St. Mary's University Schools of Graduate Studies

Measuring the Performance of Multimodal Transport System in Ethiopia: The Case of Ethiopian Shipping and Logistics Services Enterprise

By: Wubishet Asaye Wondem

ID No: SGS/0093/2008B

June, 2018

Addis Ababa, Ethiopia

Measuring the Performance of Multimodal Transport System in Ethiopia

A Thesis Submitted to School of Graduate Studies of St. Mary's University in Partial Fulfillment of the Requirement of Degree of Art Masters of Business Administration in General Management

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Advisor: Temesgen Belayneh (PHD)

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STATEMENT OF DECLARATION

I declared that this thesis of MBA in general management at St. Mary's University, which was done independently with the advice and suggestions of my advisor, Temesgen Belayneh (PhD), is my original work and had not been previously submitted for a degree at this or another University and that all reference materials contained therein have been duly acknowledged.

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Signature

Advisor: Temesgen Belayneh (PhD)

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Signature

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ACRONYMS/ABREVATIONS

AIAA	American Institute of Aeronautics and Astronautics
ASEAN	Associations of Southeast Asian Nations
BPBS	Bank of Post Business Section
BPBS	Bangkok Post of Business Service
CDOT	Colorado Department of Transportation
DSGI	Descartes systems Group Inc
E.C	Ethiopian Calendar
ESLSE	Ethiopian Shipping and Logistics Service Enterprise
EUTRP	European Union Transportation Research
FNGP	Federal Negarit Gazeta Proclamation
ICC	International Chamber of Commerce
ICOTERMS	International Commercial Terms
ICT	Information Communication Technology
MPIE	Multimodal Performance in Ethiopia
MTO	Multimodal Transport Operator
MTS	Multimodal Transport Service
MTSB	Multimodal Transport Service Business
OPMTS	Overall Performance of Multimodal Transport System
PTI	Professional Testing Inc
RHUD	Random House Unabridged Dictionary
TEU	Twenty foot Equivalent Unit

U.S NCHRP	United States National Cooperative Highway Research Program
U.S TRB	United States Transportation Research Board
UNCOIMTOG	United Nations Convention on International Multimodal Transport of Goods
UNCTAD	United Nations Conference and Development
UNMOFW	United Nations Manual on Freight Forwarding
US.FDOT	United States Department of Transport
VMFP	Virginia Multimodal Freight Plan
VTPI	Victoria Transport Policy Institute
WCO	World Customs Organization
WBGR	World Bank Global Ranking
WSDOT	Washington Department of Transport
WER	World Economic Review

Abstract

As trade and transport networks were taking shape through series of developments, together with the growth of containerized transport and improvement of cargo transfer system between different modes, modern transport practices such as Multimodal Transport has significantly affect current transport systems by providing reliable, shortening dwelling time and cost effective. ESLSE has to enhance the performance of multimodal transport system most importantly knowing what factors have significant influence on the overall performance of multimodal transport system. Hence the objective of this research was to measure the performance of multimodal transport system and ranking factors based on their level of importance. In order to achieve this objective, the researcher has used quantitative research methods which always used to gather numerical data. To collect data from respondent and other sources, this study used primary and secondary sources of data. In order to analyze and present the collected data, descriptive and econometric models were used to make fair presentation of results. The study used linear regression model to see the effect of independent variables, which were the factors under study, on dependent variable overall performance of multimodal transport system using SPSS software. The findings from hypothesis testing showed that mobility, reliability, infrastructure and cost have positive and statistically significant relationship with the overall performance of multimodal transport system. However, safety and security has positive but statistically insignificant relationship with the overall performance of multimodal transport system. In addition to this, the findings from regression analysis coefficients of β (beta) showed that reliability was the most determinant factor followed by cost, infrastructure, mobility and safety and security system on the overall performance of multimodal transport system. Therefore, the researcher has recommended that ESLSE should give due emphasis to those driving factors to appropriately address performance issues.

Key Words: *Dwelling time, reliability, infrastructure, mobility, safety and security, cost*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Transportation has long been recognized as essential to economic development. Efficient and reliable movement of people and goods improves productivity and can spur economic growth. Transportation investments are the key to boosting a region's attractiveness to business and residents VTPI (2008). Transportation has been essential to span across the oceans of the world, across rivers, roads highways, airplane, and every other means to get the goods from one location to another. World class companies build smart transpiration system. They are able to predict demand and optimize transportation capacity. The trading nations of the world could not have developed to the extent they have without sufficient and efficient means of transport (ASEAN, 2014). The growth of business, commerce and industry is very much connected with the development of transportation Buta and Abegaz (2016). Overall, the appropriate use of transportation is an integral part of the supply chains effectiveness.

The continuous economic globalization, the growing demand speed-to-market, product delivery, and need to manage global supply chains more effectively, has led to the sustained increase in demand towards multimodal transportation systems Pérez (2013). This had changed the way goods are moved from one country to the other due to advance in technology, customer expectation etc. As trade and transport networks are taking shape through serious of development, together with growth of containerized transport and improvement of cargo transfer system between different modes (Multimodal transport is essentially an internationally increasing through-transport combination with various modes of transport such as ships, rail, airplane etc..., primarily through the use of containers). Containers will insure the transport of unitized cargo from its origin to its final destination, with efficiency and least possible risk UNCTAD (2017). With containerization and globalization, today’s discerning clients require no less than international door to door transport even on shelf to shelve concepts under a single liability system, leading to better command, control and coordinated transport system, with lower delivered costs Thomas (2016).

International multimodal transport is defined as the "carriage of goods by at least two different modes of transport on the basis of multimodal transport contract from a place designated for delivery situated in a different country at which the goods are taken in charge by the multimodal transport operator to a designated for delivery situated in different country," UNCTAD (1979). It is a concept aimed at improving trading efficiency and to transform the relationship between trading partners and international carriers from the traditional buyer seller roles to a new partnership in trade and transport. In transport of goods between two specific locations using a multimodal option allows the minimization of travel costs through the selection of the optimal methods of shipment by the freight for-warder Mortimer et al (2014). Multimodal transport is therefore a concept which places the responsibility for transport activities under one operator, who then manages and co-ordinates the total task from the shipper's door to the consignee's door, ensuring the continuous movement of the goods along the best route, by the most efficient and, cost-effective means, to meet the shippers requirements of delivery.

When a multimodal transport service is provided, the multimodal transport operator (MTO) will be liable from the point of origin to the point of destination UNCTAD (1995a). He will issue one transport document that will include invoice for freight charges, also guarantee for the transit time. From the point onwards, the MTO concludes a number of sub contracts with individual carriers, road rail, shipping lines, port authorities, terminal operators, stevedores, etc..., on the MTO'S own name, not that of shipper or the consignee. Only the MTO is entitled to take delivery of the goods from each actual sub carrier and pass them to the next sub carrier. The MTO, is acting as a principal, is responsible for the whole transport chain UNCTAD (2017).

Measuring transportation systems performance, especially the operation of the system, has become an important issues or concerns of those making investment decisions Meyer (2004). A good performance measures system is critical to identify transportation related disruptions which are caused by a diverse array of issues such as congestion at sea ports, dry ports, and multimodal facilities, etc. As it would be expected, performance measures and concepts vary according to the freight transport market sector. As suggested by many theoretical and empirical studies, there is no uniformity in measuring the performance of multimodal transport system. Freight performance measures are different in different countries of the world. There can also be

variations within the given mode, according to the magnitude and scale of operation Cottrell (2008). The success of an intermodal transportation system design and the required performance should be identified at the very beginning of system design. Therefore, many national, local, and academic studies have been putting tremendous effort on intermodal transportation performance measures in recent years. Based on the concepts forwarded by different writers and global best practitioners checking the performance of multimodal transport system by setting measurement standards will bring insights weather the system is performing well or not to set corrective measures to improve the system.

Ethiopia being one of the developing countries needs to be integrated with global economy and that can only possible through efficient and effective flows of goods to and from the country in international trade. To this end, the country needs an efficient and effective intermodal freight transport system for international trade Amentae (2015). The country has understood multiple benefits of multimodal transport system from global experience and many countries have implemented this system to minimize transit time and cost which was resulted in economic growth. Ethiopia has adopted multimodal transport system with proclamation No. No548/2007 and implemented in the year 2008 E.C under the responsibility of Ethiopian Shipping and Logistics Service Enterprise FNGP (2007). The major driving force the establishments of multimodal transportation system in Ethiopia were the problems of freight transit cost, freight delays, safety of freight leaving port lessens of the country aside.

1.2 Background of the Organization

ESLSE is the result of the amalgamation of four national companies from Ethiopia. These companies are: Ethiopian Shipping Lines (ESL), founded in 1964, Ethiopian Maritime and Transit Services Enterprise (EMTS), founded in1968, and Dry Port Services Enterprise (DPSE), founded in 2007 and Comet Transport. This newly amalgamated enterprise came into being following the issuance of Regulation by the Council of Ministers (Regulation No. 255/2011) dated 21st November 2011, and is vested with the huge responsibility of rendering sea-transport & logistics services to the country's importers, exporters, and investors in a more effective and efficient way, by reducing transit time, cost and handoffs. It is known as a multimodal transport

operator. Besides, a truck operating company named Comet Transport SC has recently been transferred to ESLSE following a government decree issued in the mid of 2014 MTBS (2013). ESL has its headquarters located in the heart of Addis Ababa, Ethiopia, with main branches at Djibouti, Modjo, and Kality (the former Comet) and other branches in Mekelle, DireDawa, Kombolcha, Semera and Gelan towns. It also has a Maritime Training Institute at a place called Babogaya in Bishoftu formerly (Debrezeit) town ESLSE manual (2015).

Today ESLSE is a vessel owner, charterer, liner operator and multi modal services provider. The company offers both shipping as well as in land transportation, dry port container depots, warehousing, forwarding and clearance activities for both import and export cargoes MTBS (2013). As set-out in the regulation, the objectives of the Enterprise are rendering coastal and international marine and inland water transport services, rendering freight forwarding agency, multimodal transport, shipping agency and air agency services, providing the services of stevedoring, shore-handling, dry port, warehousing and other logistics services for import and export goods, providing container terminal services, engage in the development, management and operation of ports, establishing and run human resources development and training center in the field of maritime profession, studying the country's import and export trade demand and there by develop technological capacity in order, rendering efficient maritime and transit transport services, engage in other related activities conducive to the achievement of its objective MTBS (2013).

The main modes of transport are sea and inland transport, but in couple of year's railway be a second option. ESLSE has a multitude of vessels, heavy duty trucks, sea and dry port facilities etc. that enables to render efficient sea and inland transport services. To facilitate the sea freight transport operation and the enterprise has 13 dry cargo and 2 fuel tanker vessels. Fuel tanker vessels have loading capacity of 400,000 ton and 84,000 ton respectively. The operation under inland transport is supported by 459 container carrier trucks, 3 RORO carrier trucks, 14 rig stackers, 45 forklifts, 3 cranes, 19 chassis, 3 empty container lifting forklifts, 2910 empty containers and 10 tractors MPIE (2015).

In order to implement and integrate the flow of multimodal transport system the enterprise (MTO) is organized in four sectors such as shipping sector, freight forwarding, port and terminal

service sector and corporate service sector. The three sectors except corporate service sector are organized to perform the main activities of multimodal transport system. Thus, the integration and the interdependency between the three sectors and the overall flow of multimodal transport system are presented in the following diagram 1.1.

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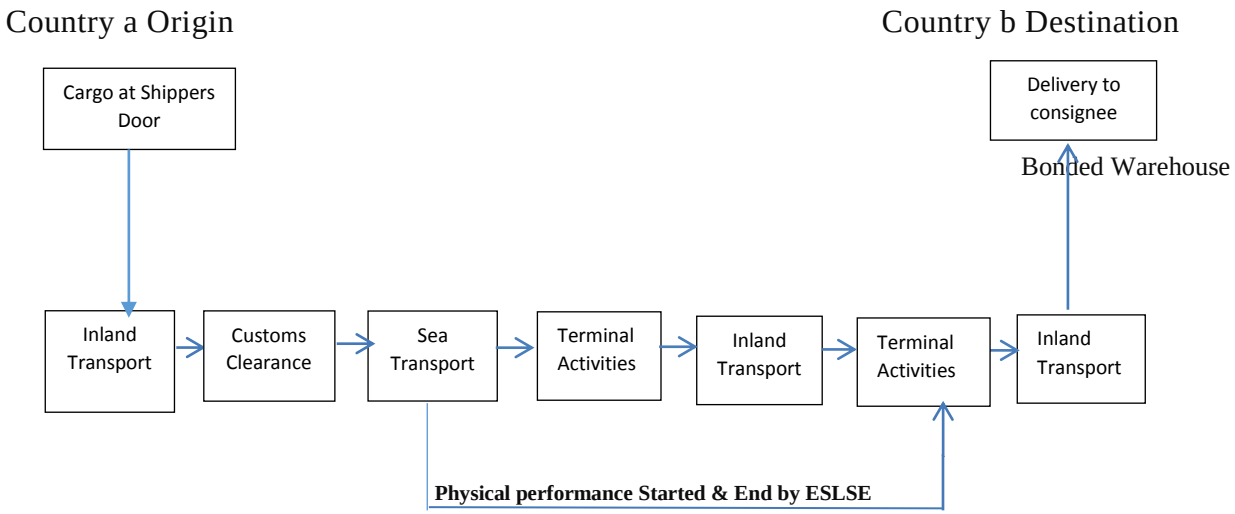


Source: International Journal of Economics (2015) and modified by the researcher

Figure 1.1 Process of Multimodal Transport in Ethiopia

As stated in the above diagram 1.1, ESLSE multimodal transport services are categorized in to two phases. The first phase is the service performed starting from port of origin and ends at dry ports. The second phase of the service starts from port of origin and ends up at customer's warehouse. Customers who are using this type of service are required to engage in manufacturing activity which significantly impacts the economy of the country.

The other part of the service shown on the diagram is unimodal transport service. According to ESLSE case unimodal transport service is performed starting from port of origin and ends at port Djibouti. This implies, at port Djibouti, customers are required to pick their cargo by using their own trucks (own transport) with their full risk for problems arising due to cargo damage, loss and any other. This type of service is not highly encouraged by the enterprise. To give a

clear picture over the service of multimodal transport system, the major services provided by ESLSE under multimodal transport service are presented in the following manner.

Sea Transport Services: The main focus of the Shipping Sector of ESL is to provide Coastal and International Marine Transport services to and from Djibouti Port, through the Ports of: Gulf and Indian sub-Continent, China, Korea, Japan, Singapore, South Africa, and Indonesia. The Shipping Sector provides uninterrupted sea transport service in and around the above ports with own ships as well as via slot chartering of major global carriers ESLSE Manual (2015).

Agency Services : ESL's Shipping Sector branch office, at city and port of Djibouti makes prompt notification to port authorities, whenever its own ships as well as other principal ships call to port and process all due formalities. It makes all the necessary provisions available for the ships and their crew. It prepares timely notifications for importers, and facilitates seamless flow and recollection of containers at Djibouti port. It also provides booking and canvassing services for huge amount of Ethiopian export goods destined to various parts of the world ESLSE Manual (2015).

Stevedoring: ESL is one of the major stevedores in the port of Djibouti that provide efficient loading and discharging service of import and export cargoes, by making use of modern port equipment. In this case, ESL discharges various types of import cargoes from ships. It also renders stuffing service, thus facilitating the loading of cargoes for shipment. It also avails needed containers timely and expedites the recollection of empty containers to carriers ESLSE Manual (2015).

Shore Handling: This service includes safe storage of discharged cargoes from vessels in Djibouti Port until they have been transported to their destination in the country. ESL's Djibouti Branch offers coordinated and efficient shore handling services with its CLT (Container Lifting Trucks), trucks, truck trailers, tractors and forklifts of various capacities. Cargoes under ESL's custody are handled with care and with maximum discharging and dispatching rates. In case of bulk cargoes and other containerized goods, a quick direct delivery service is provided with minimum transit time. In this manner a number of gangs are operated in all the three shifts throughout the day ESLSE Manual (2015).

Multimodal Transport Service: Essentially, this is a door-to-door cargo service with SAD (single administrative document) from the point of origin to the point of destination. In ESL's case, the cargoes are shipped all the way from the port of their origin via Djibouti port and finally to Modjo Dry Port as well as other inland ports. Therefore, ESL as official Multimodal Operator /MTO/, takes all possible care to the cargo under its custody, as of the time the shipment is confirmed and ordered ESLSE Manual (2015).

Unimodal transport service by contrast involves one mode of transportation, i.e., sea, rail or road, or air freight of cargo. Here services are disintegrated, with many operators and agreements involved. In ESL's case, the unimodal service ends at port of Djibouti, after which the consignee will choose his/her freight forwarder and/or transporter and enter agreement with to receive cargo in the hinterland of the country ESLSE Manual (2015).

Customs and Port Clearing: Introducing time saving and reliable documentation process, ESLSE accomplishes, with utmost care, port and customs formalities and enables imported/exported cargoes to arrive at appropriate destination ESLSE Manual (2015).

Trucking: ESL is equipped with modern heavy trucks with the objective of speeding up transportation of freight from Djibouti to inland ports or other designated destinations and vice versa. In this regard, ESL originally had 60 heavy duty trucks with a total lifting capacity of 2400 tons of dry cargo at a time. Its recently transferred company, Comet Transport SC, runs around 205 heavy duty trucks of its own. With Comet now merging with ESL, the Enterprise's (ESL's) present fleet size has risen to 265. Besides, last June, ESL and Comet jointly entered into Agreement Contract with Renault Trucks for the supply of 215 brand new heavy duty trucks by early 2015. This will soon raise the land fleet capacity of ESL to 480 trucks. Apart from its own trucks, ESL sub-contracts all the necessary trucks for direct or consolidated cargo delivery from private and public transport operators ESLSE Manual (2015).

Port and Terminal Service: It is essential that all imported goods have to timely serve the purpose they are intended for. They should reach the ultimate user at the right time. However, just before the import cargoes are supplied to the desired clients, they should be safely kept and processed in the dry ports. The Port & Terminal Sector of the Enterprise is a point of destination

to Ethiopia's imports and a point of consolidation for exports, where goods are loaded and unloaded; customs formalities are completed; goods are temporarily stored, stuffed and un-stuffed, made ready for transport, and dispatched to their final destinations. Thus, the Enterprise endeavors to make these services more efficient and convenient to importers and exporters and play a crucial role in the logistics value chain ESLSE Manual (2015).

The overall import and export activity is conducted with four trade roots around the globe organized as Golf and Middle East, India and Far East, Europe, Africa and China. These trade roots have around thirty nine agents who facilitate the operation of unimodal and multimodal transport operation MPIE (2015). They are listed in the following table 1.1

Table 1.1 ESLSE Trade Roots

No.	**Continent**	**Countries**	**Ports**	**Agents**
1	North sub-continent	13	18	13
2	Far east	7	12	5
3	Africa	8	12	7
4	Gulf	5	7	9
5	India	3	10	3
6	China	1	11	2
Total		37	70	39

Source: ESLSE Company profile March, 2015.

1.3 Statement of the Problem

Our country, Ethiopia, import trade shows increasing from year to year. In order to fit with this trend multimodal transport system should be reliable, dependable, efficient, safe and cost effective starting from port of origin to the end of port of destination. The government has introduced the multimodal transport system, creating the possibilities for onward transportation under one single way bill to reduce transit time, transport cost and to provide single window

service. Contrary to this fact, Ethiopia's trade competitiveness features with many issues including long transit time, higher logistics cost, lower port lifting capacity, higher port dwell time, and fragmented service delivery, among others compared with various economies and income groups. In general, the Ethiopia's freight logistics does not cope-up with either the nation's present economic development or falls far short of the global best practices WBGR (2016).

International logistics performance index (LPI) global ranking created to help countries to identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI 2016 report shows Ethiopia ranked as 126 out of 160 countries WBGR (2016). The rank is evaluated against other landlocked countries like Uganda and Rwanda. As shown by the performance of both Uganda and Rwanda, in the history of the connecting to compete reports, landlocked countries are no longer automatically disadvantaged, which benefit from regionally coordinated efforts to improve trade corridors. In addition to this, our country Ethiopia, score in world economic forum (WEF) index of global competitiveness in four indicators such as functional institutions scored 96 out of 144 countries, infrastructure scored 125 out of 144, technological readiness scored 133 out of 144, and macroeconomic scored 95 out of 144 countries. Furthermore, index of global competitiveness for Ethiopia; imply that the logistics performance is low under different indicators compared with other economies MTSB (2013).

Ethiopia aimed at addressing their special development needs and challenges imply that there are ongoing efforts such as infrastructure developments; regional integration and cooperation in order to reduce transit time and cost, and streamline transit processes, but the achievements are no longer achieved as expected to come up with the increasing demand of effective and efficient transportation.

This tells paramount emphasis has to be expected and placed on MTO program to be solution for the effectiveness of multimodal transport system for imported goods in Ethiopia. In general, the country has to work more to improve the overall logistics performance. Thus, the study was measured the overall performance of multimodal transport system, identified the critical

problems that hider not to achieve higher performance with their effects at each stage of intermodal crossings and suggested solutions for the major problems.

1.4 Basic Research Questions

To get answer for each and every aspect of measuring the overall performance of multimodal transport system, the study forwarded the following questions.

- What would be the current state of the practice of multimodal transport system?
- What would be the overall performance of multimodal transport system?
- What would be the rank of predictor variables according to their degree of influence on the overall performance of multimodal transport system?
- Which of explanatory measurement variables significantly predict the overall performance of multimodal transport system?
- What kind of relationship exists between multimodal transport measurement variables and the overall performance of multimodal transport system?
- Does multimodal transport cargos at port Djibouti and Dry port are picked as promised?
- What are the recommended solutions used to improve the overall performance of multimodal transport system?

1.5 Objective of the Study

1.5.1 General Objective of the Study

The general objective of this study is to measure the performance of multimodal transport system for imported goods in Ethiopia under the responsibility of ESLSE.

1.5.2 Specific Objective of the Study

The specific objectives of this study were:

- ✓ To Review the existing state of practice of multimodal transport system
- ✓ To measure the performance of multimodal transport system
- ✓ To rank the factors according to their degree of influence on the overall performance of multimodal transport system
- ✓ To identify explanatory measurement variables significantly predict the overall performance of multimodal transport system
- ✓ To determine the degree of relationship between explained and explanatory variables
- ✓ To determine the difference between the promised and the actual performance of average transit time at Djibouti and dry port
- ✓ To predict the overall performance of multimodal transport system
- ✓ To suggest solutions for problems of the research findings

1.6 Scope of the Study

Time and place convenience makes the study confined at ESLSE head office found in the capital city of Ethiopia, Addis Ababa. The current scenario in multimodal business practice requires all customers cannot not get the end result of a full packaged multimodal transport service without arriving at head office. Due to this, the researcher chooses head office as the geographical area of the study.

Conceptually, the scope of the study was limited to measuring the performance of multimodal transport system using measurement variables such as mobility, reliability, safety and security, infrastructure and cost. The performance of multimodal transport is measured differently in different countries. As stated in many literatures, there is no uniformity in using freight performance measurement variables to measure the performance of multimodal transport system

for various modes. Thus, the researcher was used the stated input measurement variables based on the various ideas, concepts, freight mode, the availability of data and the interest of various stakeholders.

This study was delimited to using quantitative research methods to measure the overall performance of multimodal transport system. In many national economies multimodal transport system business performance is measured consuming large amount of quantitative data collected through secondary and primary data collection methods. To collect primary data, open ended and closed ended questions were used. Due to non-uniformity in the unit of measurement between modes at different time and lack of time serious data makes to use both secondary and primary data collection methods.

1.7 Significance of the Study

The study was presented the status of the key performance indicators of freight transportation. This will give a clear picture of the performance of multimodal transport operation for policy makers, different stakeholders, academicians, and company managers those who want to participate directly or indirectly in logistics and supply chain management activities. This have an impact to make informed decisions related with the issue of multimodal transport system. It is also important to reduce the weakness and enrich the strength of the enterprise. Furthermore, the study will provide additional information to the existing literature and indicate areas that need further investigation in areas under studied.

1.8 Limitations of the study

To cover all the performance measurement variables which are frequently used by many countries, there was limitations of getting data from central server. No national institution exists to collect, scrub, and deploy such comprehensive data. At the enterprise level, the enterprise and its affiliates are not networked with modern logistics information systems which resulted in fragmentation of data and information. This was made data and information access sooner difficult. As a result, the researcher was used freight performance measurement indicators

depending on the availability of data and limitations of time, and the capability of respondents answering each question stated on the survey.

As all we know multimodal transport is vast part and parcel of logistics activity. The activity is mainly performed on the import and export activity. Due to limitations of time and budget, the study only investigates the performance of freight transport for imported goods.

1.9 Definition of Terms

- Dwelling Time represents the amount of days (hr.) the cargo staying in the port and terminal from the time it is off loaded from the vessel until it is moved in land obtaining all permit and clearance requirements EMAA (2016).
- Grace Period: The free period at which customers are not obliged to pay demurrage and storage after the cargo discharged at dry port or sea port.
- Bill of Loading: A receipt signed by or on behalf of the carrier and issued to the shipper acknowledging that goods, as described in it, have been shipped in a particular vessel UNCTAD (1971).
- Freight forwarder: "A freight forwarder, or forwarding agent, is a person or company that organizes shipments for individuals or corporations to get goods from the manufacturer or producer to the market, customer or final point of destination" RHUD (1997).
- Shipper: "Someone who sends goods for shipment, by packaging labeling, and arranging for transit, or who coordinate the transport of goods" DSGI (2018).
- Tracking: "A carrier's system of recording movement intervals of shipments from origin to destination." DSGI (2018).
- Twenty Equivalent Units (TEU) or 20': "A measure of shipping container's capacity using a standard 20-foot international ocean shipping container as a measuring unit." DSGI (2018).
- Berth a specified length of quay wall a vessel can tie up.
- Vessel: includes a ship or boat or a description of a vessel or boat or any artificial contrivance used or capable of being used as a means of transportation on water (www.ppa.com).
- Anchorage: A place with sufficient depth of water where anchor within the harbor (www.ppa.com)

1.10 Organization of the Study

The study was organized in five parts. Part one presents the introduction and gives back ground information about the nature of the research; the second part, the review of related literature was accessed basic concepts, measurement variables, and other related concepts critically essential to the study. The third part was presented the research methodology, approach and designs. Under this section, research approaches, methods of data collection, sampling designs and techniques, and methods of data analysis and presentation were assessed. The fourth part was analyzed the data collected through survey questionnaire and second hand information using various statistical measurement tools depending on the characteristics of variables used on the study. The final section provided conclusions and the actions required solving the problems arising from the finding of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Basic Concepts in Multimodal Transport System

Multimodal transport system developed in 1980 by United Nations conference on trade and development UNCTAD (1980). The most authoritative definition of the term "international multimodal transport" is provided in article 1 (1) of the United Nations Convention on International Multimodal Transport of Goods 1980 (hereinafter referred to as the MT Convention) which reads as "'International multimodal transport' means the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country at which the goods are taken in charge by the multimodal transport operator to a place designated for delivery situated in a different country..." UNCTAD (2001).

This definition should be read in conjunction with the definition of the term "multimodal transport operator" (MTO) provided in article 1 (2) of the MT Convention, which provides: "'Multimodal transport operator' means any person who on his own behalf or through another person acting on his behalf concludes a multimodal transport contract and who acts as a principal, not as an agent or on behalf of the consignor or of the carriers participating in the multimodal transport operations, and who assumes responsibility for the performance of the contract" UNCTAD (2001). MTO have features such as, the carriage of goods by two or more modes of transport, under one contract, one document and one responsible party (MTO) for the entire carriage, who might subcontract the performance of some, or all modes, of the carriage too their carriers UNCTAD (2001). A key issue in the context of establishing the liability of MTO for loss of, or damage to, goods has been the choice between the "uniform" or "network" system of liability. Under the "uniform" system the same liability regime is applied to the entire multimodal transport, irrespective of the stage at which the loss or damage occurred UNCTAD (1980).

The freight transport industry is more complex and intermodal, such as more than one mode may be used to transport a good during its origin- destination journey ASEAN (2014). According to

Manheim (1979) the field of transportation system analysis has characteristics such as covering all modes of transport, covers all sectors, it is multi problem, and multidisciplinary. The advantage of multimodal transport lies in the most efficient combination of multiple means of transport, wiliest optimizing deadlines, cutting back on inventory costs, keeping costs of merchandize under control.

2.2 Types of Cargos

According to the report of Port of Aantwerp (2017), cargos are categorized in to container cargo, liquid bulk, dry bulk, break bulk, and ro-ro. Depending on the nature of cargo type they have, they are described in the following manner.

2.2.1 Container Cargo

Container is a large standard size metal box in to which cargo is packed for shipment a broad specially configured transport modes Rodrigue and Slack (1998). Containers are loading and transporting goods with different methods (land, sea, air…). Having a logical operator in charge of selecting the most appropriate one is essential for our goods to reach their destination in perfect conditions Bilogistik (2016). Toys, televisions, DVDs, clothing, meat and computers; containers are the best way to transport these and many similar products. Container shipping is different from conventional shipping because it uses containers of various standards sizes -20 feet (6.09gm), 40 (12.18m), 45 feet (13.70m), 48 feet (14.60m), and 53 feet (16.15m) to load, transport, and unload goods. As a result, containers can be moved seamlessly between ships, trucks and trains. The two most important, and most commonly used sizes today, are the 20 feet and 40 feet. In addition to this based on their type containers are divided as flat rack, open side, open top and tank Prabhankar (2016). The fixed size of the containers also has a major advantage. The standard sizes mean containers fit on sea-going vessels, Lorries, inland barges and train wagons.

2.2.2 Liquid Bulk

Crude oil, petrol, fuel oil, vegetable oils and even wine; all liquid products which are often transported on big tankers or through a pipeline to the next destination Port of Aantwerp (2017).

Liquid forms of bulk are measured by weight or volume (primarily tones). Commodities like crude oil, gasoline and miscellaneous chemicals are common liquid bulk cargos.

2.2.3 Dry Bulk

Dry bulk refers to grain, coal, iron ore, cement, sugar, salt and sand. They are not packaged separately, but transported in large quantities in the hold of a ship, wagon or lorry.

2.2.4 Break-Bulk

Break bulk is a term used in the shipping industry. It refers to cargo that needs to be individually loaded. Break bulk cargo cannot be shipped in inter- modal containers or in bulk, like grains or oil. It has been the most common type of cargo since the beginning of the service. In modern times, container shipping has become more popular and break bulk has declined. A bulk of cargo is broken down in to groups that can be easily loaded using equipment available at the port. Break bulk cargo is often shipped on pallets, barrels, drums, boxes or bags (ESLSE Statistical Bulletin, 2010).

2.2.5 Ro-Ro

Ro-ro refers to 'roll on / roll off'. This name explains how the cargo is discharged and loaded. This concerns cargo that can be driven which is only done by especially trained drivers. Ro-ro is used for cars, busses, trucks, agricultural vehicles and cranes. To transport as many of these vehicles in one go, enormous ro-ro vessels have been built. Some ro-ro vessels have enough room for more than 8,500 cars! In the Antwerp port area, ro-ro is chiefly on the Left bank.

2.3 Multimodalism & Containerization of Cargo

The history of containerization is a development that can be pinpointed to the mid of 20th century pioneered by U.S based conveyance business man Malcolm Mclean, cargo containers were fashioned in a bid to simplify the long dream processes involved in shipping of cargo through sea routes Tomlinson (2009). Mulimodalism developed with container revolution of 1960 and 1970. It is the most vital factor of multimodal transportation as if combines the consistency of rail, flexibility of road, the cost effectiveness of shipping and speed of air transport.

Simply stated, carrying cargo in a container is "containerization". It refers to the increasing and generalized use of the container as a support for freight transportation. The process is an improvement on the concept of unitization and pillarization of cargo for the purpose of making handling easier and reducing costs in transport. The development of intermodal transportation and containerization are mutually inclusive, self-strengthening relay of a set of driving forces linked with technology, infrastructure and management Rodrigue and Slack (1998). The concept whereby cargo is carried in boxes of standard dimension allows these containers to be handled mechanically, transferred from one mode of transport to another efficiently and without disturbing the actual cargo inside; owing to high unit volume weight handled per move, the productivity of handling equipment and throughputs is many times greater if the same volume of cargo were handled in break-bulk fashion UNCTAD (1981).

2.4 Components of Multimodal Transport System

Multimodalism refers to transportation of goods between two points by more than one mode of transport. This could be road-rail, road-rail-sea, road-air or any other combination Prabhankar (2016). See Figure 2.1.

Figure 2.1: Components of Multimodal Transport System

Origin/Supplier ⟶ Destination/Customer

Physical Base	Depot	Road/Rail	Terminal	Sea Truck/Leg	Terminal	Road/Rail	Depot

Commercial System	Cost& Delivery	Pack	Inland Movement	Papers	Port to Port	Papers	Inland Movement	Unpack	Cost& Delivery

Management and coordination	Packing	Container Positioning	Inland Movement	Terminal Operations	Ships towage Route Scheduling

Flow of information Net work	Booking	Waybill	Invoice	Manifest	Delivery Instructions	Release of Cargo

Liability	Forwarder	Road	Rail	Terminals	sea	Forwarder

Source: Adapted from D'Este (1996)

2.5 The Relevance of Multimodal Transport and Logistics Services for Development

International freight costs have an impact on trade equivalent to customs tariffs or the exchange rate. A reduction in the cost of transport directly stimulates exports and imports, just as an increase in the exchange rate make exports more competitive, and a reduction in national customs tariffs lowers the cost of imports UN (2002).

Spending on transport is also increasing because of improved quality of service, especially greater dependability and "just in time" (JIT) delivery. As a result, the inventory component within the overall cost of logistics declines, while the transport component raises Prologus (2003). If the shipping of imports becomes more expensive, higher inflation ensures as a result of the increased cost of imported goods. If export freight costs increase, the result is drop in earnings for the exporting country or simply the loss of a market, depending on the elasticity of demand and the availability of substitutes. Econometric estimates suggest that the doubling of an individual country's transport costs lead to a drop in its trade of 80 percent or even more Limao.et al (2001).

Trade is increasingly taking place in intermediate goods, which are used in international production processes and which require JIT deliveries of inputs. JIT in turn requires a particularly sophisticated and efficient transport system, which tends not to be available in developing countries. In a context where management does not know whether delivery of required raw materials or intermediate goods is going to be on time, either expenditure on inventory holding goes up or the producer becomes uncompetitive himself, because he will not be able to deliver JIT to his own customers. Trade, logistics services and development are thus evermore closely linked with one another Alcorta (1995).

2.6 Multimodal Transport Requirements

The use of multimodal transport implies overall structural changes covering new trade and transport practices various measures are needed to implement multimodal transport, from the streamlining of commercial regulations to the development of transport infrastructure. The

upgrade of three main elements is necessarily for an efficient multimodal transport system. This is commercial practices, administration requirements, and transport infrastructures.

2.6.1 Commercial Practices

2.6.1.1 Merchants

There are international conventions in force governing contracts for the international sale of goods, so disputes and misunderstandings have often arisen between buyers and sellers, mainly because of different interpretations about the terms used in the contracts. In order to avoid such situations which hinder the smooth flow of international trade, the ICC has intrude standardized trade terms Alcorta, (1995) known as INCOTERMS (International rules for the interpretation of trade terms*).* In Practice, The ICC Rules were accepted as the appropriate standard for the Model Combined Transport Bills of Lading designed by such industry associations as the Baltic and International Maritime Council (BIMCO) and the International Federation of Freight Forwarders (FIATA) (INCOTERMS). These terms deal delivery conditions between the buyer and the seller, and their main purpose is to divide the costs and risks of transport movement and related operations between the two parties ASEAN (2014).

2.6.1.2 Banking Practices and Documentation System

In the transport of goods in break bulk from, the critical point at which the carrier accepted responsibility for the goods often passed from the seller to the buyer was the ship's rail. In the financing of such sales, (ICC Publication No.460) documentary credits, the seller then provides the bill of lading to the bank in exchange for payments. The seller's bank exchanges the bill of lading for payment from buyer. The buyer then provides the bill of lading to the carrier and takes delivery of goods UNMOFW (1992).

2.6.2 Administrative Requirements

2.6.2.1 Trade Facilitation

One of the main problems that occur in international trade is that each country has its own rules and procedures concerning the import and export of goods, and also that the cargo velocity today has outpaced the document velocity, in other words, the goods in many cases and on

certain routes may arrive before the transport documents. This is one of the reason for the success of courier services but courier services are however not the ideal solution to the problem of getting the various documents to their destination fast enough BPBS (1999). For this reason, FALPRO (United Nation Trade Facilitation Program) is standardizing and simplifying documentation and trade procedures through regional or national facilitation organizations. According to FALPRO, trade facilitation is done through the streamlining of the information flow mainly through simplification, normalization, and harmonization.

2.6.2.2 Customs Practice

To implement multimodal transport, customs are required to facilitate the container flows, through minimization of import or export documents and to permit the movement of cargo to and from ports under bond or in a sealed container. Customs procedures can be eased through the adherence to various customs conventions UNCTAD (2017).

2.6.3 Infrastructure

Transport infrastructure is one the most important part of economic infrastructure Boruch (2009). Transport infrastructure and services, including shipping, ports, roads and railways are essential for global merchandise trade, and related supply chains. Where transport infrastructure is poor, the development of multimodal transport may not be easy. In order to be able to be gain maximum benefit from multimodal transport, infrastructure that is capable of handling containers must be in place UNCTAD (1990).

Today, it is generally accepted that containerization is necessary condition for an increasing proposition of trade in merchandise and intermodal goods, also in developing countries. Especially in multimodal transport, the transport chain usually containerized. Containerized cargo requires less but better qualified personnel in ports, where reforms are still pending in many developing countries. It further requires ports, 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 of the main obstacle to transport providers offering multimodal transport UNCTAD (2003).

Therefore, the logistics infrastructure is a set of various facilities, equipment and means and technical devices which facilitates the completion of logistics processes in the logistics micro and macro systems. The logistics infrastructure within such meaning of the concept comprises, warehousing infrastructure, handling infrastructure, transport infrastructure, transport packaging, and IT infrastructure Skorobogatova and Merlino (2016).

2.7 Selection Criteria for Performance Measures

The U.S NCHRP proposed that, selection criteria are instructive us to agencies concerns and the intended use of the performance measures. Agencies that used selection criteria usually are concerned with the actual operationalization of performance measures, and with the many different dimensions of performance measures.

Of course, selection criteria may vary from one agency to the next, depending upon need, resources, and capabilities. One common area of difference is in the degree to which agencies are willing or able to support new data collection procedures in order to implement new performance measures. When selecting performance measures, one has to evaluate measures based on the criteria's such as measurability, forecasting ability, multimodality, clarity, usefulness, temporal issues, geographic scale, multiple indicators of goals, control, relevance, and ability to diagnose problems.

2.8 Operational Performance of Multimodal Transport in Ethiopia

Table 2.1 Annual Operational Performance of ESLSE

Service type		Years			
	measurement	2014	2015	2016	2017
Imported goods by ESLSE	Ton	2,767,053	3,340,135	4,966,265	4,538,722
Imported goods by ESLSE vessels	Ton	1,104,813	998,597	952,628	603,237
Proportion (ESLSE vessels/ total import)	%	39.93	29.9	19.18	13.29
Imported containers by multimodal transport	TEU	88,559	120,404	175,672	179,170
Imported vehicles by multimodal transport	Unit	4,225	10,636	14,736	9,464
containers served at dry port	TEU	84,869	114,369	162,047	169,241
vehicles served at dry port	Unit	4,183	8,275	13,224	8,507

Source: Annual Statistical Bulletin 2010

As indicated in the above table 2.1 imported containers by multimodal transport service was increased from 88,559 containers in the year 2014 to 179,170 containers in the year 2017. The import of vehicles also shows increase from 4,225 units in the year 2014 to 14,736 units in the year 2016 and decreased to 9,464 units in the year 2017. In addition to this, containers served at dry ports were also increased at increasing rate from 84,869 containers to 169,241 containers in the year 2014. This is an indication that the using multimodal transport has increased from year to year. Therefore, the government has to improve its capacity to serve this growth propensity.

2.9 Measurement Variables of Multimodal Transport Operation

Multimodal transport system is measured by using different performance indicators at different countries. There is little uniformity in performance measurement in freight transportation, particularly across the five modes. Some measures by necessary are pertinent to only one or two modes, such "barrel per day" on oil pipeline industry, and carloads originated in the rail road's industry. There is also little agreement on the best or the most critical measure, even among individual providers Cattrell (2008). The key to identifying a performance indicator is that it is measurable, efficient, able to be forecasted, and easy to understand Harrison et al. (2006).

Lack of uniform measures, which can be used for all modes, makes it hard to compare alternatives and make a mode choice decision. There are diverse array of concern in many stakeholders. Public sector stakeholders are interested in policy and intra structural issues, whereas private sector are more interested in cost, reliability, and travel time measures ATRI (2011). Freight performance measure is challenged by both on overwhelming abundance of data and by lack of complete data for many important freight system performance functions. Systematic data regarding multimodal freight performance are practically nonexistent ATRI (2011). Selecting measures that best capture the important aspects of the problem at hand is ideal Harrison et al. (2006). The success of performance measures rely largely on the availability of data needed to derive the measure U.S TRB (2004).

The inclusion of performance measures has been helpful for providing tools that support, guide, and justify decisions made by agency planners who operate in an environment of high

accountability and transparency. These conditions require objective measures that are helpful in communicating to the public and to policy-makers the course of action that will improve the movement of goods and people. Well-developed performance measures can benefit planners by providing the information needed to make decisions. Moreover, performance measures assist an agency in communicating decisions to the public, increasing accountability to use resources where they are needed, and improving the operational condition of transportation systems. The keys to identifying a performance indicator are that it is measurable, efficient, able to be forecast, and easy to understand.

With numerous characteristics, performance measures can be classified as either qualitative or quantitative. Quantitative performance measures can be valued with a number such as average time of a travel, cost per ton-mile, and so on. Qualitative performance measures are those hard to be quantified and are indicative measures for system efficiency. Although some of the performance measures are hard to quantify directly, a generalized model, which quantifies and combines all performance measures, can give a simple guidance for decision-making.

Even if, there are numerous performance measurement variables with their heterogeneous characteristics, the researcher has identified the following variables for research purpose based on the problems identified, the objective seated, the availability of getting data, and easy for operationalization of variables. As a result the measurement variables are forwarded as mobility, reliability, safety and security, infrastructure and cost which are discussed below looking the above different measurement scenarios.

2.9.1 Mobility of Multimodal Transport System

Mobility can be defined as the ability to transport goods, and people efficiently. The average travel time is widely used to measure the efficiency. For example, average origin-destination travel time per trip is introduced by Mingzhou and Haiyuan (2004). Speed (mile/hr.) and travel length (mile/trip) are two main determinants for the total travel time of a specific trip. Speed is heavily dependent on the congestion conditions Mingzhou and Haiyuan (2004). Mobility strategic goal is to ensure a transportation system that is accessible, integrated, fast, efficient, and flexible (Meyer, 2001).

Since the main purpose of transportation is to move goods and people from origins to destinations, mobility is one important indicator on how well a transportation system functions U.S.TRB (2004). Freight mobility is critical to the economic success of any community. Efficient freight movement ensures that stores stocked appropriately, manufacturers get raw materials that they need, and local business receives packages, office supplies, and other goods Williams and Carroll (2015).

Transit times vary substantially based on freight mode and carriage systems, the analysis considered average time spent for various activities in the import and export operation. Transit time takes the time from cargo discharged at sea port up to delivery including customs clearance time at sea port, time taken to get D/O and port clearance, assigning trucks and gate pass & truck waybill EMAA (2016).

Import lead time includes the time required for securing foreign currency, preparation and connectivity from seller's point of origin to the port of loading, to fulfill import procedure at port of loading, sea passage time, and clearance at sea ports, inland transit time and time taken to clear cargo at destination EMAA (2016).

Freight Mobility Index is FTMT/Truck VMT*Average Speed, where truck VMT denotes truck vehicle miles traveled. Mobility index can be used to reduce complexity and volume of performance measures and compare the performance of different facilities among different modes. In some cases, not only the average speed but also the variance of speed can have significant impact on the total traveling time Mingzhou and Haiyuan (2004).

According to Barber and Grobar **(*2001*)** indicators/performance measures for mobility are average waits time for trucks inside the port complex, throughput per acre as a measure of port dwell time, the average amount of time a container spends in the port productivity, The ratio of wheeled to grounded containers(wheeled containers are on a chassis grounded containers need to be place on a chassis, average number of times a container is handled in the port, and lifts per hour of containers by cranes.

In addition to the above mobility intervening variables, Jhung (1993) noted that the primary performance indicators used by ports are the vessels turnaround time, and the tonnage handled

per ship day in ports. The vessels turnaround time is the length of stay from time of arrival to time of departure. A variation of turnaround time, dwell time, which is the number of days that a ton of cargo (as opposed to a vessel) remains in port.

2.9.2 Reliability of Multimodal Transport System

For a transportation system, reliability is usually represented by the delay caused by some unusual events or incident such as accident delay, intersection delay, intermodal terminal delay, or other lost time. Level of congestion is used by CDOT (2000). To denote one aspect of the reliability of transportation systems. Delays are measured by different researchers in quite a different fashion, for example, transferring time between modes, delays per ton-mile, lost time or delay time, and congested high way miles divided by total high way miles CDOT (2000). These sets of performance measures generally have the same theme in terms of the reliability of a transportation system. Travel time reliability was proposed by the WSDOT (2003) to determine the best available tools and methods for collecting travel time data on a real time basis and recommending a methodology to determine travel time reliability. On-time performance and frequency of transit service are commonly considered to be a major indication of transportation efficiency especially for the evaluation of a transit system Mullen and Monsere (2010).

According to Hagler Bailly services Inc., (2000), measures that address travel time and reliability of high way performance as it relates to freight are point-to-point travel times for selected freight-significant highways, hours of delay per 1000 vehicle-miles on freight-significant highways, ratio of peak period travel time to off-peak travel time at freight-significant nodes, ratio of variance to average minutes per trip in peak periods at freight-significant nodes, and hours of incident-based delay on freight-significant highways.

Barber and Grobar (*2001*) suggested indicators for Reliability as average length of time for cargo containers to pass customs, percentage of cases in which a crew arrives on time to service an arriving vessel, and how often chassis equipment is rejected by truckers, delaying container movement.

2.9.3 Safety and Security of Multimodal Transport System

Transit safety is an important to a more accessible and efficient transportation system. Safety and security are of primary concern for any transport system EUTRP (2016).

Different modes have different causes to influence safety, so safety measures are different according to the mode for different modes in the literature Mullen and Monsere (2010). In general, accident rates, fatality rates, and injury rates are directly related to the loss due to accidents. The figures of these rates directly reflect the safety performance of a transportation system. Accident rates at major intermodal terminal s are a subset of the total accident rates, and they should not be a direct reflection of the whole transportation system performance. These measures represent the speed of response for any accident. Since a delay caused by an accident could heavily affect the economic value corresponding with it and, as a result, the customer satisfaction will be harmed by the sluggish service by the system, a transportation system needs to be very responsive. The number of accidents, fatalities, and injuries are some appropriated performance measures to evaluate the safety of a transportation system Mingzhou and Haiyuan (2004).

2.9.4 Transport Infrastructure

Transport infrastructure is one of the most important elements of infrastructure now days. Transport infrastructure facilitates the development of connections between regions within a country and between countries, and consequently, it supports the formation of mutual economic, social, cultural relations. Transport infrastructure improvement to facilitate transfer of vehicles and/ or vehicle components between modes, and development of multimodal network. This has an impact on the efficiency and effectiveness of multimodal transport system by improving mobility, congestion and other conditions. It includes various facilities such as warehouse or storage facilities, port machineries or equipment's, vehicles, roads, IT infrastructure, and any other facilities.

Efficient international logistics is also heavily dependent on internationally harmonized documentary procedures enabling speedy electronic transmission of freight bills, payment orders, insurance contracts and other transaction documentation. M. Cukrov et al (2016) said

that information exchange and documentation efficiency within a port is crucial for multimodal based level standard performance. Accordingly, the author suggested infrastructural performance indicators such as availability of suitable ICT systems for remote real time information exchange (electronic document transfer between all multimodal service stakeholders), communication of cargo documentation well in advance of ship arrival in port, online booking system and cargo trucking information system at each and every terminal or intermodal crossings.

Ports are extremely valuable assets for the national economy and hence any changes need to be considered carefully and cautiously UNCTAD (1998). Port facilities provided at dry ports vary considerably UNCTAD (1981). It includes port machineries and other facilities such as cranes, forklifts, rachis takers and storage or warehousing facilities etc. Therefore, the researcher has designed conceptual framework as transport infrastructures, port facilities, and IT infrastructures based on the ideas derived from different literatures and other related concepts.

2.9.5 Cost of Multimodal Transport System

Business that has a large amount of cargo to transport on a regular basis can make considerable savings by choosing multimodal transport procedure. Multimodal transport policies tend to be more cost effective. The lower costs that result from using multimodal transport remain its biggest selling point. It is the ability to move large quantities of goods for relatively little money that makes the concept of multimodal transport so appealing and worth pursuing (www.multimodal.org.uk).

Many authors are developed different cost structure in different times at different circumstances to measure the performance of multimodal transport system. According to Hagler Bailly services Inc, (*2000*) measures that address the cost are cost of highway freight per ton-mile, cargo insurance rates, fuel consumption of heavy trucks per ton-mile. In addition to this, cost components used to measure the performance of multimodal transport are transaction LC value, sea freight cost, inland transport cost, port handling and storage costs, insurance, container demurrage, and commissions and other related expenses EMAA (2016). From this we can

understand, there is difference in cost model to measure the performance of cost of multimodal transport system.

2.10 Basic Concepts of Unimodal Transport

ASEAN (2014) defined unimodal Transport is a transport system, 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. In sea transport, if the goods is shipped by one carrier who issues own transport document, bill of lading from one port to another port is normal case, however, If there is more than one carrier, for example, the carriage from one port via another port (transshipment at intermediate port) to final destination port, the first carrier who has taken in charge may issue a through bill of lading covering the entire transport with full responsibility and liability for the entire port-to-port transport ASEAN (2014).

2.11 Empirical Study

Researches about multimodal transport system have done by some academician's by different people at different times while they have their own limitations evaluated empirically. Accordingly, the researcher has evaluated the following research titles which were directly related the study under investigated.

2.11.1 Customer Satisfaction on Multimodal Transport System

The study conducted by Belay T. (2016) titled as assessment of customer satisfaction on multimodal transport system: the case of selected private import business. According to this study, customer satisfaction was measured with three measurement dimensions such as multimodal transport service value (MMTS), logistics service value (LSV) and customer service quality (CSRQ). The result showed under the descriptive analysis of multimodal transport indicates that the majority of customers are satisfied with regard to variables such as documentation, arrangement of inland transportation, schedule reliability, customs clearance. Contrary to this, World Bank (2017) report shows that Ethiopian logistics service sector is characterized by long transit time; the business requires obtaining more documents, problems in

ICT infrastructure facilities, non-dependable port and customs clearance process and higher transport cost. Research findings are limited to both time and place. The study should be appropriately surveyed to get the real picture of the study and has to be supported by other evidences collected in collaboration with questionnaires.

2.11.2 Multimodal Freight Transport Performance

In addition to the above study, the study performed by Amentae (2015) "Multimodal Freight Transport Performance by Customers and Employees: Towards International freight Shipping and Logistics Services Enterprise." This study has not explicitly stated the basic research gaps which are basically used as spring board to perform the study. Research gap is identified by conducting preliminary study or by reading secondary sources of data and any other sources. It has to be clearly stated in order to create a reader to understand what the study wants to investigate.

Generally, the above two and other studies conducted over multimodal transport system are mainly performed using descriptive research design. Using this type of research design, cannot show the validity, reliability, the relationship between dependent and independent variables, the strength and predictability of variables. Strong research's has to be done both descriptively and inferentially which are tasted by various statistical tools.

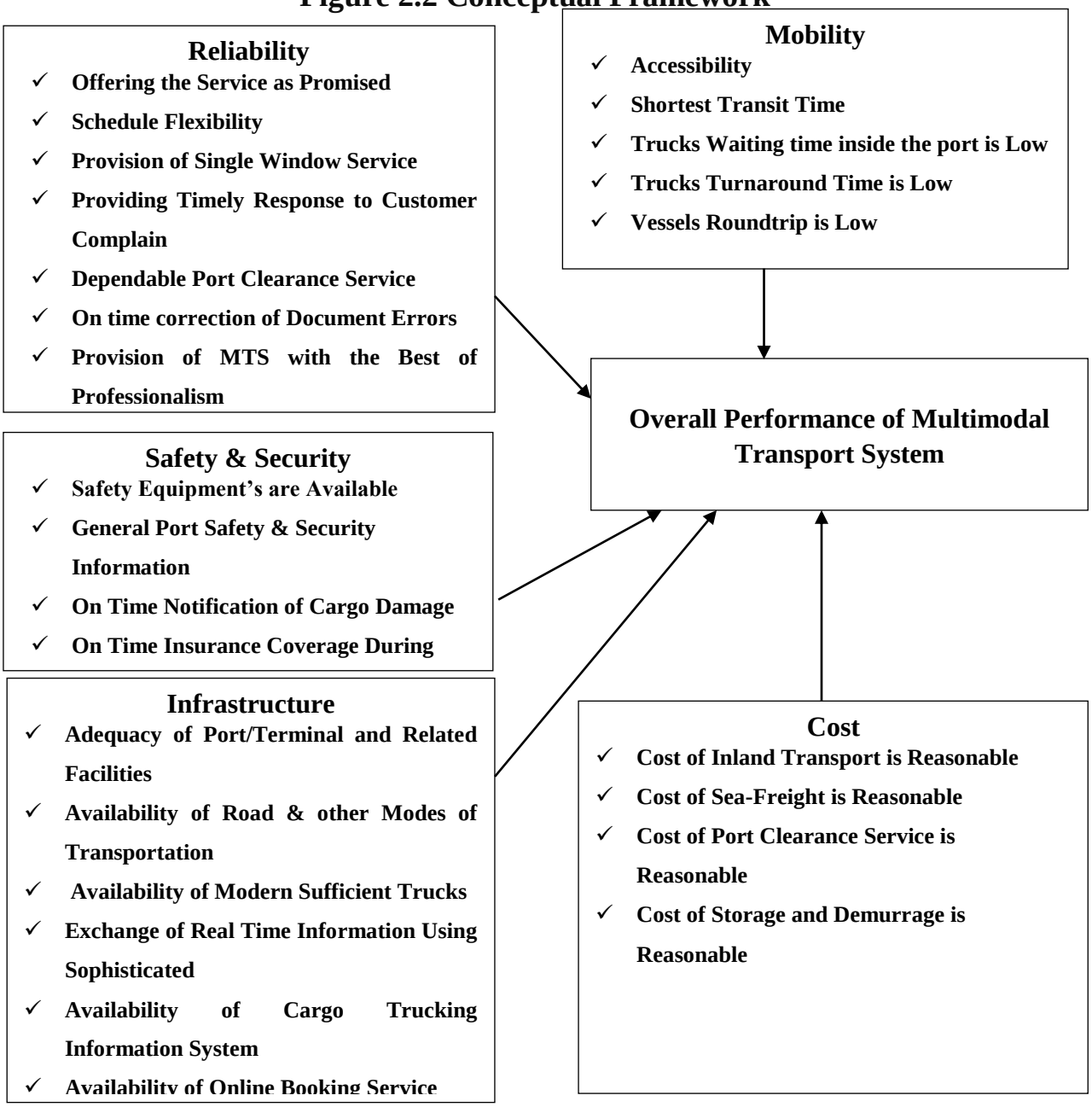
2.12 Conceptual Framework

Most research reports cast the problem statement within the context of a conceptual or theoretical framework Chalmers (1982). Conceptual framework is an analytical tool with several variations and contexts. A description of this framework contributes a research report in at least two ways because it identifies research variables, and clarifies relationship among the variables. It is essential to bring focus within the context and also acts as a link between literatures, methodology and results Miles and HuberMan (1994).

The conceptual framework of this study was designed based on concepts, literatures, research problems, methodologies, research objectives and basic research questions. The framework has dependent, independent and intervening variables which were used to measure the overall

performance of multimodal transport system. The link or the relationship between the explanatory and outcome variables was drawn in the following diagram.

Figure 2.2 Conceptual Framework



Source: Adopted from Williamson et al. (1990) and Modified by the Author

2.13 Hypothesis Testing of the Study Variables

Quite often a research hypothesis is a predictive statement, capable of being tested by scientific methods, that relates independent variables to some dependent variable Kothari (1990). It is usually considered as the principal instrument in research its main function is to suggest experiments and observations Kothari (1990). They are numeric estimates of population values based on data collected from samples Creswell (2009). In quantitative studies, investigators use research questions and hypothesis to shape and specifically focus on the purpose of the study Creswell (2009). The researcher has formulates his hypothesis based on the review of literature. It provides the rationale for the study Sigh (2006). In the context of statistical analysis, we often talk about null hypothesis and alternative hypothesis. The null hypothesis is generally symbolized as Ho and alternative hypothesis as Ha. Alternative hypothesis usually the one which one wishes to prove and null hypothesis is one wish to disprove. Thus, a null hypothesis represents the hypothesis we are trying to reject, and alternative hypothesis represents all other possibilities Kothari (1990). Depending on the review of different related literatures in the previous chapters, the researcher put forwarded the following hypotheses.

- H1: Reliability has a positive correlation and significantly affect the overall performance of multimodal transport
- H2: Safety and security of multimodal transport system are positively related and has significant effect on the overall performance of multimodal transport system
- H3: Infrastructure has a positive relationship and significantly affect the overall performance of multimodal transport system
- H4: Cost is positively associated and significantly affect the overall performance of multimodal transport system
- H5: Mobility has a positive relationship and significant effect on the overall performance of multimodal transport system in Ethiopia
- H5a: Average dwelling time (waiting time) of cargo at Djibouti and dry port is not within the grace period. This hypothesis is an extension or sub hypothesis of mobility which is known as transit time of multimodal transport system.

CHAPTER THREE
RESEARCH METHDOLOGY

3.1 Research Approach

In order to measure the overall performance of multimodal transport system, the research has utilized quantitative research approaches. So as to respond to a serious of questions, survey method in the form of open-ended and close-ended questions were used to insure the collection of reliable data from respondents. The study also uses secondary sources of data collection method to supplement the data collected in the form of primary data.

In logistics and transport research, there are pragmatic reasons for the intensive use of survey-based methods in the form of questionnaires to collect data. First, it allows involvement of various actors which affect the system positively and negatively. Secondly, it allows the researcher to reach upper managerial and executive levels Wagner and Kemmerling, (2010). Finally, ensures anonymity, standardized wording to avoid drawbacks such as interviewer bias De Vaus (2001) and Trochim (2006).

3.2. Research Design

A research design refers to the overall strategy that you choose to integrate the different components of the study in coherent and logical way, thereby; ensuring you will effectively address the research problem: it constitutes the blue print for the collection, measurement, and analysis of data Singh (2009). The study was used explanatory and inferential type of research designs. In order to get information what going on the ground and operationalize each type of data collected different types of statistical analytical tools were used.

3.3 Data Collection Methods and Instruments

In order to collect available data from different sources, primary and secondary data collection methods were used. To collect primary data, the researcher has used self-administered questionnaire approach in an attempt to understand and measure the overall performance multimodal transport system. It includes both open ended and closed ended questions. The

survey questionnaire was distributed to customers of ESLSE, who are directly affected by the service of multimodal transport system. Closed ended questions were measured containing items of 5 point likert scale which represented 1 as strongly disagree, 2 as disagree, 3 as moderate, 4 as agree and 5 as strongly agree. In addition to Primary data collection methods, the study has used secondary sources of data collected from company's records, national and international publications used to get good insights from best practitioners of multimodal transport system.

3.4 Population of the Study

The study was conducted at MTO 'Ethiopian Shipping and Logistics Services Enterprise 'which is situated in the capital city of Ethiopia, Addis Ababa. Due to the constraints of time and budget, it is impossible to collect data from the entire population. The total number of the target population has estimated to be 3,000 in number who are currently using the service of multimodal transport. Due to convince of place and easy to access the whole customers included in the sample, the head office was used to administer the questionnaire.

3.5. Sampling Techniques and Sampling Procedures

To determine the sample size from the number of people included in the survey, simple random sampling method was conducted. Simple random sampling: Is one in which each element of the population has an equal and independent chance of being included in the sample i.e. a sample selected by randomization method is known as simple random sample and the technique is simple random sampling Yamane (1967). In this case the sampling method used to randomize customers in the target population was simple random sampling technique. The customers were considered to be homogenous in their nature and also influenced by the operation of the system. To calculate the sample size Israel (1992) provides a simplified formula. Based on this formula confidence level is 95% and level of precision is 5%. The value of $Z_{\sigma/2}$, $\alpha = 0.05$. From the Z standard table $\mathbf{Z_{0.025}}$ =1.96, taking p and q equal proportion since the customers are homogeneous so that p=0.2 and q=0.8 were applied and the marginal error e was limited to 0.05. Where e^2 is the marginal error, σ^2 is the population variance.

$n_o = \frac{Z^2 \alpha/2\, pq}{e^2}$ **Formula 2 (Israel, 1992)**

Using this formula $n_o \frac{(1.96)^2 0.2x0.8}{0.05^2} = \frac{(1.96)^2 0.2x0.8}{0.05^2} = 246$, since $\frac{n_o}{N} = \frac{246}{3000} = 0.082$

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

Therefore, based on the above analysis the sample size was determined by 228 customers.

3.6 Data Analysis and Presentation

The data collected in the form of survey questionnaire was analyzed quantitatively. To analyze the responses collected from closed ended questions, the researcher has used different formulas and statistical tools such as SPSS depending on the data collected and the purpose of the research. In addition to this, open ended questions were analyzed through the use of percentage.

The data have both descriptive and inferential characteristics. Accordingly, descriptive analysis was done by using measures of central tendency such as average mean score and percentage. In addition to this inferential analysis was done by using statistical tools such as coefficient of correlation, multiple linear regression analysis, sample T-test, and ANOVA (analysis of variance). To summarize and create a clear picture for the reader to understand the result of the study figures, tables, and other tools were used.

3.7 Model Reliability & Validity Assumptions

The model fitting is the first part of the story for regression analysis Penrose et al (1985). Regression analysis is a statistical technique for determining the relationship between a single dependent (criterion) variable and one or more independent (prediction) variables. The analysis yields a predicted value for the criterion resulting from a linear combination of the predictors. According to pedhazur (1985) regression analysis has two uses in scientific literature: prediction, including classification, and explanation.

To make regression analysis and to assess the overall model effectiveness the study was applied different types of model assumption to overcome model tests. The first step is to determine the

criterion variable. Pedhazar (1985) suggests that the criterion have acceptable measurement qualities (i.e. reliability and validity).

3.7.1 Reliability

According to Nunnally (1978) reliability is used to check measurements are reliable to the extent that they are reputable and that random influence which tends to make measurements different from occasion to occasion or circumstance to circumstance is a source of measurement error.

Cronbach's Alpha, is most commonly used to assess the internal consistency of a questionnaire made up of multiple likert type of scales and items Cronbach (1990). Cronbach's alpha ranges from 0.00 to 1.00, a negative alpha means you probably need to reverse some items. Reliability coefficient of 0.70 or higher is considered or acceptable in most social science research situations. cronbach's is often used in assessing the reliability of tests with questions that have more than two possible responses Sapp and Jensen (1997). 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 (2007). According to Willima and Berry (2010) exhibiting a coefficient of alpha between 0.80 and 0.96 are considered to have very good reliability, between 0.70 and 0.80 are considered to have good reliability and alpha value between 0.60 and 0.70 indicated fair reliability and when the coefficient of alpha is below 0.60, the scale has poor reliability.

Table 3.1 Test of Reliability

Variables	No. of Items	Cronbach's Alpha
Mobility	5	0.782
Reliability	7	0.949
Safety and Security	4	0.869
Infrastructure	6	0.909
Cost	4	0.725

Source Own Survey, 2018

According to the assumption of reliability test of the above table 3.1, cronbachs's alpha value is between 0.00 to 1.00 with an acceptable range of 0.70 or above. As stated in the above table 3.1 the cronbach's alpha value for each construct indicates that, mobility 0.782, reliability 0.949, safety and security 0.869, infrastructure 0.909, and cost 0.725. Thus, the observed variables truly reflect the latent construct and deletion or amendments are not necessary.

3.7.2 Validity

Validation assessment is the process of determining the degree to which a model is an accurate representation of the real world from the respective of the intended use of the model. The goal of validation is to quantify confidence in the predictive capability of the model by comparison with experimental data AIAA (1998). To check the operationalization of variables against some criterion, criterion-related validity type was selected. Criterion-related validity with different validity types usually makes a prediction about how the operationalization will perform based on the theory of the contract Trochim (2016). Among various criterion-related validity types, predictive validity type was applied to test the predictive ability of the construct under study. Predictive validity assesses the operationalization's ability to predict something it should theoretically be able to predict Trochim, (2016).

Regression models with one dependent Variable and more than one independent variables are called multi-linear regression Tabachnick (1996) and Buyukozturk (2002). Multiple regressions also involve constructing an equation to estimate the expected value of the dependent variable which is predicated from number of independent variables. It is used to see the relation between dependent and independent variable and to predict the value one dependent variable with an increase in each unit of independent variables Gulden and Nese (2013). Accordingly, the researcher was used multiple linear regression model to find a set of predictors among the five performance quality dimension which are most effective in measuring the overall performance of multimodal transport system. Overall, the study was employed multiple linear regression analysis, independent sample t- test, theories and hypotheses in order to examine the impact of predictor variables on dependent and to point out the difference in determining the overall performance across different group of customers Yifrashewa (2003).

According to definition given by many authors Multivariate regression analysis model that account for individual explanatory variables specified for the particular study were formulated in the following:

Mtpn=Bo+B1Mobn+B2Reln+B3SafSecn+B4IInfra +B5sco+E

Ymo=Bo+b1x1+bx2+b3x3+……bnxn+emtp

Where:

- Mtpn = dependent variable for the performance of multimodal transport system
- Mob; Mobility of multimodal transport system (independent variable)
- REL; Reliability of multimodal transport system (exogenous variable)
- SASEQ; Safety and security of multimodal transport system (exogenous variable)
- INFR ; Infrastructure of multimodal transport system exogenous variable)
- CO; cost of multimodal transport system

Before performing regression analysis tests of validity assumptions such as normality, multicollinearity, and autocorrelation and correlation analysis were performed with their own distinctive feature. Each of the tests was performed by reviewing related literatures, theories and other ideas.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

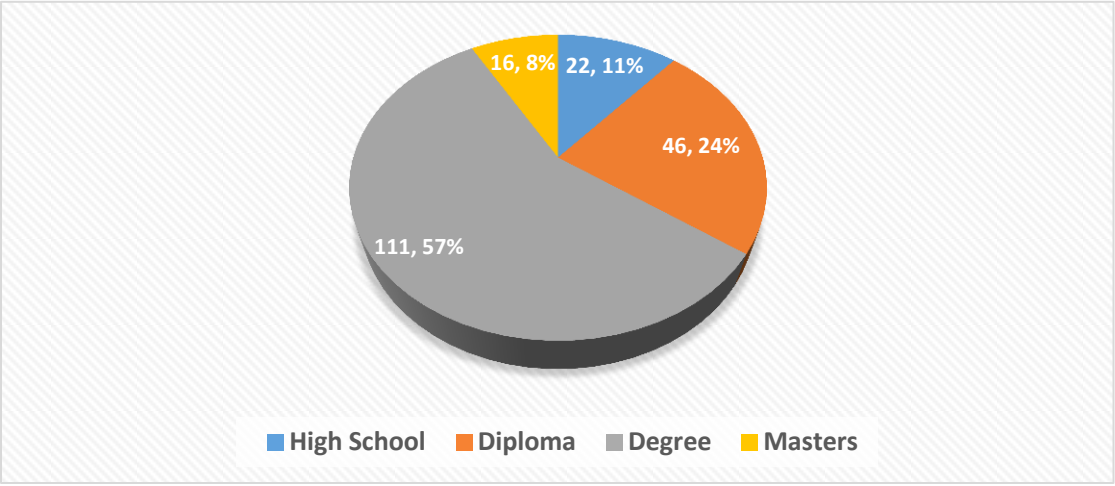
This chapter deals with presentation, analysis and interpretation of the data obtained through survey questionnaire and secondary source of data. To collect primary data 228 questionnaires were distributed. From the total number of respondents 195 respondents feel the questionnaire which were resulted to arrive the overall performance of multimodal transport system. The result of the responsiveness of the respondents is calculated as the number of returned questionnaires divided by the total sample who sent the survey initially Mitchell (1989). Applying this formula the result of the response rate was presented as 86 percent of respondents were returned the questionnaire filling properly. Therefore, the result obtained from the response rate implies the rate is a best representative of the sample size.

4.1. Respondents Background Information

4.1.1 Educational Background

The respondent's educational background was composed of 11.3 percent high school, 23.6 percent Diploma, 59.9 percent degree and 8.2 percent master's degree. From this we can conclude that above 75 percent of respondents have diploma and above qualification.

Figure 4.1 Educational Background



Source: Own Survey, 2018

4.1.2 Work Experience of Customers

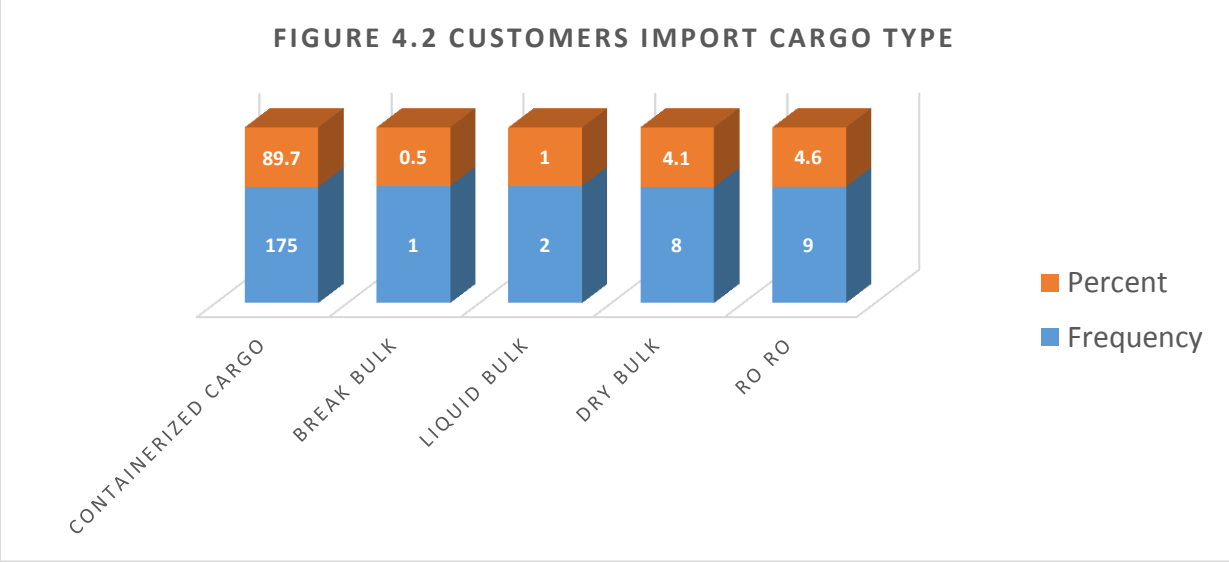
As shown in the following table 4.1, work experience of multimodal transport customers shows that, 20.4% worked less than two years, 29.2% worked from 2-4 years, and 50.8% worked from 5-8 years, 16.4% worked from 8-10 years and 27.7 % worked over 10 years. Almost 50 percent of customers have above 5 years' experience. The overall experience of respondents is depicted in the following table 4.1.

Table 4.1 Work Experience

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than two years	40	20.5	20.5	20.5
2-4 years	57	29.2	29.2	49.7
5-8 years	98	50.3	50.3	100
Total	195	100	100	

Source: Own Survey, 2018

4.1.3 Respondents Import Cargo Type



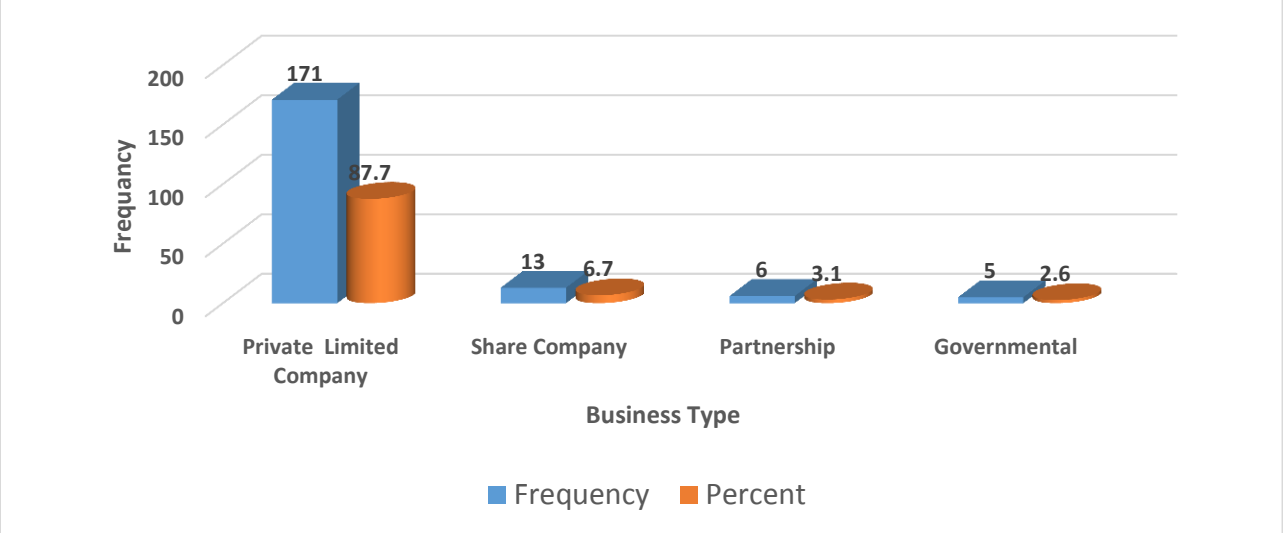
Source: Own Survey, 2018

As indicated on the above figure 4.2, 89.7 percent of customers were imported containerized cargo, 0.5 percent imported breaks Bulk, 1 percent imported liquid bulk, 4.1 percent imported dry bulk and 4.6 percent imported RORO type of cargo. The share of imported containerized cargo indicates, the majority of cargo was imported through the use of containers which are the result of multimodalism. The evolution of multimodalizm is associated with containerization and unitization of cargo. According to ESLSE (2017) annual operational performance, the annual imported cargo through the use of containers was increased from 2,767,053 ton in the year 2014, 3,340,135 ton in the year 2015, 4,966,265 ton in the year 2016 and 4,538,722 ton in the year 2017. Examining this annual report, imported cargo has increased from the year 2014 up to 2016 while decreased in the year 2017 due to currency problem.

4.1.4. Business Type of Respondents

According to the profile of respondents, 87.7% were private limited companies, 6.7% share companies, 3.1% partnership and 2.6% were governmental organizations respectively. The result indicates that private limited company owner's share the highest percentage than all other type of business. The number respondents, business type and percentage share were listed in the following Figure 4.3.

Figure 4.3 Business Type Operated by customers

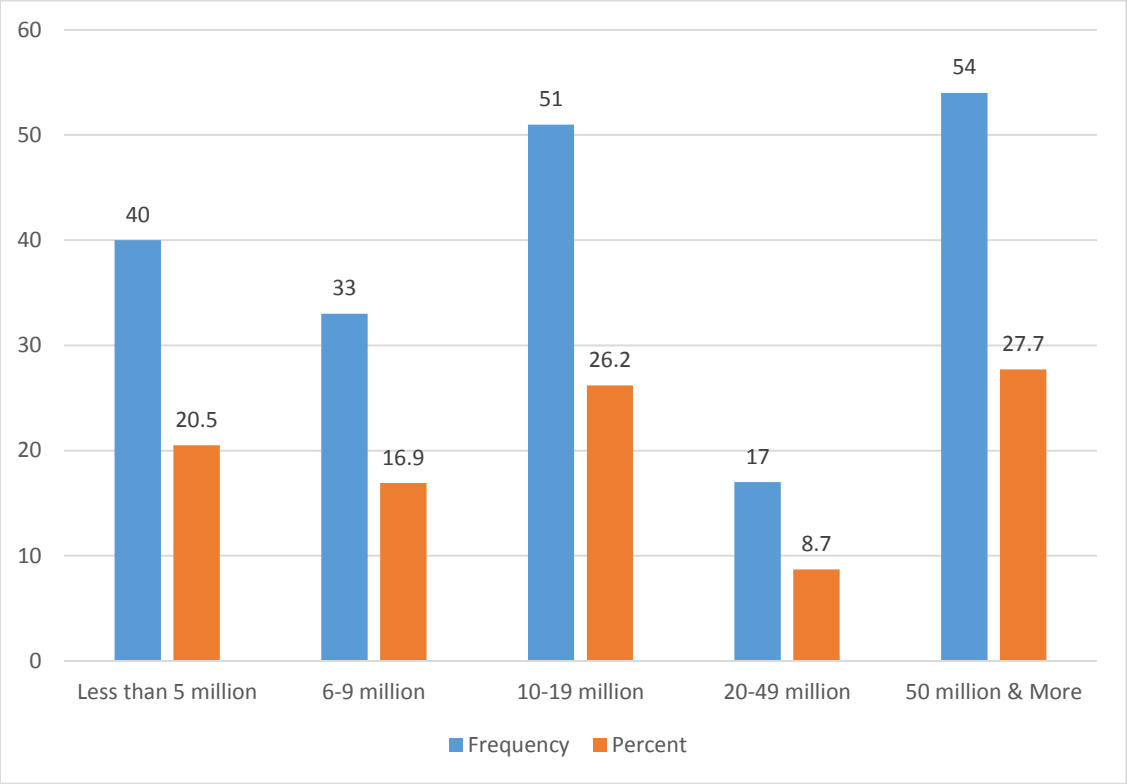


Source: Own Survey, 2018

4.1.5. Annual Import Turnover of Respondents

According to the survey result of annual import turnover of respondents stated in the figure 4.4 , 20.5 percent were imported less than birr 5 million, 16.9 percent imported birr 6-9 million, 26.20 percent imported birr10-19 million, 8.7 percent imported birr 20-49, and 27.7 percent imported 50 million and above per annum.

Figure 4.4 Annual Import Turnover



Source: Own Survey, 2018

4.2 Analysis of Descriptive Statistics

In orders to analyze, describe and summarize the characteristics of responses, mean and percentage were used. These research designs were used to point out the degree of variability and percentage share of responses that were answered questions stated in the questionnaire.

4.2.1 Mobility of Multimodal Transport System

In order to measure the mobility of multimodal transport system, the researcher has used intervening variables such as accessibility, transit time, the average waiting time of trucks inside the port, trucks turnaround time and vessels round trip. Accordingly, questions with their responses for each type of questions were forwarded in the following table 4.2.

Table 4.2 Mobility Statistics

	Multimodal Transport service accessible (Q1)	Multimodal Transport has shortest Transit Time (Q2)	The average waiting time of trucks inside the port is low (Q3)	Trucks Turnaround Time is Low (Q4)	The vessels length of stay is low from the time of arrival to the time of departure (Q5)
N	195.00	195.00	195.00	195.00	195.00
Mean	3.65	2.18	2.88	3.06	2.33

Source: Own Survey, 2018

As observed from the above table 4.2, there was difference in responses for each of the questions. For the questions weather multimodal transport system is accessible or not, the mean score of the respondents were 3.65 which confirms that respondents have no doubt with the accessibility of multimodal transport system. This was the result of ports recently opened in each of regions.

The response for the second question regarding whether or not multimodal transport system has shortest transit time, the mean score of the respondent was 2.18 under the range of disagreement. Therefore, respondents were dissatisfied with the transit time of multimodal transport system.

Lack of synchronized clearance process, lack of integrated port system to accomplish all on single window basis to cut time and non-value adding procedures were factors that contributed to highest transit time of multimodal transport system. Thus, each segment of the clearance activity should be taken with its own pace and time.

As of the question forwarded to measure trucks waiting time inside the port has the mean score of 2.99 which was moderate that needs some improvement. The fact that, this has significant impact on container circulation, container throughput, trucks round trip. According to the ESLSE (2018) nine month report, container circulation that one container round-trip per year in between Djibouti port and dry port was 1.18 which implies almost ones in a year. This has occurred due to clearance process problem shares 30%, system down time 18%, cargo truck problem 14%, tin problem 7%, and manifest problem 18%, and SS system problem 1%. From this figure, clearance process has the highest percentage for trucks to wait inside the port for longer time until discharging or loading cargo.

The other intervening variable related with mobility was trucks turnaround time with the mean score of 3.06. According to this, it was observed that there was moderate performance in trucks circulation. The observed result has an implication that still there is a desire to improve the overall inland transport system in spite of the observed progressive changes. Recently ESLSE has purchased 215 heavy Renault trucks in order to provide timely, cost effective, efficient and optimized logistics service. As published in Ethio-logistics annual magazine (2017), trucks turnaround time in the year 2017 was 3.14 and decreased to 2.75 in the preceding year ESLSE nine month report (2018). Thus, newly purchased modern Renault trucks are not changed trucks roundtrip starting from Djibouti to dry port or vice versa. Maintenance down time was the leading factor which contributed to slow down trucks turnaround time.

The final question forwarded to check whether vessels turnaround time was low or high with a mean score of 2.33 which informs that cargo at sea waits for a long period of time. Some of the gaps which caused lower roundtrip were lack of cargo readiness, decision making problem for the maintenance of vessels; engine problem, environmental problem, and high congestion at sea port. This was supported by the data collected from the study made by EMAA (2016), “Freight

Logistics Strategy for Ethiopia stated in the table 4.3, the average vessels waiting time at anchorage for bulk cargo carriers was 10 days, for general cargo 5 days, and containerized ships 1-2 days. Anchorage waiting time varies from cargo to cargo. Compared with other African countries like Kenya port (Mombasa) is better. Despite this, anchorage waiting time for general cargo carriers was higher due to uncoordinated bulk shipment planning and insufficient operation at berth.

Table 4.3 Average Vessels Waiting Time at Anchorage

Type of cargo	**Waiting Time**
Bulk Cargo Carriers	10 Days
General Cargo	5 Days
Container Carriers	1-2 Days

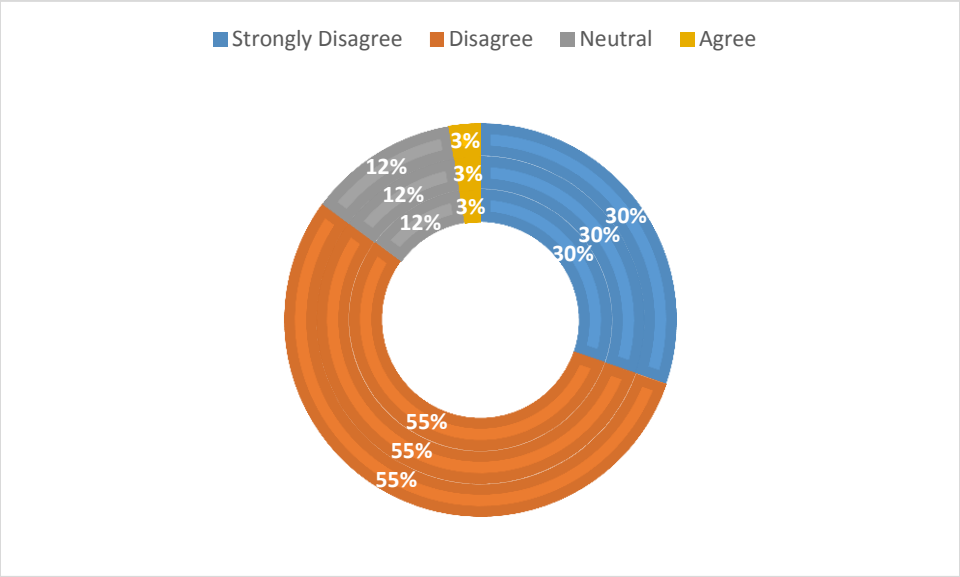
Source: EMAA (2016)

4.2.2 Reliability of Multimodal Transport System

With the increased competition in major markets forcing business to adopt just in time production and management system, flexibility, speed and reliability in delivery of goods have assumed significant importance UNCTAD (2003).

The second major input variable used to measure the overall performance of multimodal transport system was reliability. Reliability is the performance of service without delay or performing the service as promised.

Figure.4.5 Promised Service



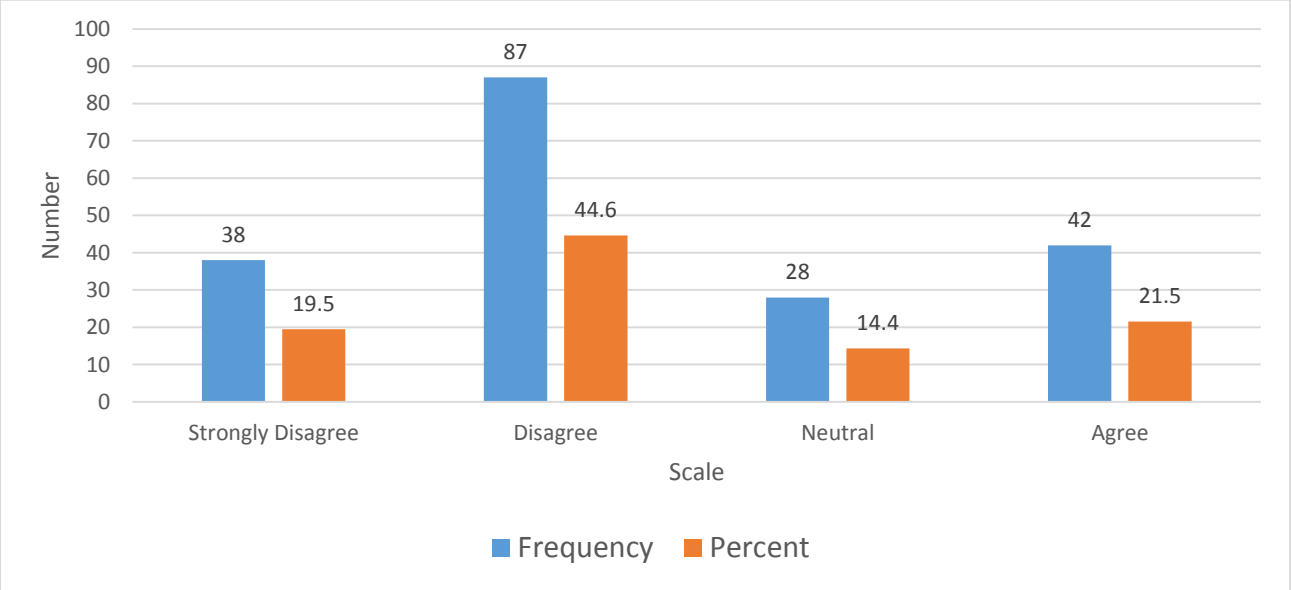
Source: Own Survey, 2018

As shown in the above figure, the activity of providing the service as promised, 30 percent strongly disagree, 55 percent disagree, 12 percent neutral, and 3 percent agree. The result indicates the majority of respondents were disagreed over the provision of multimodal transport service as promised with the mean score of 1.87. Thus, the majority of customers were not getting the service within the service promised time. As declared in citizen charter the enterprise was promised to reduce the dwelling time of cargo 40 days for containerized cargo at Modjo, and 5 days at Djibouti. Observations from ESLSE (2018) nine month operational performance report tells, the dwelling time of containerized cargo at dry port was 43.4 days and 11 days at Djibouti.

The second question was asked to confirm the schedule flexibility of multimodal transport system. Based on this question, 19.5 percent strongly disagree, 44.6 disagree, 14.4 percent neutral, and the remaining 21.5 percent agree. From this result we can understand that the majority 60 percent of customers are strongly disagree and disagree over the schedule flexibility of multimodal transport system.

The second question was asked to confirm the schedule flexibility of multimodal transport system. Based on this question, 19.5 percent strongly disagree, 44.6 disagree, 14.4 percent neutral, and the remaining 21.5 percent agree. From this result we can understand that the majority 60 percent of customers are strongly disagree and disagree over the schedule flexibility of multimodal transport system.

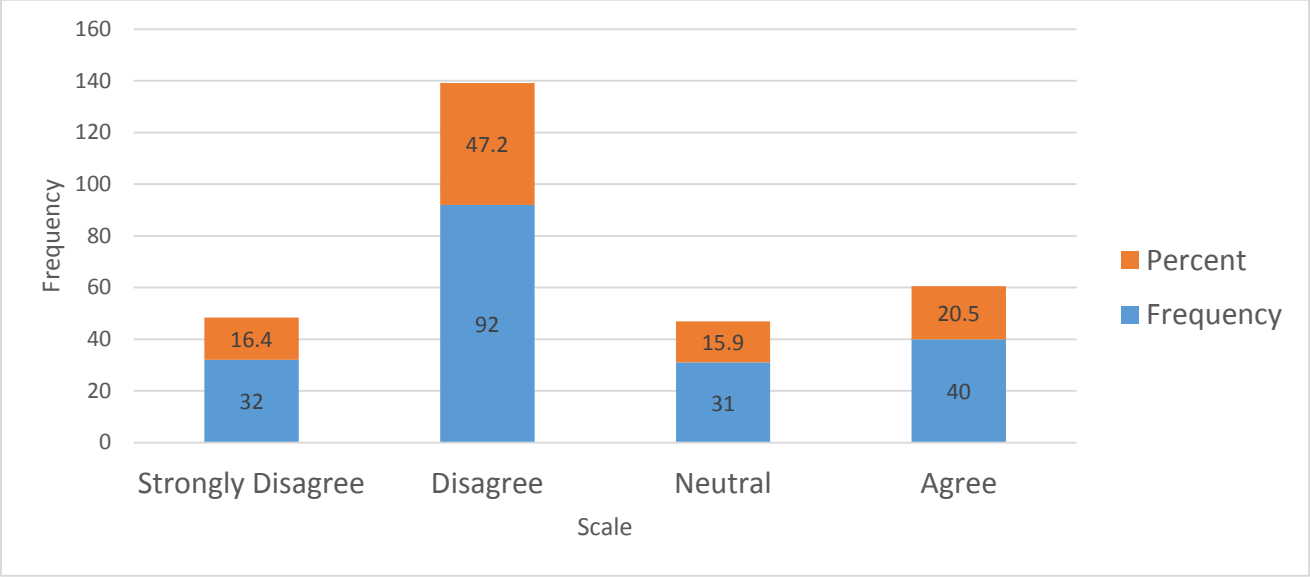
Figure 4.6 Schedule Flexibility



Source: Own Survey, 2018

The basic and the most important issue in multimodal transport is the provision of single window service. According to the WCO (2011) definition single window service is "a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, and transit related regulatory requirements. If information is electronic, then individual data elements should be submitted ones." Depending on this definition customers were asked to give their response regarding the applicability of single window service.

Figure 4.7 Provision of Single Window Service



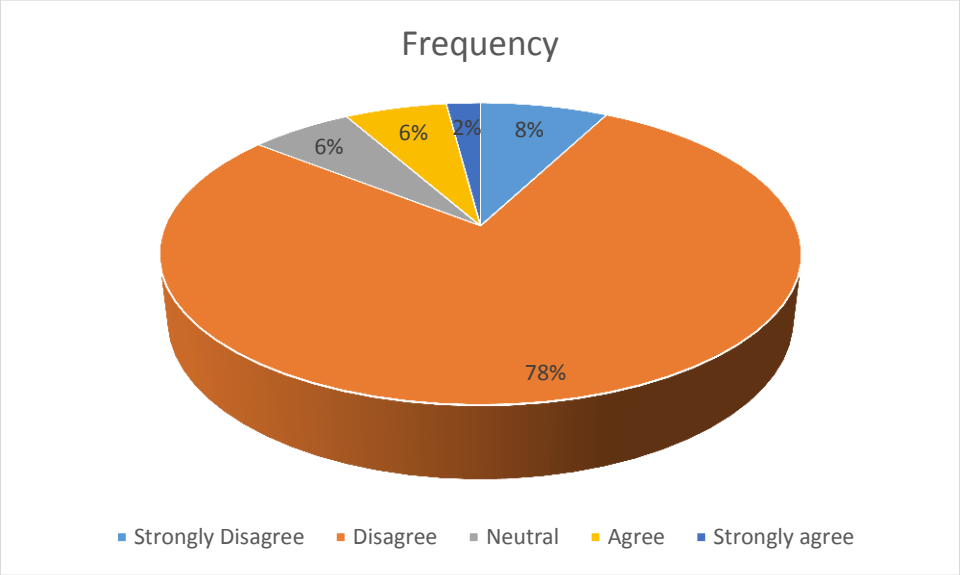
Source: Own Survey, 2018

As it was observed in the above figure 4.7, the customer's response indicates that, 16.4 percent strongly disagree, 47.2 percent disagree, 15.9 percent neutral, 20.5 percent agree and 20.5 percent strongly agree. The highest percentage of the response rests under the scale disagree which accounted 47.2 percent. This implies that there exists fragmentation of multimodal transport service performance in different separate departmental and office units. In addition to this 16.4 percent of the respondents are highly dissatisfied with the provision of single window service. The remaining 15.9 percent were agreed and 20.5 percent are moderate with the service rendered either knowingly or unknowingly. In general the result derived from strongly disagree and disagree implies that the majority of customers are dissatisfied with the practice of single window service. Customers are required to move in different departments and branch offices within the single organization managed and operated by ESLSE. In Ethiopia, businesses are required to obtain more documents for the logistics process as compared with other nations. There are 103 procedures, and about 21 documents that are needed at different stages of the process to obtain customs clearance WBDBR (2017). In order to provide one stop shopping

multimodal transport service, the enterprise has to apply electronic data interchange which reduces the time length of document transfer in between different stake holders.

The fifth question was asked to conform whether or not port and customs clearance service was dependable. Based on the below figure 4.8, 8 percent strongly disagree, 78 percent disagree, 6 percent neutral, and 6 percent agree and 2 percent strongly agree with the mean score of 2.20 which indicates highest number of respondents were disagreed. Lack of collaboration between ESLSE and Ethiopian customs authority and other parties were the root causes for delay in clearance service. Practically the service performance is started with processes as customs clearance, waiting for D/O, port clearance and waiting time for get pass and truck way bill. After clearance process at sea port is finalized, the next clearance process is passed to dry ports. The formalities at each stage of sea and dry port caused to increase in the average dwelling time and to pay unnecessary storage and other related costs. This harms the overall performance of multimodal transport system. In order to provide dependable customs and port clearance service, the overall clearance service should be performed electronically and reducing the number of unnecessary documents used in the clearance process.

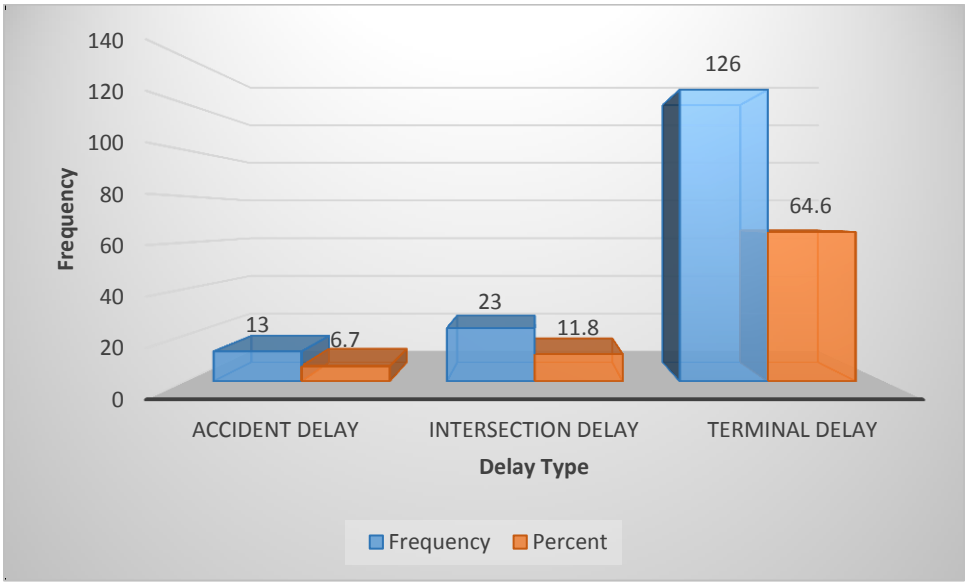
Figure 4.8 Frequency of Dependable Port & Customs Clearance Service



Source: Own Survey, 2018

The other intervening variable of reliability is delay which slows down the performance of multimodal transport system. For transportation system reliability is usually represented by the delay caused by some unusual overs or incidents such as accident delay, intersection delay and intermodal terminal delay, or any other loss in time. Based on these assumptions, customers were asked to answer this question. What type of delay they get? Accordingly, respondents rank their opinion in the following Figure 4.9.

Figure 4.9 Types of Delays in Multimodal Transport System



Source Own Survey, 2018

As seen in the above figure 4.9, 162 numbers of respondents who answer yes were given their opinion as 6.7 percent accident delay, 11.8 percent intersection delay, and 64 percent intermodal terminal delay. This result gives information that the lion share of cargo delays were occurred at sea and dry port terminals. The second percentage share of delay lies in intersection delay which accounts 11.8 percent and occurred at the stage of inland transport root (Awash, Mele and other intersection areas). Accident delay was the lowest percentage accounts 6.7 percent of share. Comparatively terminal delay was the highest of all delays which have significant impact on the performance of multimodal transport system. The greatest effort has to be exerted to achieve the

lowest possible terminal delay by providing port machineries such as forklifts, Rich's takers, and other facilities to reduce terminal delay.

The question whether document errors corrected with the lowest possible time, respondents answer show that, 7.7 percent strongly disagree, 77.9 disagree, 6.2 percent neutral, and 2.1 percent strongly agree with the mean score of 2.169. The answer indicates that majority of respondents were disagree over the service provision stated in table 4.4.

Table 4.4 Document errors have corrected with the shortest possible time

Mean=2.169

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	15	7.7	7.7	7.7
	Disagree	152	77.9	77.9	85.6
	Neutral	12	6.2	6.2	91.8
	Agree	12	6.2	6.2	97.9
	Strongly agree	4	2.1	2.1	100.0
	Total	195	100.0	100.0	

Source: Own Survey, 2018

The final reliability issue is the provision of multimodal transport service with the best of professionalism which is shown in table 4.5.

Table 4.5 MTO Service is Provided by a Staff with the Best Professionalism

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	19	9.7	9.7	9.7
	Neutral	94	48.2	48.2	57.9
	Agree	82	42.1	42.1	100.0
	Total	195	100.0	100.0	

Source: Own Survey, 2018

As illustrated in the above table 4.5, 9.7 percent disagree, 48.2 neutral, and 42. 1 agrees with the mean score of 3.231. Therefore, the provision of multimodal transport service with the best of professionalism was moderate.

4.2.3 Descriptive Analysis of Safety and Security

The transportation sector is challenged with increasing and improving transportation safety and security in the fate of limited funding, aging infrastructure, new emerging threats to infrastructure and lives. Transit safety is important component to a more accessible and efficient transportation system. One of the most important advantages of using multimodal transport system is to maintain cargo safety and security. To check this, four intervening variables were used to measure the safety and security system of multimodal transport system.

Table 4.6 Frequency of Safety and Security System

Variables	Scale	Percentage	Mean
1.Personal and cargo safety protection equipment's are available	Disagree	10.3	3.61
	Neutral	25.6	
	Agree	56.92	
	Strongly Agree	7.2	
2.General port safety and security information is available	Strongly Disagree	2.6	3.46
	Disagree	13.85	
	Neutral	26.67	
	Agree	48.72	
	Strongly Agree	8.2	
3.Multimodal transport operator notifies cargo damage on time	Disagree	16.4	3.40
	Neutral	27.20	
	Agree	56.40	
4.There is on time insurance coverage during cargo damage	Disagree	19.5	3.22
	Neutral	38.5	
	Agree	42.1	
	Strongly Agree	5.64	

Source: Own Survey, 2018

From the above table 4.6, the result of the first question shows that, 10.3 percent disagree, 25.6 percent neutral, 59.2 percent agree and 7.18 percent strongly agree. In fact, 64.10 percent of respondents were agreed on the availability of personal and cargo safety protection equipment's. The result of the second question shows, 2.56 percent strongly disagree, 13.85 percent disagree, 26.67 percent neutral, and 48.72 percent agree. The same with the first question many of respondents were satisfied and more satisfied on the provision of safety and security information system. Providing safety and security information will make the environment free from hazards. At the same time it maintains the safety of employees free from contamination of dangerous goods and protects cargo from damage. Each port facility should be responsible for undertaking its own port security assessment, using an approved recognized security organization PSAPTTEC (2007). The response for the third question was consolidated as, 16.4 percent disagree, 27.2 percent neutral, and 56.4 percent agree. We can conclude that almost above 55 percent of respondents were agreed with notification of cargo damage. The last question was forwarded to know whether or not insurance coverage is done on time during cargo damage. According to the result 19.5 percent disagree, 38.5 percent neutral, and 42.1 percent agree. Examining the result 38.5 percent neither agree nor disagree on the service. In general the average response falls on moderate on the provision of insurance service on cargo damage.

Multimodal transport operator has the responsibility to provide insurance coverage on cargo damage until the cargo reaches customers premise. Clearly, service providers that have the responsibility for the cargo along the transport chain, such as multimodal transport operators, will have access to the information at an early stage and will be able to comply more easily UNCTAD (2003). For damage, liabilities differ depending on the construct understudied. According to UNCTAD (2001) article 1(2) the liability of multimodal transport operator for loss of, or damage to goods as well as delay is based on the principle of "presumed fault or neglect."

In relation to this, respondents were asked to answer yes or no questions, which was asked as "have you faced cargo damage?" from the total number of respondents those who answer "yes" share 17.9 percent and the rest 82.1 percent answer no. At the same time, respondents who answer yes were required to choose the place where the damage was occurred. The figure 4.7 below represents the number of respondents, who faced cargo damage with their place.

Table 4.7. The place where cargo Damage occurred

	Frequency	Percent	Valid Percent	Cumulative Percent
At Djibouti Port	14	38.9	38.9	38.9
At Dry Port	17	47.2	47.2	86.1
At Shipment	5	13.9	13.9	100.0
Total	36	100.0	100.0	

Source Own Survey, 2018

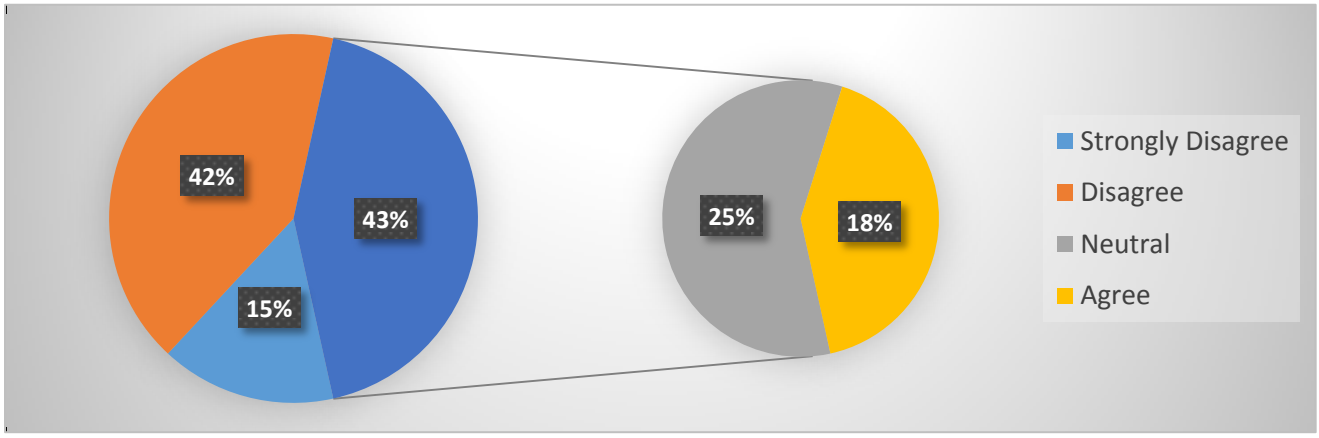
As shown on the above table 4.7, 47.2 percent faced cargo damage at dry port, 38.9 percent at Djibouti, and 13.9 percent at shipment. This percentage implies, most of the damages were occurred at dry ports. Due to lack of cargo damage notification system many customers know cargo damage when they receive their cargo at dry port.

Based on the above safety and security system measurement results and discussions, it is possible to conclude that the overall safety and security system was better in its performance at every corner with some limitations. Relatively the least performance was found to be on time insurance coverage during cargo damage with a mean score of 3.22 (neutral) which implies customers were neither agree nor disagree or they were not familiar with the issue but there was something that has to be improved. In order to enhance the insurance coverage process enterprise collaboration system has to be installed which creates interface between ports.

4.2.4 Descriptive Analysis of Infrastructure

Transport infrastructure is one of the most important parts of economic infrastructure. The impact of transportation on economic growth and foreign trade is a very important phenomenon, particularly when making decisions on allocation of financial funds to investments in different fields of transportation Boruch (2009). It includes port/terminal and corresponding facilities, roads, rails, trucks, and ICT facilities EMAA (2016). To test the related literatures, the following survey questionnaires were forwarded to users of multimodal transport. For the first question the researcher aims to know the availability and sufficiency of port and terminal facilities which is presented in the following Figure 4.10.

Figure 4.10 Frequency of Port/Terminal and Corresponding Facilities



Source: Own Survey, 2018

As seen in the above figure 4.10, 15 percent strongly disagree, 42 percent disagree, 25 percent neutral and the rest 18 percent agree. According to this response, 57 percent users of multimodal transport system were not satisfied with the adequacy of port and terminal facilities. Port and terminal facilities have a tendency to impact the operational performance of multimodal transport by smoothing the flow cargo transport. ESLSE has taken measures to provide port and terminal facilities such as port handling machineries like forklifts, cranes, storage facilities and other facilities used to enhance port operation. But these efforts are not parallel to the growth of imported cargo which brings to achieve effective and efficient logistics service.

The second question was asked to measure the availability of adequate road, and other modes of transportation. As stated in the following table 4.8, the result shows that 24.1 percent disagree, 32.3 percent neutral, and 43.6 percent agree. Relaying with this result the largest proportion of customers was agree and moderately satisfied with the adequacy of multimodal modes of transportation.

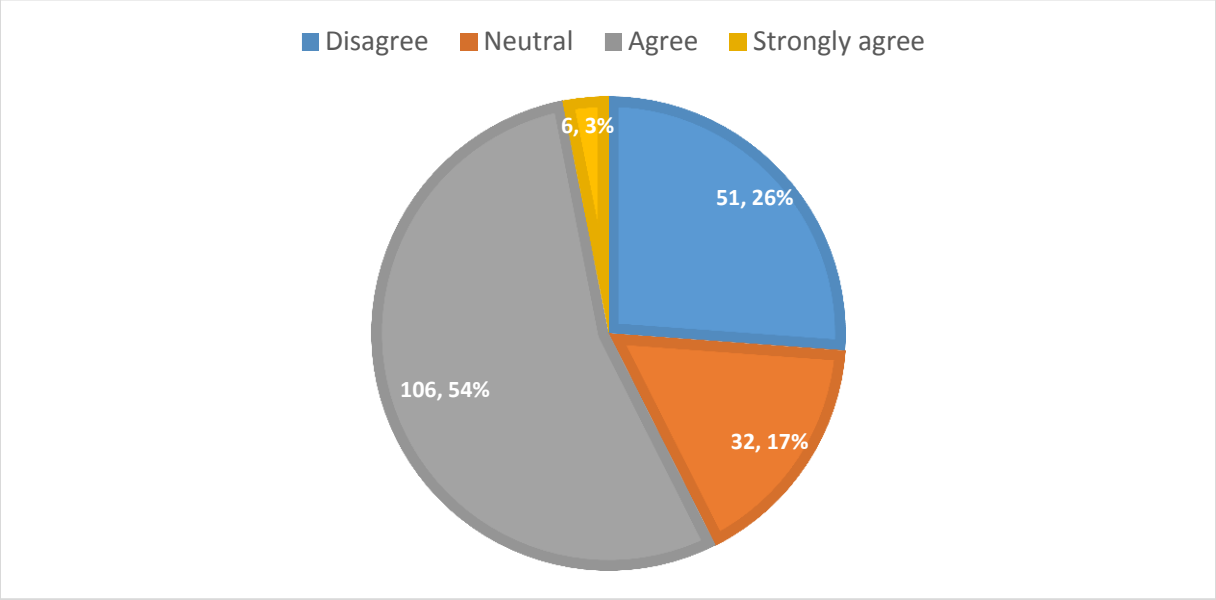
Table 4.8. Adequate Road and Other Mode of Transportation

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	47	24.1	24.1	24.1
Neutral	63	32.3	32.3	56.4
Agree	85	43.6	43.6	100
Total	195	100	100	

Source Own Survey, 2018

In addition to the above two consecutive questions, the researcher was asked whether or not adequate and appropriate types of capacity rucks were available.

Figure 4.11 Frequency of Adequate Capacity Trucks

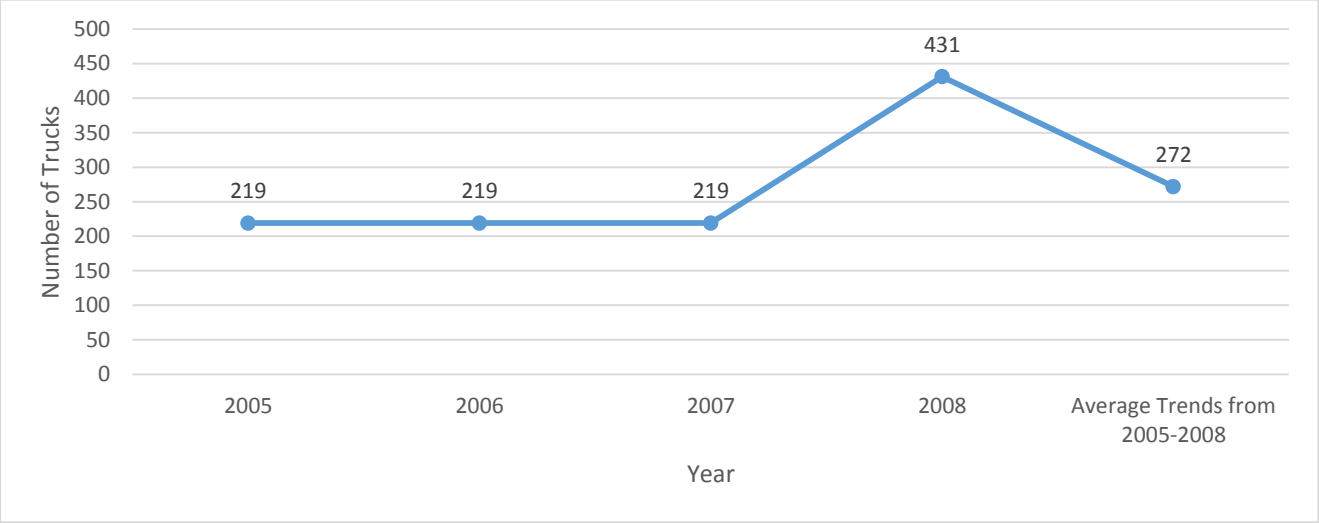


Source: Own Survey, 2018

As seen in the above figure 4.11, 26 percent disagree, 17 percent neutral, 54 percent agree, and 6.3 percent strongly agree with the availability of adequate and appropriate types of capacity trucks. According to this result, the largest percentage indicates, 60.3 percent of respondents

were satisfied and strongly satisfied with the availability and adequacy of the resource. Currently, ESLSE has 459 trucks which have different loading capacity, speed, and technology utilization. The following figure shows the number of trucks owned by the enterprise from the year 2005 to 2008 E.C.

Figure 4.12 Total Number of Trucks



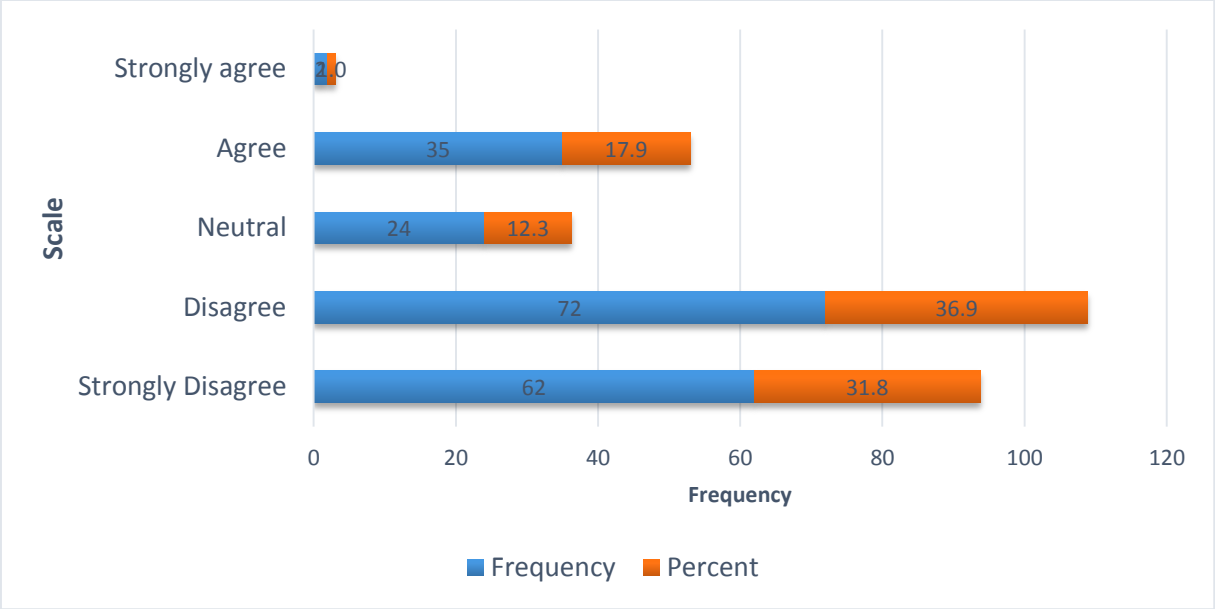
Source: ESLSE 2016 Annual Report and Modified by the Researcher

As stated in the above figure 4.12, the number of trucks has increased from the year 2007 to 2008 E.C. From the total number of truck, the half of the percentage indicates, the availability of 219 old trucks acquired from Comet Transport Share Company through merger. Currently, these trucks are performing the least possible round-trip and they are incurring high maintenance cost.

In addition to the above transportation infrastructural facilities, one of the most important components used to facilitate the flow of information is information communication technology. ICT facilitates the management of interconnecting major information flows related to goods flows Evangelista (2002). In order to measure the overall use and application of information technology in multimodal transport system, seven explanatory variables were used. So as to get a clear picture of responds about information exchange and documentation system in multimodal transport system the following questions were forwarded to customers.

The first question was presented to check whether or not exchange of real time information using sophisticated ICT, 31.8 percent strongly disagree, 36.9 percent disagree, 12.3 percent neutral, 17.9 percent agree and 1 percent strongly agree. The percentage share of each of the scales is presented in the following figure.

Figure 4.13 Frequency Distribution of Exchange of Real Time Information Mean=2.19



Source: Own Survey, 2018

As of presented in the above figure 4.13, the response has a mean score of 2.19 which indicates the largest percentage of respondents were not satisfied with the exchange of real time information using modern technology. For today's requirement, traditional transport services are often insufficient. What is needed to day are more complete logistics services, involving the use of ICT and multimodal transport operations which have a service provider assuming responsibility for the entire transport UNCTAD (2003). According to ESLSE (2018) nine month operational performance report, the enterprise is using more than 4 IT application software's are used to exchange data and information between different parties who directly and indirectly involve in the operation of multimodal transport system. The different IT systems are presented in table 4.9.

Table 4.9 Types of IT Application Software's currently used by ESLSE

System Type	Operational Function	Location
DPOIS	✓ Controlling port and terminal operations (Container Tracking, calculating Demurrage etc.)	✓ In all Ports (Modjo, Gelan, Kality, Semera,Kombolcha, Diredawa)
CTTS (Cargo Trucking System)	✓ Tracking Cargo	✓ Head Office and Djibouti
SS System	✓ Only preparing head office permanent and contract employees salary except Sea-Going employees salary performed by MS Access ✓ Preparing Purchase Requisition	✓ HR (Payroll section, and some other departments only to prepare purchase requisition)
Sea liner	✓ To raise Sea freight and inland haulage charges ✓ To prepare Freight & Inland Transport Settlement voucher ✓ Other Functions	✓ Head Office and in all dry ports

Source Own Survey, 2018

From the above table 4.9, we can conclude that, fragmented application software's were used in exchange of real time information. The same type of activities was performed within different application software's which harms the flow of data and information. Currently, most of the operational, financial and other activities are performed using micro soft access which is outdated in today's information era to record and process data. So as to utilize and access data and information in efficient and effective manner ESLSE shall to install a full package of application software's.

The second variable included under information exchange and documentation system is the availability and accessibility of cargo tracking information system. On the basis of the stated advantages respondents were asked to rate their responses presented in the table 4.10.

Table 4.10 Cargo Tracking Information System

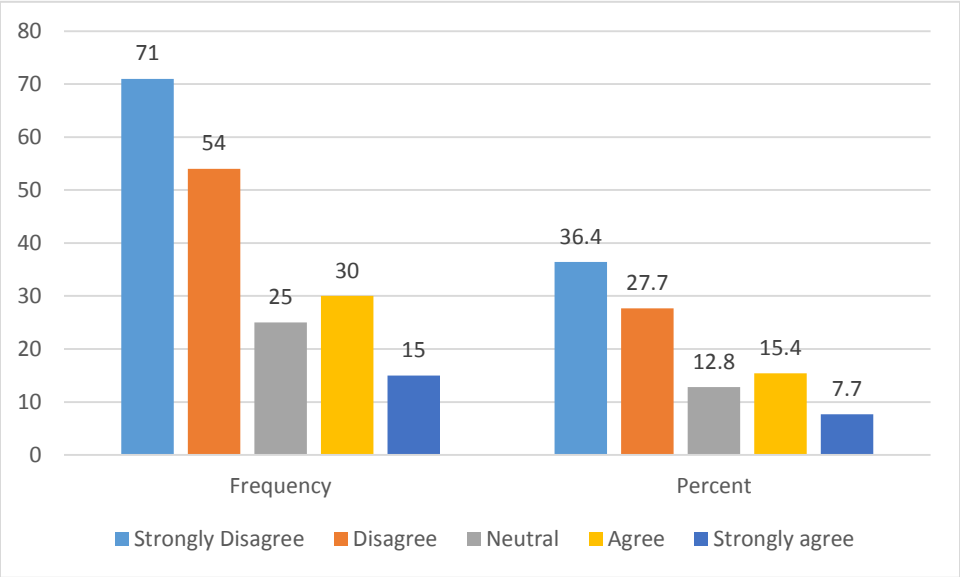
	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	15	7.7	7.7	7.7
Disagree	36	18.5	18.5	26.2
Neutral	43	22.1	22.1	48.2
Agree	97	49.7	49.7	97.9
Strongly agree	4	2.1	2.1	100
Total	195	100	100	

Source: Own Survey, 2018

As shown in the above table 4.10, the response over the availability and accessibility of cargo tracking information system indicates that, 7.7 percent strongly disagree, 18.5 percent disagree, 22.1 percent neutral, 49.7 percent agree and 2.1 percent strongly disagree with the overall mean score of 3.2 which have an implication that customers were moderately satisfied with the availability and accessibility of cargo trucking system. In relation to this, to inform customers about the arrival of their cargo, 24,204 customers were contacted by short SMS and 14,767 with telephone ESLSE (2018) nine month operational report. According to this report, the overall status of cargo was not tracked by the application of modern cargo trucking system. The available fragmented cargo trucking systems were used only for internal office instead of external users or customers.

The final question tries to find whether or not the service provided by multimodal transport system has online booking service.

Figure 4.14 Frequency Distribution of Online Booking Service



Mean=2.30

Source: Own Survey, 2018

As seen in the above figure 4.14, respondents answer implies, 36.4 percent strongly disagree, 27.7 disagree, 12.8 percent neutral, 15.4 percent agree, and 7.7 percent strongly agree with the mean score of 2.30. The result can be interpreted as multimodal transport service was not supported by online booking service due to lack of technological readiness, and management commitment to provide full packaged on line booking service. ESLSE as a global logistics company, the overall cargo import activity must be supported by online booking service.

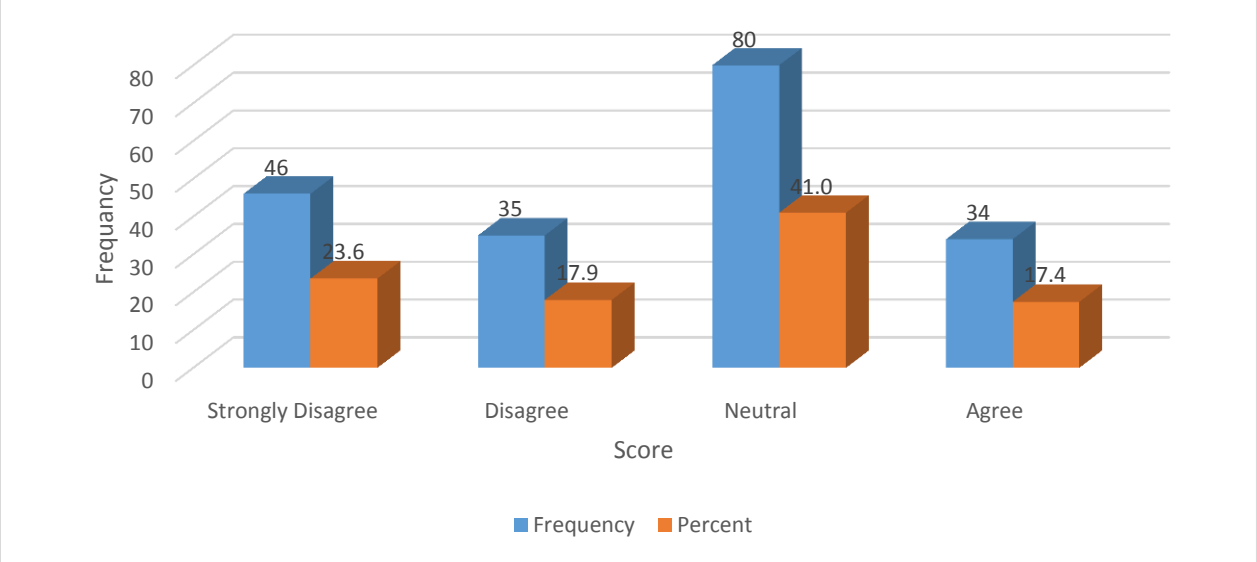
4.2.5 Descriptive Analysis of Multimodal Transport Cost

Transport costs have significant impact on the structure of economic activities as well as on the international trade Rodrigue and Notteboom (2017). Multimodal transport service is designed to cutback cost components such as inventory, storage, port handling and overall transport costs. The fact that, many landlocked countries impose high cost to perform multimodal transport service which resulted from inefficiencies of logistics practice. In order to assure whether the cost of multimodal transport was high or not, the researcher has used measurement variables considering their importance in measuring the performance of multimodal transport system.

The first question refers whether or not multimodal inland transport cost was reasonable. Accordingly, respondents rank their opinion as, 23.1 Percent strongly disagree, 17.9 Percent

disagree, 22.6 percent neutral, and 36.4 percent agree. According to the result, majority of respondents were moderately satisfied with the inland transportation tariff with the mean score of 2.72. This indicates customers are still requiring inland transport cost reduction.

Figure 4.15 Inland Transport Cost



Source: Own Survey, 2018

International transport costs are a key component of trade costs and economic development UNCTAD (2015). Sea freight cost is a cost incurred to transport cargo via ocean or sea. In relation to this the researcher has asked the reasonableness of sea freight cost.

Table 4.11 Frequency Distribution of Sea-Freight Cost

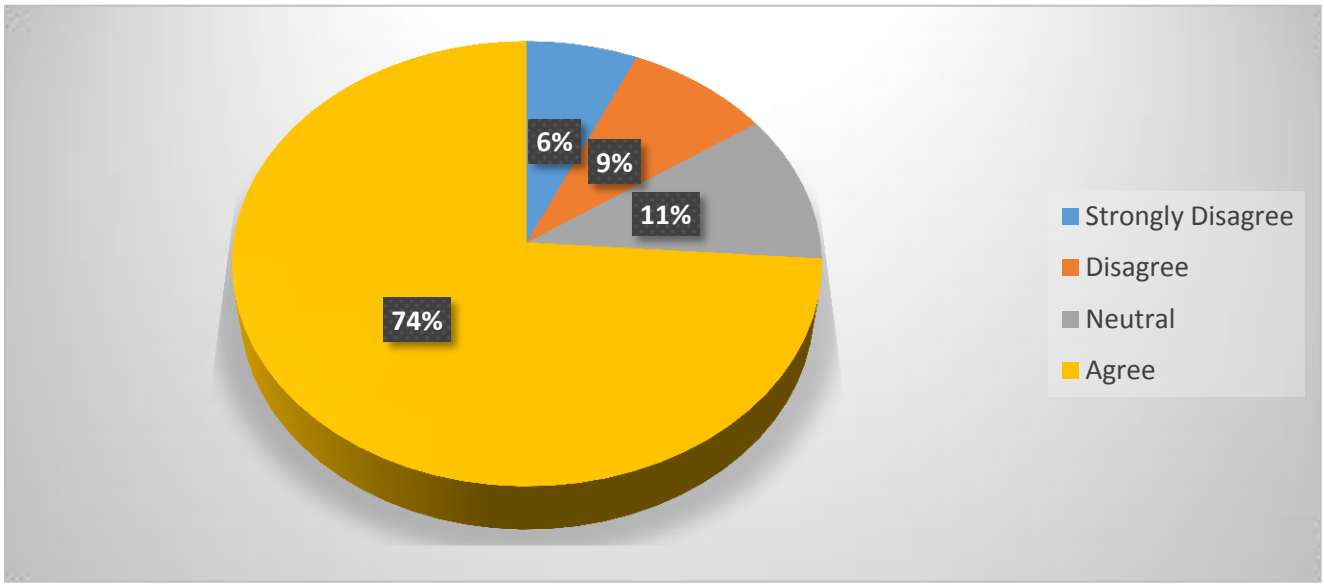
	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	51	26.2	26.2	26.2
Disagree	93	47.7	47.7	73.8
Neutral	47	24.1	24.1	97.9
Agree	4	2.1	2.1	100.0
Total	195	100.0	100.0	

Source: Own Survey, 2018

As shown in the above table 4.11, 26.2 Percent respondents strongly disagree, 47.7 percent disagree, 24.1 percent neutral, and the remaining 2.1 percent agree with the mean score of 2.02. Looking the mean score, all customers were not satisfied with sea transport charge. Maintenance down time, higher dwelling time at major sea ports, regulatory issues and economies of scale has contributed to charging higher sea freight cost.

In addition to this, the other cost related issue was the cost of storage and demurrage. Demurrage costs are costs incurred as results of affecting the yard space, port productivity; causing berth and port congestion after passing the grace period offered by MTO whereas storage costs are costs spend as a result of using space. Whether this cost was reasonable or not customers were asked and forwarded their responses accordingly.

Figure 4.16 Frequency Distribution of Demurrage Cost



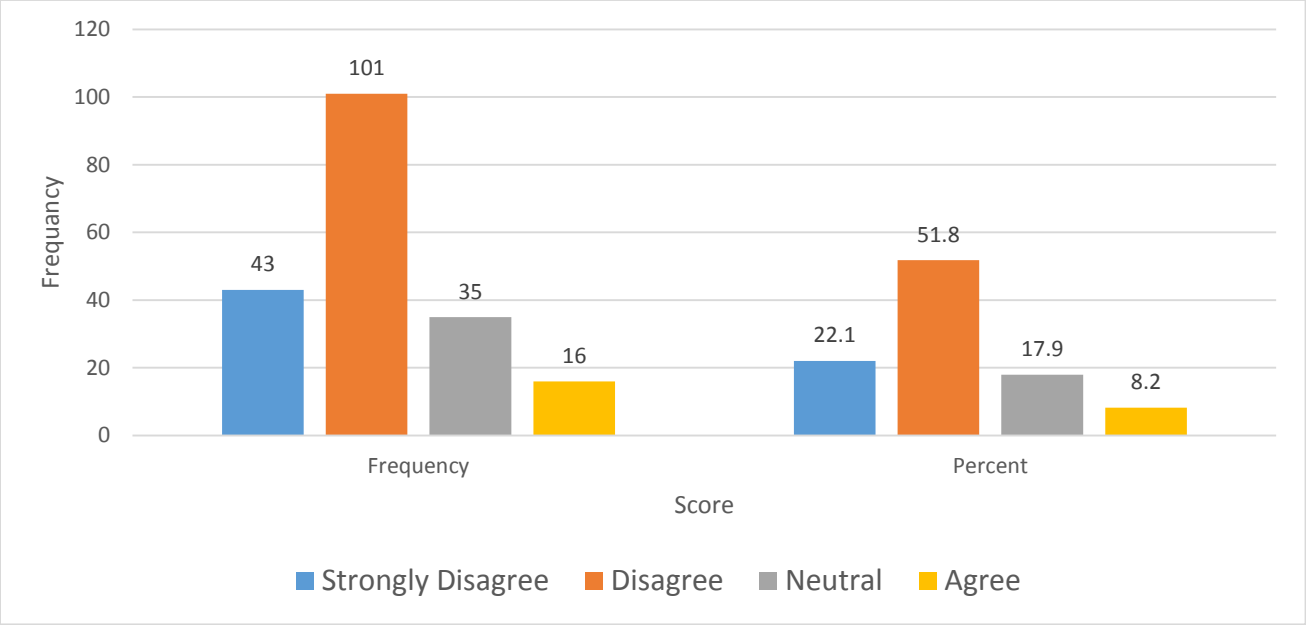
Source: Own Survey, 2018

As of presented in the above figure 4.16, 6 percent strongly disagree, 9 percent disagree, 11 percent neutral, and 74 percent agree with the mean score of 3.52. Examining the mean score it is possible to conclude that customers were agreed with the tariff set by ESLSE. Lowering this cost causes to increases in dwelling time at dry port, high congestion and lowers container circulation. The enterprise should follow win-win approach by moderating cost of storage and demurrage.

Because charging too high demurrage and storage cost causes to increase in the cost of imported goods which impacts the overall economy of the country whereas to much lowering this cost increases the dwelling time of cargo at port.

The final and the most prominent cost charged at terminal collected by terminal authorities in our case Djibouti port, against the movement of cargo to and from the vessel (stevedoring), handling equipment's and maintenance, etc. EMAA (2015).

Figure 4.17 Frequency Distribution of Port Handling Charge



Source: Own Survey, 2018

As observed in the above figure 4.17, 22.1 percent strongly disagree, 51.8 percent disagree, 17.9 neutral, and 8.2 percent agree on the reasonableness of port handling charges with the mean score of 2.12. The score indicates on average all customers were not satisfied with this cost structure. In order to reduce costs incurred associated with port clearance, the government shall From the table below 4.12, it is found that for 20 TEU Port Sudan have the least port charge followed by port Mombasa, Berbera, Aden and Hodeida respectively.

Table 4.12 Port handling Charge

TEU	Port Charges (USD) full Container								
	Aden	**Hodeida**	**Port Sudan**	**Berbera**	**Mombasa**	**Average**	**Min**	**Max**	**Djibouti**
20’	228	235	127	200	157	189	127	228	455
40’	301	159	172	300	195	225	159	301	810

Source: EMAA, 2016

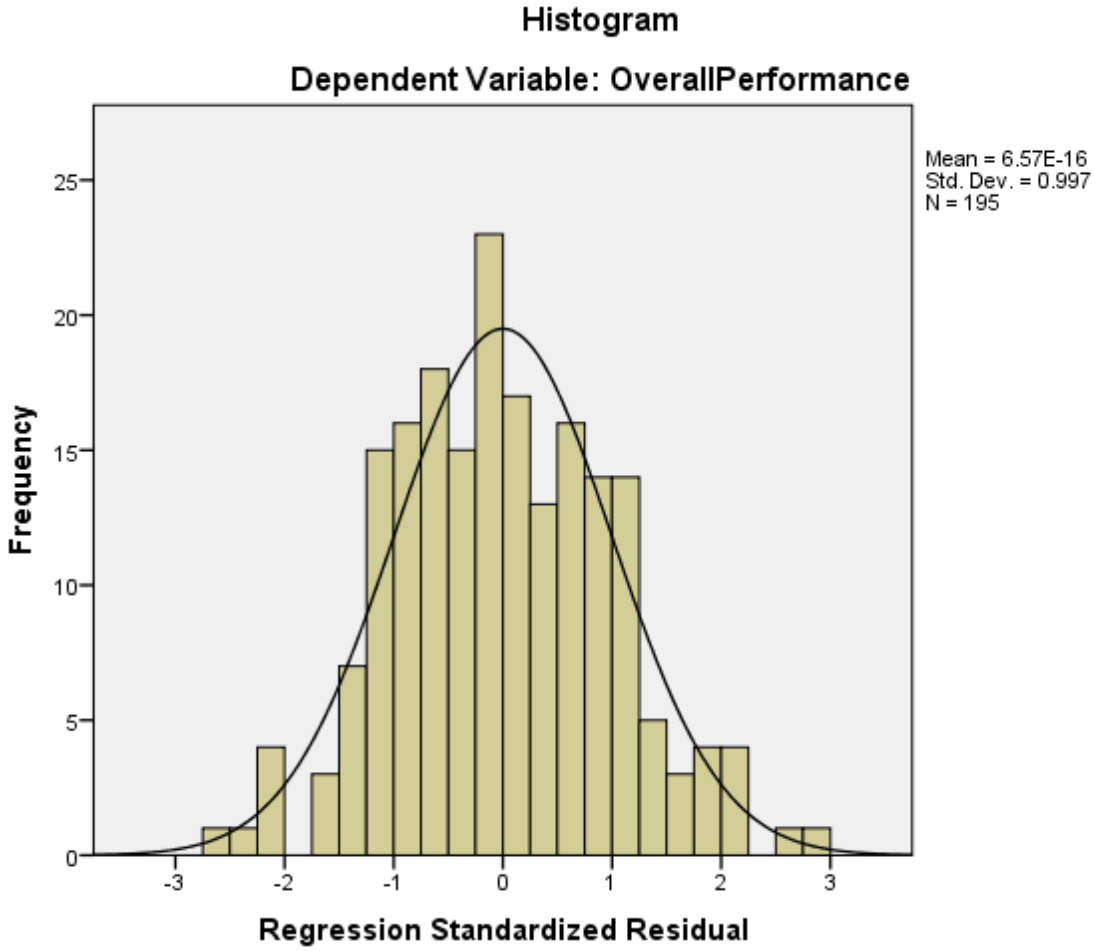
4.3 Test of Regression Assumptions

Before making regression analysis the researcher was conducted test of normality, test of multicollinearity, test of autocorrelation, and test of correlation.

4.3.1 Normality Test

According to Osborne and Waters (2002) variables have normal distributions. Those non normally distributed variables are distrubed with substential outliers. They can be identified through visual inspection of histograms or frequancy distributions. If the residuals are normally distributed, the histogram should be bell-shaped and Bera-Jarque statistic would be not significant Brooke (2008). In parametric statistics, we fill the blanks concerning shape by assuming that the sampling distribution of the mean is normal Mordkoff (2016). Normality can be determined based on skewness and kurtosis statistics. Whereas kurtosis measured the relative flatness and Preakness of data values in the center versus in the tails of frequency distribution when compared with normal distribution Mulugeta (2017). To test normality of sample distributions the researcher was used histograms, skewedness, and kurtosis as presented in the following figure 4.18.

Figure 4.18 Normality Test Using Histograms



Source: Own Survey, 2018

As seen in the above figure 4.18, visual inspection of the histogram, it is bell shaped. As a result, normality is not a problem to perform regression analysis.

In addition to histograms to test normality the researcher has used skewedness and kurtosis value which is presented in the following table 4.13.

Table 4.13 Statistics

	Mobility	Reliability	Safety and Security	Infrastructure	Cost
Skewnes	.097	.299	-.513	.362	.015
Kurtosis	.243	-.642	-.169	.199	-.285

Source own Survey, 2018

As observed in the above table, kurtosis value is less than 3 have a low peak and thick tails. Therefore, all variables are within the acceptable range for normality and their value is below two.

4.3.2 Test of Multicollinearity

Multiple regressions assume that the independent variables are not highly correlated with each other. Colliniarity also called also called multicollinearity refers to the assumption that the independent variables are uncorrelated Darlington (1968) and Keith (2006). Multicollinearity occurs when several independent variables correlate at high levels with one another or when one independent variable is a near combination of other independent variables Keith (2006). The more variables overlap (correlate) the less able researchers can separate the effects of variables. Multicollinearity can result in misleading and unusual results, inflated standard errors, and reduced power of the regression coefficients that create a need for larger sample sizes Jacquard et al (2006).

If multicollinearity is found in the data, one possible solution is to center the data. To center the data, subtract the mean score from each observation from each independent variable. However, the simplest solution is to identify the variables causing multicollinearity issues (i.e., through correlations or VIF values) and removing these variables from the regression. The VIF value tells us how much the variance of the coefficient estimate is being inflated by multicollinearity Williams (2015). Interpretations and conclusions based on the size of the regression coefficients, their standard errors or associated T-test may be misleading because of the confounding effects of collinearity Mason and Perrault (1991).

The assumption is tested using variance inflation factor (VIF) values and tolerance. Variance inflation factor (VIF) - The VIF‘s of the linear regression indicate the degree that the variance in the regression estimates are increased due to multicollinearity. VIF values higher than 10 indicates that multicollinearity is a problem. In addition to VIF value, tolerance value for each variable should be less than 1.

As a result of the above assumption and associated theories, the researcher was used variance inflation factor (VIF) and level of tolerance to test detect multicollinearity among explanatory variables and to perform linear multiple regression analysis. Accordingly, the values for each parameter were presented in the table 4.14 below.

Table 4.14 Collinearity Statistics

Model	Collinearity Statistics	
	Tolerance	**VIF**
Mobility	0.811	1.234
Reliability	0.668	1.497
Safety & Security	0.968	1.033
Infrastructure	0.799	1.252
Cost	0.814	1.229

Source Own Survey, 2018

As observed in the above collinearity statistics table 4.14, the value of variance inflation factor (VIF) mobility 1.23, reliability 1.49, safety and security 1.03, infrastructure 1.25, and cost 1.22 respectively which is below 10. Numerous approaches have been proposed for coping with multicollinearity Charlotte and William (1991). Some authors argue that a tolerance value less than 1 or VIF greater than 10 roughly indicates significant multicollinearity. According to the value safety and security has the largest tolerance value as compared to the other independent variables. Generally, diagnosing the VIF and tolerance values, multicollinearity is not a problem or there is no inflation in the variance of coefficients. This would tell us there is an opportunity to overcome the overall regression analysis.

4.3.3 Test of Autocorrelation

Autocorrelation (or serial correlation) is important in econometric analysis for at least two reasons. First, when autocorrelation is present, a fundamental assumption of OLS method is violated, and the estimates of coefficient of variance will be biased downward and T-statistic upward Richard and Rosario (1998). The Durbin-Watson test, published in 1950, is probably the best known test for autocorrelation. This assumption requires that the errors are linearly independent of one another (Uncorrelated with one another). Covariance between the error terms over time is zero. If the errors are correlated with one another, it is stated that they are auto correlated. Brooks (2008) states that the test for the existence of autocorrelation is made using Durbin-Watson test and Breusch-Godfrey test. A value greater than 2 indicates a negative correlation, whereas the value below two indicates a positive correlation Field (2009). In order to perform the test, the researcher has used Durbin-Watson because of the only available test in SPSS.

Table 4.15 Autocorrelation Test

Model Summary

Change Statistics					Durbin-Watson
R Square Change	F Change	df1	df2	Sig. F Change	
.622[a]	62.076	5	189	0	1.812

Source: Own Survey, 2018

As indicated from the table 4.15, the Durbin-Watson autocorrelation test result shows the value 1.812 which is approximately two. As a result, the assumption of autocorrelation is validated, there is no randomization and the data set is under statistical control (no outliers).

4.3.4 Correlation between Independent Variables

In addition to other regression assumptions, correlation analysis in between independent variables has to be tested before going in to regression analysis. A Pearson correlation matrix is a technique of testing multicollinearity of explanatory variables by investigating the relationship of bivariate variables Wooldridge (2006). When computing a matrix of person's bivariate correlations among all independent variables the magnitude of the correction coefficients should

be less than 0.8. Thus, the result of correlation analysis was presented using Pearson's correlation coefficient which is most widely applicable in survey study.

Table 4.16 Correlation Matrix

Correlations

Variables	Overall Performance	Mobility	Reliability	Safety	Infrastructure	Cost
Overall Performance						
Mobility	0.499					
Reliability	0.712	.481**				
Safety	0.032	-0.02	-.251**			
Infrastructure	0.609	.536**	.618**	-.10**		
Cost	0.584	.330**	.570**	-.176*	.408**	

Correlation Coefficient Significant at 0.01*

Correlation Coefficient Significant at 0.05**

Source Own Survey, 2018

As of seen in the above correlation matrix table 4.16, none of the independent variables have correlation coefficient higher than 0.80. Due to this there were no any multiple relations between variables rather there is positive and negative relationship between response variables. Relatively the highest correlation was found to be in between reliability, infrastructure and cost. This makes no variable to be excluded in regression analysis. Therefore, the overall correlation analysis was satisfactory in order to proceed to regression analysis.

4.4. Discussions of Regression Results

This section presents the result of inferential statistics analysis on measuring the performance of multimodal transport system in Ethiopia from the assumptions which were tested.

The findings obtained by doing the multiple linear regression analysis concerning whether or not the five independent variables in the standard model predicted the overall performance of multimodal transport system (OPMTS), score- the dependent variable according to the ANOVA

statistics is a form of hypothesis testing for studies involving two or more variables Tom (2007) and the degree of emerging model's predicting the dependent variable in consequence of the standard regression, and the degree of the model's explaining the variance in the dependent variable were shown in table 4.17. Performance and interpretation of linear regression analysis are subject to a variety of pitfalls, which were discussed here in detail.

Table 4.17 Presentation of Regression Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.788[a]	.622	.612	.32212	.622	62.076	5	189	.000

a. Predictors: (Constant),Cost, Safety, Mobility, Infrastructure, Reliability

Source Own Survey, 2018

From the above table 4.17, we can see that, the standard regression analysis model's degree of predicting the dependent variable was found to be R=0.788. R square captures the percent of deviation from the mean in the independent variable that could be explained by the model. The model's degree of explaining the variance in the criterion variable was found to be adjusted R2=0.612. Looking at these coefficients, it is possible to say that the model predicts the dependent variable very well. In addition to this, the other thing that must be taken in to consideration is the ANOVA statistics independent variable in the standard model which was presented in table 4.18.

Table 4.18 Multiple Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.155	.206		.750	.454
	Mobility	.115	.038	.141	3.022	.003
	Reliability	.348	.053	.434	6.571	.000
	Safety & Security	.098	.050	.107	1.955	.052
	Infrastructure	.214	.066	.197	3.240	.001
	Cost	.231	.051	.245	4.478	.000

Source: Own Survey, 2018

Examining the above table 4.18 makes clear that the four independent variables in the standard model were significantly predictive of the dependent variable. The absolute value of β (Beta) indicates the order of importance of independent variable Gulden and NeseGuler (2013). The coefficient of β (Beta)-weight, is an estimate and so should be accompanied by a confidence interval that indicates its precision Tom (2007). Looking the contributions made by the predicting variables in the model, it was found that reliability made the highest contribution with the value of (β=0.434, P=0.03) followed by the score of cost, infrastructure, mobility, and safety and security. Contrary to this, the contribution made by the score of safety and security with beta value (β=0.107, P=0.52) is not significant at p value > 0.05 with the least contribution to the model. As seen from the result of the research by Mulugeta, (2017) factors that determine multimodal effectiveness are ranked in order of importance as, reliability is the first followed by transit time, cost, infrastructure and safety and security system which is excluded from regression equation. From the findings of the above research we can understand that the rank in order of importance of each of the variables is different with the result of this study. One of the basic and the big difference is the removal of safety and security from regression equation. The finding of this study has included safety and security from regressing equation at insignificant level. Safety and security problems are still inherent in the overall performance of multimodal

Transport system. When adopting multimodal transport most probably we can minimizes the risk of damage, theft and other related issues but we cannot avoid automatically from the system. In addition to this, schedule reliability, special cargo handling, frequency of schedule, tariff flexibility, knowledge of the personal, response to customer complain, cargo loss or damage record, were eliminated due to measurement redundancy, low factor loading, high modification index value and high standardized covariance Chao (2011). The basic difference is all variables are removed from taking in to consideration which was included in my thesis to measure the overall performance of multimodal transport system. According to this article this indicators are not driving factor to measure the performance of overall performance of multimodal transport system in Thailand. From this we can understand that the performance of a system may be different in different countries at different time based on the situation. In order to reach to this, much work has to be done at every corner of multimodal transport system.

The value of unstandardized coefficients shows that, constant value (α=0.155), mobility 0.115, reliability 0.348, infrastructure 0.214, cost of multimodal 0.231, and safety and security 0.098. The result can be interpreted as 1 percent increase in mobility, reliability, infrastructure, cost and safety and security could increase the overall performance of multimodal transport system by 0.115 percent, 0.348 percent, 0.214 percent, 0.231 percent and 0.098 percent respectively. Therefore, overall performance of multimodal transport system was determined by explanatory variables such as mobility, reliability, infrastructure, cost, and safety and security system.

Based on the result of regression analysis, the estimation equation is developed is shown below:

OPMTS = 0.155 + 0.115 (Mob.) + 0.348 (Rel.) + 0.214 (Inf.) + 0.231 (Cos.) + 0.098 (SaSec)

4.5 Discussions on the Result of Hypothesis Testing

This part of the study presents tentative and the actual relationship between explanatory variables and explained variable (overall performance) of multimodal transport system in Ethiopia in the case of Ethiopian Shipping and Logistics Services Enterprise. To accept or reject the hypothesis testing, the 0.05 probability level was historically an arbitrary choice but has been acceptable as a reasonable choice in most circumstances. If there is a reason to vary this level, it is acceptable to do so. So in circumstances where there might be very serious adverse consequences if the wrong decision were made about the hypothesis, then the significance level could be made more stringent at, say, 1% Cramer et al, (2004).

Hypotheses (H1)

Reliability has a positive correlation and significant effect on the overall performance of multimodal transport. As observed from correlation matrix table 4.16 reliability and overall performance of multimodal transport system were positively correlated with correlation coefficient of 0.712 significant at p-value equal to zero. Provided that accept alternative hypothesis H1. According to Chao (2011) factors that may affect the schedule reliability in a negative way are standstills, faulty equipment, signaling errors, other delayed trucks, delayed shunting yard operations, etc. all leading to delay. Woxenius (2006) finds that all time elements of transportation transport time, order time, timing, punctuality, and frequency effect negatively by increased door to door transport. On-time performance and frequency of transit service are commonly considered to be a major indication of transportation efficiency especially for the evaluation of a transit system Mullen and Monsere (2010). In addition to this reliability has positive relationship with the performance of multimodal transport system Mulugeta (2017). The result of correlation of the above three researches are related with my research hypothesis. Accordingly, increasing the reliability of multimodal transport will increase the overall performance of multimodal transport system.

Hypotheses (H2)

Safety and security systems of multimodal transport have a positive relationship and significant effect on the overall performance of multimodal transport system. As of seen in correlation matrix table 4.16, the result of correlation coefficient implies that there was a positive correlation between safety and security system and overall performance of multimodal transport. The relationship is not statistically significant at p-value>0.01 with a sample of 195 cases. Thus, it is possible to conclude that there was positive but insignificant relationship between safety and security and overall performance of multimodal transport system. The same with the study finding, safety and security system of multimodal transport system is positively related with the overall multimodal transport system Mulugeta (2017). In addition to this, safety and security were top concerns of freight carriers and shippers moving goods in Virginia. Highway crashes can significantly delay shipments to consumers and manufacturers, or interfere with delivery to port or terminal facilities VMFP (2014). This indicates there are safety problems within multimodal transport system. Negative safety and security impacts can be prevented or minimized through coordinated planning and strategies. Therefore, insuring the safety and security issues will increase the overall performance of multimodal transport system insignificantly.

Hypothesis (H3)

Infrastructure is positively related and has significant effect on the overall performance of multimodal transport system. Examining correlation matrix table 4.16, it is found that there is positive and significant association between infrastructure and overall performance of multimodal transport system. Because correlation coefficient of the variables under study have positive correlation coefficient and significant at p value less than 0.01. Therefore, we accept the alternative hypothesis H3.

Hypothesis (H4)

Cost is positively associated and significant effect on the overall performance of multimodal transport. As shown in the above correlation table 4.16, cost and overall performance of

multimodal transport are positively correlated each other with a higher significance level of p=0.000. Therefore, accept alternative hypothesis H4. Econometric estimates suggest that the doubling of an individual country's transport costs lead to a drop in its trade of 80 percent or even more Limao.et al (2001). In addition to this, a reduction in the cost of transport directly stimulates exports and imports, just as an increase in the exchange rate make exports more competitive, and a reduction in national customs tariffs lowers the cost of imports UNCTAD (2003). The same to this research finding, according to the study by Mulugeta (2017) cost is positively related with the overall multimodal effectiveness. This is related with the study EMAA (2016) that the major costs that affect the overall performance of multimodal transport system are sea- freight, inland transport, port handing, and clearance and demurrage costs. Based on the result of the research hypothesis there was truly reflection of the research hypothesis

Hypotheses (H5)

Mobility has a positive and significant relationship with the overall performance of multimodal transport system. As presented in correlation matrix table 4.16 mobility has a positive and significant relationship with the overall performance of multimodal transport system with coefficient of correlation 0.499 and significant at 0.00. Therefore, accept alternative hypotheses H5.

Hypothesis H5a (Mobility Sub Hypothesis)

Dwelling time (waiting time) of cargo at Djibouti and dry port is not within the grace period

Table 4.19 Dwelling Time at Dry Port
One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Transit Time at Dry Port	195	48.0667	22.02882	1.57752

	Test Value = 40					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Transit Time at Dry Port	5.114	194	.000	8.06667	4.9554	11.1780

Source: Own Survey, 2018

As illustrated in the above table 4.19, the result of one sample T test shows that mean transit time (dwell time) scores 48.07 days and the mean difference 8.066 days with significance level of 0.000. Accordingly, the test is significant at significance level less than 0.05. Therefore, accept alternative hypothesis. From the result we can conclude that average transit time of cargo at dry port was 48.067 which is greater than the promised average transit time of 40 days. This finding can be supported by ESLSE (2018) nine month operational report which accounts average dwelling time of cargo at dry port was 43.4 days. In general, the increase in dwelling time of cargo will charge container demurrage for each of days 30 days waiting time. This will increase the overall cost multimodal transport. In addition to this the transit time of containerized cargo at Djibouti is presented in the following table 4.20.

Table 4.20 Dwelling Time at Djibouti Port

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Transit Time at Djibouti	195	13.0308	4.67270	.33462

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Transit Time at Djibouti	24.000	194	.000	8.03077	7.3708	8.6907

Source: Own Survey, 2018

As illustrated in the above table 4.20, dwelling time at Djibouti has the mean score of 13.03 days and the mean difference 8.03 days with the level of significance equals 0.00. Thus, containerized cargos were not taken from Djibouti port with the specified grace period. Therefore, accept alternative hypothesis. Increase in the dwelling time of cargo results to the payment of unnecessary extra storage cost if cargo is not taken within 8 days which is paid in terms US dollar. ESLSE (2018) nine month operational report shows, 104 218 containers were passed via port

Djibouti. On average each of this containers are required to pay storage cost for days between 8 and 13 days which is around 5 days. In addition to this the study made by Mulugeta (2017) shows that the dwelling time of containers was more than 8 days. The finding of this study differs with that of the research conducted by Mulugeta (2017) the dwelling time of 2 days which shows dwelling time has increased. According to the nine month operational performance report ESLSE (2018) container dwelling time at Djibouti port was 11 days. As compared to 2017 report, it has increased with 5.2 days on average.

4.6. Analysis of Open Ended Questions

The customers were asked to mention major problems and suggest solutions to improve the overall performance of Multimodal transport system in Ethiopia. Accordingly, the answer is forwarded as follows:

Question 1. What are the Major Problems of multimodal transport system and their possible solutions?

As stated in many literatures Ethiopian multimodal transport is characterized by long transit time, higher cost, lack of basic infrastructural facilities. From the total number of 195 customers were mentioned their problem as lack of infrastructure accounts 55 percent followed by 20 percent cost and 25 percent reliability of cargo transport. According to this response the infrastructure includes lack of machineries such as forklifts, riches takers, cranes and containers and other facilities. In addition to this infrastructural facility includes in efficient technology all over the organizational structure. 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 customer's "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 cost component which have significant impact on the performance of multimodal transport system. Customers were putted their problem as, freight cost and clearance cost are higher than

some other foreign ship companies such as Maersk and Mediterranean shipping company. One of the most important benefits of multimodal transport is cost reduction to be competitive in global market. Currently the sector is monopolistic market which is owned and operated by ESLSE. This may make profitable in the short run but will not successful so far. Because in the long run it will be the market that many shipping companies operate. Thus, ESLSE has to adjust the cost structure depending on what other market offers.

The other problem related to multimodal transport is the issue of reliability which is the most significant factor which determines the overall performance of multimodal transport system. Accordingly customers have forwarded their problems as cargo delay at the major terminal, passing many offices to get the service and document discrepancies. Even if there are improvements in transit time, still some containers were loaded above grace period. Documentation discrepancies are one of the major problems they encountered which include consignee name, seal number, Tin number, HS code and container number, etc.

From the above problems it is possible to conclude that, ESLSE is not providing multimodal transport services as promised (schedule reliability), charging higher cost and lack of infrastructural facilities to enhance the overall multimodal transport operation. ESLSE has to perform the service depending on the global perspective to cope up with customers' needs and wants. This will make to stay in the market as pioneer or market leader.

CHAPTER FIVE

SUMMERY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of major findings, conclusions, recommendations and areas for further research based on the analysis made in the previous chapter. Thus, the chapter is organized in to three sections as section 5.1 presents summery, section 5.2 conclusions and section 5.3 recommendations.

5.1 Summary of Major Findings

The result found from the descriptive statistics presents, reliability has the lowest mean score 2.341 followed by cost with mean score 2.3974, infrastructure with the mean score 2.7821, mobility with the mean score 2.8185 and safety and security with the mean score of 3.436 respectively. Accordingly, customers are disagreed with reliability and cost, and also moderate for infrastructure, mobility, and safety and security system of multimodal transport system.

The result found from hypothesis testing and regression analysis of the study variables implies that, the overall performance of multimodal transport system was affected by predicting variables included in the study at different levels of significance. Accordingly, mobility, reliability, infrastructure and cost were positively related at significant value $p<0.05$ with the overall performance of multimodal transport system. Safety and security of multimodal transport which was positively related with overall performance of multimodal transport system insignificantly.

According to the result of regression analysis explanatory variable such as mobility, reliability, infrastructure and cost were the major drivers to the overall performance of multimodal transport system. In order of importance reliability was the first followed by cost, infrastructure, mobility and, safety and security.

5.2 Conclusions

The ability to transport goods quickly, safely, economically and reliably is seen as a vital to success of business Debela (2013). Access to logistics and multimodal transport services is an increasingly important prerequisite for competitive in a globalized economy, and many developing countries especially small island, landlocked and least developed ones, are precluded from such access UNCTAD (2003). In recent years, there has been a great increase through the movement of goods by containers or other unit-load devices .Among transport types, "multimodal transport" has the benefit of enhancing competitiveness of the freight industry as a whole through the use of most efficient mode of transport at each stage of transport Caris et al (2008). So as to get optimum benefit from multimodal transport system, the government of Ethiopia has adopted the system under the sole owner of Ethiopian Shipping and logistics Services Enterprise which is currently characterized by long transit time high cost, and other problems. To achieve the overall objective of the study, various statistical testing's approaches and methods were used. After conducting a detail analysis, the researcher has drowned conclusions.

The result of correlation between dependent and independent variables shows, there is a positive correlation. Mobility, reliability, infrastructure and cost are positively and significantly correlated with the overall performance of multimodal transport. From this result, the highest positive correlation exists in reliability followed by infrastructure, cost, and mobility. Contrary to this, safety and security of multimodal transport is negatively correlated with the overall performance of multimodal transport system. The other issue is test of significance which indicates the level of significance effect of one independent variable to the dependent variable. According to the result obtained from the test, overall performance has significant relationship with mobility, reliability infrastructure, and cost while insignificant relationship with safety and security which is opposed to p-value cutoff point.

The output of multiple linear regressions indicates that the variation in the overall performance of multimodal transport is explained by the independent variables such as mobility, reliability, infrastructure, and cost and, safety and security of multimodal transport system.

In general, reliability, cost, infrastructure, and mobility are significant key derivers of overall performance of multimodal transport system in Ethiopia whereas safety and security are insignificant determinants of overall performance of multimodal transport system in Ethiopian in the case of Ethiopian Shipping and Logistics Services Enterprise.

5.3 Recommendations

On the basis of the findings of the study, the researcher has forwarded the following recommendations:

- ✓ Reliability of multimodal transport system is the most important determinant factor on the overall performance of multimodal transport system. To improve the reliability of multimodal transport system ESLSE has to offer the service as promised, having flexible schedule, providing single window service, providing timely response to customer complain, providing dependable customs and clearance service, timely correcting document errors (TIN, bill of loading, manifest and other errors) and providing multimodal transport service with the best of professionalism.
- ✓ Reliability should be enhanced through strongly working with Djibouti government to avoid non value adding customs formalities to pick cargo early as possible within the grace period. To shorten the length of clearance and customs formalities, ESLSE should reduce the number of required documents and procedures at port Djibouti.
- ✓ Dwelling time of cargo should be reduced at Djibouti and Dry Ports. To shorten the dwelling time at Djibouti, the government of Ethiopia should reduce the transit permit process time at Ethiopian customs, customs clearance time at Djibouti, waiting time for D/O, port clearance time, waiting time for gate pass and truck waybill, and time for assigning trucks and loading.
- ✓ The costs of multimodal transport system should be reduced, especially sea freight and clearance costs. The sea-freight cost should be reduced through introducing planning in to the supply chain which maximize the advance notice to the carrier about the future loads important to maximize assets, including trucks, drivers, containers, and warehousing space and other related facilities. Developing a reputation for loading quickly also reduce sea-freight cost through inclining the carrier to work with the shipper. Shippers with consistent load time performance can even get these favorable load times baked in to the rate. This avoids the need to chase down assessorial charges a huge time drain. A shipper that operates more efficiently saves money and has the carrier lining up to serve them a twofold benefit. It can be also reduced through encouraging customers to take large orders. Additionally, to reduce port clearance cost, the government of Ethiopia should use alternative sea ports which

have minimum port charge and clearance costs than port Djibouti such as Port Sudan, port Berbera, and port Aden.

- ✓ Downsizing the free period of cargo stay at dry ports without charging demurrage costs. Currently, the free period those customers are not obliged to pay demurrage cost within 30 days. This affects the overall performance of multimodal transport. The government should reduce the grace period that customers obliged to pick their cargo early as possible before the charging demurrage costs.
- ✓ There must be exchange of real time information with customers and other parties with and outside the organization. Currently the ESLSE is using fragmented IT system which makes information and data exchange sooner difficult. This must be avoided in order. This should be improved through installing a full-fledged IT system which incorporates the overall process of multimodal transport system from port of origin to port of destination. Generally, it is important to give one stop shopping service to customers of multimodal transport system.
- ✓ Cargo tracking system has to be installed to follow the status of cargo at each stage of border crossings.
- ✓ Trucks round-trip must be enhanced through avoiding old trucks and using modern fleet management system. Currently, from the total of trucks owned by ESLSE, the half percentage indicates, they are old aged which has longer down time and higher maintenance cost. To increase trucks round trip ESLSE should purchase modern, speedy and high capacity trucks whereas avoiding old trucks.
- ✓ Vessels round-trip must be enhanced by using proper ship planning and making cargo ready early before vessels arrival. This should be improved through procuring the more and efficient cargo handling equipment, there should be proper supervision and replanting for berth operations specially during discharging of cargo. Decongestant measures should also be stepped up. Customs should review their clearance procedures and lastly, warehousing culture should be cultivated to reduce erratic importing which leads to congestion and hence increasing turnaround time.
- ✓ Signing international agreements to impose significant impact on ways how multimodal transport business done, aiming to increase efficiency and to reduce cost for MTO'S. This is

important to capture new ways or knowledge how multimodal business is performed acquired through sharing experience with best practitioners of multimodal transport system.

5.3.1 Recommendations for Further Study

Going forward there are many aspects of performance of multimodal transport system that still need to be investigated further. Given the above limitations, it would be beneficial to carry out research that improves the overall performance of multimodal transport system in Ethiopia from a broader perspective. Accordingly, researcher has forwarded the following research titles to be studied in the future.

- ✓ Assessment of the practice of multimodal transport planning in Ethiopia
- ✓ The impact of multimodal transport legislation on the performance of multimodal transport system in Ethiopia
- ✓ The implications of coordination and interaction of stakeholders on the performance of multimodal transport system in Ethiopia

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Appendix

Survey Questionnaire for Customers

St Mary's University School Post graduate Studies

A Survey Questionnaires for research project to be conducted in partial fulfillment of General MBA at St Mary's University

This survey is required to study the performance of multimodal transport system in Ethiopia for imported goods, in the case of Ethiopian Shipping and Logistics Services Enterprise.

Please note that, the information provided will kept confidential and used for academic purposed only. Your cooperation in completing the survey questionnaire by providing quire and reliable information is highly valuable and greatly appreciated. Thanking you in advance for giving your time and sharing experience.

Part I

I. Back ground information (**Make Circle**)

1. What type of business do you operate?
   A. Private Limited Company
   B. Share Company
   C. Partnership
   D. Joint Venture
   E. Governmental
2. Educational Background
   A. High school
   B. Diploma
   C. Degree
   D. Masters
   E. Doctorate (PHD)
3. How many years you have worked with Ethiopian Shipping and Logistics Service Enterprise_____
4. What was your company's annual total import turnover (in million Birr)
   1. ☐ Less than 5 Million 2. ☐ 6-9 Million ☐ 3. 10-19 Million
   4. . ☐ 20-49 Million 5. . ☐ 50 Million & More

6. Which type of cargo do you import mostly? 1. ☐ Containerized Cargo

2. Break Bulk ☐ 3. Liquid Bulk ☐ 4. Dry Bulk ☐ 5. RoRo (Vehicles) ☐

7. Have you faced Cargo Shipment Delay? A. Yes B. ☐ No ☐

8. If your answer is Yes What type of delay do you get?

1. ☐ Accident Delay 2. ☐ Intersection (awash, mele) Delay

3. ☐ terminal delay (Dry Port) 4. ☐ All 5. If any_____

9. Have you faced Cargo damage? A. ☐ Yes B. ☐ No

10. If your answer is yes, where did you get?

1. ☐ at Djibouti Port 2. ☐ At Modjo /Kality Dry port 3. ☐ At shipment

11. On average How many days your cargo waits at Djibouti and dry port _____ Days

12. On average How many days your cargo took starting from Djibouti _____ Days

Part II. Measure the Performance of Multimodal transport service as per the following Measurement Variables (Make tick Mark as √)

No	Multimodal transport service Measurement Indicators	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	I. Mobility					
1	Multimodal Transport Service is accessible					
2	Multimodal Transport has Shortest transit time					
3	The average Waiting time of containers & Trucks in the port is low					
4	Trucks Turnaround time is low					
5	The vessels length of stay is high from the time of arrival to the time of departure					
No.	**Multimodal transport service Measurement Indicators**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	II Reliability					
1	Multimodal transport Operator is offering the service as promised (Based on the schedule)					
2	Multimodal transport has flexible Schedule					
3	Multi modal transport service provides single window service					
4	Provides timely response to customer complain					
5	Has dependable customs and port clearance service					
6	Document Errors are corrected timely					
7	Multimodal transport service is provided with the best of professionalism					
	III Safety and Security					
1	Personal and cargo safety protection equipment's are available					
2	General port safety and security information is available					
3	Multimodal transport operator notifies cargo damage on time					
4	There is on time insurance coverage during cargo damage					
	IV Infrastructure					
1	Adequacy of port and terminal facilities and Corresponding facilities					

2	Adequate road and other mode of transportation					
3	Inland Transport has sufficient modern Trucks					
4	All over there is Exchange of real time information using sophisticated ICT tools					
5	Availability of Cargo Trucking Information System					
6	The service provided by Multimodal transport has online Booking					
V Cost						
1	cost of Inland Transport is Reasonable					
2	Cost of Sea Freight is Reasonable					
3	Cost of Port Customs and Port Clearance is Reasonable					
4	Cost of Storage and Demurrage is Reasonable					
VI Overall performance of Multimodal						
1	The Overall performance of multimodal transport has excellent performance					

Part III Q1. Please specify the major problems in multimodal Transport System?
