor variables. The existence detected by checking strong correlation among independent variables. Accordingly (Andy F., 2009) stated that, one way of identifying multicollinearity is to scan a correlation matrix of all predictor (independent variables) variables and set if any correlation is high (by high mean correlation of above 0.80 or 0.90). Accordingly the correlation among independent variables is computed and presented as follow.

Table 20 Correlation of independent variables

<b>Correlations</b>				
	cost of multimodal	Infrastructure	transit time	Service Reliability
<b>cost of multimodal</b>				
<b>Infrastructure</b>	0.05*			
<b>transit time</b>	0.03*	0.23*		
<b>Service Reliability</b>	-0.070	0.573**	0.511**	
<b>safety/liability</b>	0.31*	0.361*	0.532**	0.385**
<b>*. Correlation is significant at the 0.05 level (2-tailed).</b>				
<b>** . Correlation is significant at the 0.01 level (2-tailed).</b>				

Based on Andy F. (2009) statement, the correlation among independent variables is below the limit of high correlation (by high mean correlation of above .80 or .90). The highest correlation is detected between Infrastructure and service reliability (0.573), transit time and service reliability (0.511) and safety/liability and transit time (0.532) and the lowest correction is scored between transit cost and transit time (0.03) .

Multicollinearity would be also detected with tolerance values and variance Inflation Factor (VIF) for each independent variable. The variance inflation factor (VIF) and tolerance were used to measures the degree of multicollinearity of the independent

variable with another Independent variables in a regression model. (O'brien,R.M, 2007), VIF indicates how much the estimated variance of the  $i^{\text{th}}$  regression coefficient is increased above what it would be if  $R^2_i$  equal zero: a situation in which the  $i^{\text{th}}$  independent variables is related with the other independent variables in the analysis . On the other hand Tolerance is an indicator of how much of the variability of the specified independent variable is not explained by the other independent variables in the model and is calculated using the formula  $1-R^2$  for each variable. If this value is very small (less than 0.1) indicates that the multiple correlation with other variables is high (Menard, 1995).

Various recommendations for acceptable levels of VIF have been published in the literature. Perhaps most commonly, a value of 10 has been recommended as the maximum level of VIF (Kennedy,p., 1992). The VIF recommendation of 10 corresponds to the tolerance recommendation of .10 (i.e.,  $1/.10 = 10$ ). However, a recommended maximum VIF value of 5 (Rogerson,P.A, 2001)and even 4(pan,y & Jackson, 2008) were found in the literature. For this study the Multicollinearity of independent variables were checked and the result is shown in table 18.

Table 21.Multicollinearity Statistics

	<b>MultiCollinearity Statistics</b>	
	Tolerance	VIF
<b>cost of multimodal</b>	0.855	1.168
<b>infrastructure</b>	0.625	1.599
<b>transit time</b>	0.581	1.719
<b>Service Reliability</b>	0.507	1.972
<b>safety/liability</b>	0.577	1.734

Source: my computation Survey data

The result shows that VIF is less than 3 and the tolerance also more than 0.10 in all cases. The tolerance and VIF values of transit cost, infrastructure, transit time, Service Reliability, and safety/liability are for tolerance 0.855, 0.625, 0.581, 0.507, 0.577 and VIF are 1.168, 1.1599, 1.719, 1.972, and 1.734 respectively. All are within the

recommended range of VIF and tolerance, thus it can be concluded that the model fits the requirement and multicollinearity is not a problem.

#### 4.5.4 Correlation Analysis

The relationship between variables is detected with correlation coefficient. A correlation coefficient expresses quantitatively the magnitude and direction of the relationship between two variables. One of the most common correlation coefficients is called Pearson correlation (r). It varies from + 1.0 -1.0. The sign of the coefficient tells us whether the relationship is positive or negative. The numerical portion of the coefficient describes the magnitude of the relationship. A coefficient of + 1.0 indicates that a perfect relationship exists between the two variables. Contrarily, a value of 0.0 indicates no relationship.

Correlation between the independent variables with the dependent variable was undertaken the summary of correlation presented as follow:

Table 22: Correlation between dependent and independent variables

<b>Variance</b>	<b>Correlation</b>	<b>P-Value (Sig)</b>
<b>cost of multimodal</b>	0.268*	0.05
<b>infrastructure</b>	0.600**	0.000
<b>transit time</b>	0.477**	0.001
<b>Service Reliability</b>	0.715**	0.000
<b>safety/liability</b>	0.474**	0.001

It is also observed that, infrastructure, has a positive and significant (.000) relationship with multimodal transport effective with a correlation coefficient of (0.600\*\*). This indicates that, if the enterprise supports the service with information technology, enough port machineries, and online payments, tracking and tracing system. Service reliability has also a positive and strong relationship with multimodal effectiveness with correlation coefficient (0.715\*\*) significant (0.000). This indicates that the organization (ESLSE) has

to focus on improvements of reliability measures such as providing services as promised, in handling customer service problems, complete service and error free service. Transit time is significant and positively related with multimodal effectiveness correlation 0.477 (p- value 0.001). The other determinate safety/liability is also positively and significantly relation with correlation coefficient 0.474 with significant level (P=0.001) which include cargo safety and when damage is occur how fast insurance claim is handled. Cost of multi modal transport show weak positive relation with multimodal transport with correlation coefficient of (0.268) with p- value 0.05.

#### 4.5.5 Regression Analysis

According to Daniel, L. (1991, p.421), correlation between two variables does not imply that one event causes the second to occur. Therefore, to know how the dimensions the determinant factors determine multimodal transport effectiveness, multiple regressions were carried out. Checking the assumptions of normality of the distribution, P-P plot test and multicollinearity of the variables were already analyzed and got normal to precede the regression.

The researcher was preferred to a stepwise multiple linear regression method was followed to get the smallest possible set of predictors in the model. The independent variables estimated to predict multimodal effectiveness were transit cost, logistics infrastructure, transit time, service reliability and cargo safety/liability. Using all these predictors, the model is written as.

$$\text{Multimodal effectiveness} = \alpha + \beta_1 \text{transit cost} + \beta_2 \text{Logistics Infrastructures} + \beta_3 \text{Transit time} + \beta_4 \text{Reliability of services} + \beta_5 \text{Saftey/liability} + \epsilon, t=1, \dots, n$$

Where  $\alpha$  is a constant,  $\beta$ 's are parameters to be estimated, and  $\epsilon$  is error term.

The general linear regression  $b$ 's estimate of  $\beta$ 's and  $a$  estimated of  $\alpha$ , then the regression line written as:

To cope with an interpretation that suits satisfaction and regulates problems with linear figures, then transformed both the dependent and the explanatory variables to logarithm. Thus, rewritten as:

$$\ln(\text{Multimodal effectiveness}) = a + b_1 \ln(\text{transit cost}) + b_2 \ln(\text{Logistics Infrastructures}) + b_3 \ln(\text{Transit time}) + b_4 \ln(\text{Reliability of services}) + b_5 \ln(\text{Safety/liability})$$

Table 23 ANOVA Analysis of Regression model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.822 <sup>a</sup>	.68	.648	.0925

a. Predictors: (Constant), cost of multimodal, infrastructure ,reliability, transit time, cargo safety/liability

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.0795	5	0.159	75.169	0.000
	Residual	.361	195	0.009		
	Total	1.157	200			

**a. Predictors: (Constant), cost of multimodal, infrastructure ,reliability, transit time, cargo safety/liability**  
**b. Dependent Variable: multimodal effectiveness**

b. Dependent Variable: multimodal effectiveness

Determination of multiple regression adjusted R square ( $R^2$ ) is 0.65 (65%). Interpretation 65% of the total variation of multimodal transport effectiveness is explained by the independent variables (cost of multimodal, infrastructure, reliability, transit time).

As depicted in the ANOVA Table 20, the F value is 75.169, which is highly Significant at ( $p < .001$ ). This result can be interpreted as, the model is significantly predicts the outcome variable. This indicates that the variation explained by the model is not due to chance and it (the model) is well fitted at significant level. The coefficient of the independent variables is given below:

Table 24 Coefficients of Independent variables

Coefficients <sup>a</sup>						
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	
	B	Std. Error	Beta			
<b>1</b>	(Constant)	.190	.124		1.533	.133
	LNCOST	.175	.059	.286	2.990	.005
	LN Infrastructure	.235	.088	.284	2.674	.011
	LN transit time	.294	.117	.336	2.518	.016
	LN Reliability	.235	.077	.372	3.065	.004
	LN Safety/liability	-.036	.080	-.055	-.447	.658
<b>a. Dependent Variable: reliability</b>						

As it is shown in the above table, the four variables, namely: transit cost, logistics infrastructures, transit time and reliability are significant at level of significant 0.05. On other hand, cargo safety/liability not significantly, which means the variable is not explain the multimodal effectiveness, this because, nowadays multimodal transport gives services only for containerize cargo and vehicles carried by car carrier. These types of cargoes by its nature protected from external contact (cargo safety is achieved). Therefore most of the customers have not possible to measure its impact.

The values of coefficients are: the constant value  $a = 0.190$ , cost of multimodal is 0.175, infrastructure 0.235, transit time 0.294, reliability 0.235, using these coefficients the model is fitted as below:

For meaningful interpretation the variables are transform into natural logarithm as:

$$\ln(MT_{eff}) = 0.190 + .175 \ln(CT) + .235 \ln(Inf) + .294 \ln(Time) + .235 \ln(Rel)$$

Where:  $MT_{eff}$  = Multimodal effectiveness,  $CoT$  = Cost of Transit,  $Inf$  = Infrastructure,  $Time$  = transit time and  $Rel$  = Reliability

The model is interpreted as, a 1 percent improvement of transit cost which bring 0.175 percent increase in multimodal effectiveness or 10 percent improvement in transit cost lead to 1.75 percent increase in multimodal effectiveness. 1 percent improvement in

logistics infrastructure will bring 0.235 percent increase in multimodal effectiveness. Likewise, 1 percent improvement in transit time or Reliability brings multimodal effectiveness 0.294 percent and 0.235 percent respectively. This indicates that the organization (ESLSE) has to focus on improvements of logistic cost, logistics infrastructure, transit time and reliability measures by providing services as promised, enhance dependability in handling customer service, error free services, by doing this the service will be improved.

From table Beta coefficient, reliability has highest beta value which is 0.372, which means reliability is more important factor in explaining multimodal effectiveness followed by transit time, cost and logistics infrastructure respectively.

### **Open-ended questions**

**For the question about the major problems of multimodal transport, the respondents replies are summarized as follows.**

Multimodal transport system as a system invites more transport actors and to work together as a single system. ESLSE, as operator rule, is coordinating those actors, some of these actors are banks, carriers, custom, Djibouti port Authority and custom, transport authority. Consequently each actor would have its own duties and responsibilities to be performed to ensure the normal operation of the system. For instance customers as part of the system are required to fulfill the requirements needed from them to get the full service of the multimodal transport operator by entering a multimodal transport agreement. After that the multimodal transport operator will deliver the service promised as per the agreement made with its customer. In certain situations these entities could be found not fulfilling what is agreed earlier or breaching their prior transport contractual agreement. This is the case where the regulatory framework becomes important to maintain the system's operation by resolving the differences that might happen among parties in the system. That means the regulatory framework will have a role of governing the operations of multimodal transport system.

The customers were asked to mention major problems and suggest solutions of Multimodal transport. Their answer is categorized as follows:

**Table 25. major problems of multimodal transport**

s/b	Major problem	Answered	Percentage
1	Lack of infrastructure / IT, dry port machineries.../	81	40
2	Longer transit time	67	33
3	Document errors and correction delay	33	17
4	higher transport cost	19	10
	Total	200	100

As properly mentioned in the above table, the major problem is infrastructure which accounts 40 percent of the responses. The infrastructure includes: different modes of transport, dry port machineries and information technology which are critical for Logistics operation. Since goods are produced in one country and consumed in different countries, it needs fastest movement of cargo and fast information technology that satisfy the customers' expectation. Some of the advantages information technology for logistics: rapidly communicate orders, to know track order status, to Check inventory availability, to monitor levels and track shipments and payments.

The second problem is long transit time which accounts 33 percent. Even if there are improvements in transit time, still some containers loaded above grace period. About 17 percent the respondents mentioned documentation discrepancies are one of the major problems they encountered which include consignee name, seal number, Tin number, HS code and container number, etc. Once the problem occurred, it takes many days for correction. 10 percent of the respondents said that multimodal transport cost is expensive. Which include costs of inland transport, sea transport and clearance.

As mentioned by the customers, ESLSE is not providing services that satisfy their interest. It incurs costs and increase transit time. As a result, industries becomes uncompetitive in the market, create market inflation and consumers are affected by the high cost of goods and ultimately it affects the macroeconomy.

The dry port and terminal service is one of the fundamental services being provided by ESLSE under the multimodal transport system. Port and terminal service include loading

and unloading, temporary storage, stuffing, unstuffing services for incoming and outgoing goods until custom clearance has been completed.

Table 26. Major problem longer dwell time of cargoes at dry port

<b>s/b</b>	<b>Major problem</b>	<b>Answered</b>	<b>Percentage</b>
<b>1</b>	Lack of money	57	28
<b>2</b>	Document delay from supplier	50	25
<b>3</b>	Dry port machinery problem	36	18
<b>4</b>	No one stop services	36	18
<b>5</b>	Other problems	21	11
	Total	200	100

As indicated above, one of the major problems that the multimodal customer faces regarding pile up of cargoes is lack of money. This is money used for payment of custom duty and taxes, for dry port service charges and transportation. The second major problem is delay of documents; out of 200 respondents 25 percent of them mentioned this problem. Unless the documents avail from suppliers, the custom clearance cannot be preceded. These are original bill of lading, packing list certificate of origin, commercial invoice and Performa invoice. Out of 200 respondents 36 /18 percent/ of them mentioned the third problem related to dry port machinery. After customer completed cargo clearance, port machinery needed for loading and unloading, stuffing and unstuffing cargoes. The machineries are not available in enough quantity and some of them are in garage. For these reason, the customers are waiting for long. From the respondents 36 or 18 percent of them said that there is no one stops service at dry ports.

According to the cargo type, there are different parties involved in assuring the cargo qualities; agriculture personnel for food items, medicine personnel for medicinal items and equipment. One cannot get these parties in one office or in networked system. The last category deals with other problems that constitute 11 Percent, which include, payment system failure sometimes cargoes misplaced other dry port without the knowledge of customers, truck accidents along Djibouti to Ethiopia. These also take time, since there is no tracking system.

## CHAPTER FIVE

### 5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents a summary of the findings, conclusions and recommendations made to help and improve the performance of multimodal transport system based on the objectives of the study. The chapter also concludes with recommended areas for further research work.

#### 5.1 Summary of major findings

Multimodal transport has been expanding transport system around the world, one of the reasons is increasing in unitization of cargo. Unitization decrease logistics costs by moving more goods within container. It moves long distance with safety and minimizing the liability of multimodal operators. Cargo can be moved from one country to another with single administration document (SAD) and one multimodal operator. Internationally, most of countries get benefit of multimodal transport that can minimize logistics cost and transit time. The study finds how do customers evaluate this system with five determinant factors; transit cost, transit time, logistics infrastructures, reliability and safety and liability.

**Transit cost of multi modal transport** the mean score of respondents score is 2.07, which means disagree. This implies that majority of the respondents said that transit cost of multimodal is expensive. The costs include transport, port handling and clearance costs. Transit cost of multimodal transport is positively correlated with multimodal transport effectiveness with Spearman's correlation coefficient 0.268, at  $P=0.004$ .

From the regression model, a 10 percent improvement in transit cost, it increases multimodal effectiveness by 1.75 percent. The secondary data also show transit cost of multimodal transport is slightly better than unimodal transport, but the difference is not so much. It explains 17.5 percent of the variances in multimodal effectiveness

**Transit time / dwell time / of cargo** the mean score of respondents score is 3.08, which means moderate. The secondary data also supports the result. Only 76.4 percent of multimodal containers were loaded within grace period, whereas the remaining 23.6 percent of loaded above grace period. This shows that to load all cargoes within grace period, ESLSE should solve the problem of shipment documents discrepancy, increase the availability of trucks that fit for different weight of containers and improve round trip of trucks.

From the regression model, the coefficient of transit time is 0.294. The figure interpreted as 10 percent improvement in transit time, it increase 2.94 percent in multimodal effectiveness. On the other hand, transit cost accounts for 29.4 percent of the variations in multimodal transport effectiveness.

**Logistics Infrastructure** one of the determinant factors for multimodal transport effectiveness. From the findings, the respondents mean score is 3.1, which means the variability of logistics infrastructures are at moderate level.

From the regression model, the coefficient of logistics infrastructure is 0.235. This implies that logistics infrastructure accounts for 23.5 percent of the variations in multimodal transport effectiveness. It is also interpreted as a 10 percent improvement in logistics infrastructure; it increases multimodal effectiveness by 2.35 percent. The result shows that logistics infrastructure one of the factors that hinder multimodal transport effectiveness. For fast movement of cargoes modern logistics infrastructures are needed. This in turn, reduces cost, transit time and reliability of services.

**Reliability of services** from analysis of descriptive statistics, the mean score of respondents score is 3.35, which means moderate. This implies that majority of the respondents did not as such satisfied by the service rendered by ESLSE. Reliability of service strongly positively correlated with multimodal transport effectiveness with Spearman's correlation coefficient 0.715, at  $P=0.004$ .

From the regression model, coefficient of reliability is 0.294. Which is interpreted as 1 percent improvement in service reliability; it increases multimodal effectiveness by

2.35percent. That is, a complete improvement in reliability brings about 23.5percent increases multimodal effectiveness.

Over all summaries, the descriptive statistics the respondents of transport did not satisfied by the transit cost, Customers moderately agreed on the infrastructure, transit time and reliability of the service. In addition, the regression analysis shows that 65 percent of multimodal effectiveness is explained by the variables such as transit cost, transit time, logistics infrastructures and service reliability.

## **5.2 Conclusion**

The research finds that ESLSE faced challenges in implementation of multimodal freight transport system in the country. However, desired intention of the “multimodal” transport system for Ethiopia is not an option rather a must to proceed if Ethiopia has to benefit from international trade and development.

It can be concluded that transit costs, transit time, logistics infrastructures, and service reliability positively affect the multimodal transport effectiveness. The independent variables explain about 65 percent variation of multimodal effectiveness. Customers disagree about fairness of multimodal transit cost. The reasons behind are inefficiencies, lack in use of modern technology, integration of stakeholders and there are double costs. Unless clearance at Djibouti has been issued before vessel arrive and cargoes has been transported like vessel to truck or train, there is double cost of port handling charges at Djibouti and dry port. Transit time is related with costs. It depends on the time takes the trucks to make round trip per month. These factors include the truck age, the fleet management system, how fast loading/ unloading will be done. The average round trip made by ESLSE truck about 2.5, which is very small as compared with national standard that is 4.5. Furthermore, there is fragmented information technology in the enterprise and majority of the services have not been supported by information technology like cargo and truck tracing and trucking system from port of loading up to dry.

To sum up, it is worth mentioning that the ESLSE though it has faced big challenges in implementation of multimodal freight transport system, with the opportunities at hand and working with all concerned may bring the desired intention of the multimodal

transport system for Ethiopia which is not an option rather a must to proceed. Recently the Government amalgamated four companies (Ethiopian shipping line, maritime and transit enterprise, dry port service enterprise and Comet transport S.C) forming ESLSE. Since, these enterprises are working on logistics activities. This move is expected to enable the Enterprise to work hard to minimize inland transportation to alleviate customers' dissatisfaction on transit time and cost, and reliability of services.

Generally, multimodal transport to be effective, the logistic system should be modernized with information technology; dry ports should be equipped with modern port machineries, coordination with shareholders and one stop service.

### **5.3 Recommendations**

According to the findings of the study the researcher forwarded the following points as recommendation. The researcher has a strong believe that applying those recommendations would reduce the challenges of multimodal transport system and upgrade the qualities of multimodal transport services to some extent. Unless the enterprise takes such kind of measures the multimodal transport system will not achieve the intended objectives of reducing transit time, transit cost foreign exchange outflow and cost of transport at large. For the mere success of the multimodal transport system every component of the system should work intertwined with one another.

- ✚ Information communication technology is the most important element in determining the reliability of services quality of multimodal transport system. In order to improve the information communication system of multimodal transport system, the enterprise has to install full-fledged information communication networks to link internal and external offices. This would help the business community to book, trace their shipments easily or get updated shipment information without the help of someone else from the enterprise being anywhere at any time.
- ✚ ESLSE should avoid double costs like terminal handling at Djibouti port and dry port handling, by doing direct delivery of goods.
- ✚ Terminal operation system should be implemented

- ✚ Increase availability of sufficient and modern cargo handling facilities equipment at dry ports.
- ✚ The Ethiopian Government has to strongly work with Djibouti Government to avoid unnecessary and non-value added custom formalities to enable the Enterprise avoid cargo pick up delay at Djibouti and custom should work for trade facilitation not only controlling.
- ✚ Increasing monthly truck round trip using modern fleet management and avoiding old trucks for long distance travels.
- ✚ Multimodal service is given in fragmented way in different departments of ESLSE, they should be coordinated by IT and one stop service should be implemented.
- ✚ ESLSE should also work hard to address inadequate logistics services capability and poor coordination.

**The following points are forwarded for further study in the future**

The researcher forward the following points for further study:

- ✚ Why costs of “multimodal” freight transport in Ethiopia, especially inland freight transport is high?
- ✚ Why cargoes take long dwell time at dry ports?

**5.4 Limitations of the Study**

The findings of this study should be viewed with certain limitations in mind. The non-response rate was the limitation of the research. Only 200 respondents returned back the questionnaires after proper administration from the 228 questionnaires distributed. Due to the nature of the works of the respondents few of them did not return back the questionnaires with lack of time. Some of the respondents also seemed sensitive about revealing confidential company information, which increased the difficulty of doing this research.

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# Appendix

## Survey Questionnaire

**Addis Ababa University School of Commerce**

**Post Graduate Program**

Dear Participant,

I am conducting a research on “Determinants of multimodal transport effectiveness in the case of Ethiopian Shipping and Logistics Service Enterprise”. This research is conducted in the partial fulfillment of the Masters of Art in Logistics and Supply Chain Management.

Please note that, the data collected will be treated with a very high degree of confidentiality and it meant for academic purpose only, It would be greatly appreciated if you would assist by completing the questionnaire listed below and I thank you in advance for sharing your valuable experience and time in completing the questionnaire.

For any enquiry about this survey: Please feel free to contactwith email [aklilemb@gmail.com](mailto:aklilemb@gmail.com)

Circle on choose and fill the backs for open question

### **I. General Information /Circle/**

**1. Enterprise type**

- A. Private importer /commodity/B. Manufacturing industry
- C. Other industryD.Public Enterprise
- E. Civil service organization F. NGO

**2. Owner /manager educational background**

- A. Master’s degree or above                      B. High school completed
- C. Certification/Diploma      D.Below high school

**3. Major Cargoyouhaveimported\_\_\_\_\_**

**4. What mode of transportation service do you use?**

- A. Multimodal    B. Unimodal    C. Both

## II. Major questionnaire

1. How many years have you worked with Multimodal transport?\_\_\_\_\_
2. On average how many containers/vehicles do you import yearly \_\_\_\_\_
3. How long it take to transport cargoes from Djibouti by multimodal transport\_\_\_\_\_
4. Do you have encountered any document problem/discrepancy A. Yes B. No
5. If your answer is yes for question 4, list the Major discrepancies you encounter \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
6. On average how long it took for document correction \_\_\_\_\_
7. Have you encounter any cargo damage till now? A. Yes B. No
8. For question7,If the answer is yes,on average by how many days do you let you know the damage\_\_\_\_\_
9. Where did most of the damage occurs  
 A. Port of loading B. on Ship  
 C. At port of Djibouti D. along Djibouti to Ethiopia road
10. In how many days did you finish the claim\_\_\_\_\_
11. Where do you store you cargoes  
 A. Rental warehouse B. own warehouse  
 C. Other (specify)
12. For question 11, the answer is rental, evaluate the rent  
 A. Cheap B. moderate C. Expensive

### Evaluate the performance of Multimodal transport and tick on the box/√/

s.n	Description	Strongly disagree	disagree	Moderate	Agree	Strongly Agree
1	Cost of multimodal transport is reasonable					
2	Infrastructure					
2.1	There is online Cargo					

	tracking and tracing system					
2.2	Payment is supported by IT system					
2.3	Container demurrage payment is supported					
2.4	There are enough dry Port machinery for the service					
2.5	There is dry Port cargo tracking and tracing system					
3	Delivery performance					
3.1	Accuracy of departure times					
3.2	Promising running time					
4	Reliability					
4.1	Providing services as promised					
4.2	Dependability in handling customer service problems					
4.3	Providing services at the promised time					
5	There is no problem in Cargo safety and liability					
5.1	Good at claim handling					
5.2	Notice on time during cargo damage					
6	Evaluate overall					

	multimodal effectiveness					
6.1	In terms of government regulation					
6.2	Minimize Documentation					
6.3	Safely and liability					
6.4	Logistics costs					
6.5	Transit time					

13. Please List Major problems of Multimodal transport from highly serious to low

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14. Please suggest the possible Solutions for the above mentioned problems

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15. On average by how many days have you took the cargo from dry port \_\_\_\_\_

16. For question 15,if your answer is above 8 days, what is the major problems

17. Please indicate major solutions for the above problems

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Thank you very Much!!

