ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

FACULTY OF BUSINESS

ASSESSSEMENT ON THE EFFECTS OF INFORMATION AND COMMUNICATION TECNOLOGY ON THE PERFORMANCE OF ETHIOPIA CROSS BORDER TRANSPORT FIRMS

BY

MESSAY BETRU MULATU

SGS/0019/2008A

JUNE 2017

ADDIS ABABA

ASSESSSEMENT ON THE EFFECTS OF INFORMATION AND COMMUNICATION TECNOLOGY ON THE PERFORMANCE OF ETHIOPIA CROSS BORDER TRANSPORT FIRMS

BY

MESSAY BETRU MULATU

SGS/0019/2008A

A THESIS SUBMITTED TO ST. MARY'S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION

JUNE 2017

ADDIS ABABA

ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

FACULTY OF BUSINESS

ASSESSSEMENT ON THE EFFECTS OF INFORMATION AND COMMUNICATION TECNOLOGY ON THE PERFORMANCE OF ETHIOPIA CROSS BORDER TRANSPORT FIRMS

BY

MESSAY BETRU MULATU

APPROVED BY BOARD OF EXAMINERS

_____	_____
Dean, Graduate Studies	**Signature**
_____	_____
Advisor	**Signature**
_____	_____
External Examiner	**Signature**
_____	_____
Internal Examiner	**Signature**

DEDICATION

I dedicate this research work to my mother, Beletu Tessema, who always try to make me best person. Mamiye, I would like to thank you from the bottom of my heart for all your consistent effort.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

First, I want to praise God for allowing me to pass all my steps with passion, patience, strength and dedication.

The writing of this thesis has been an exciting journey. During my thesis work, I met many remarkable people. I would like to express my sincere gratitude to them and everyone who helped me arrive at my final destination – the successful completion of this graduation paper. Specially, I would like to thank Assistant Professor Zemenu Aynaddise, my supervisor, for his constant enthusiasm, straightforward feedback, and guidance that helped me stay on the right track. The successful completion of this thesis work would not have been possible without him. I am grateful to our classmates in Master program of General MBA (2008A) for their useful advice and appropriate criticism of ideas during our entire journey, especially Ashe, Amman, Christi and Serke. I also like to acknowledge all participants in the study for their help, support, and interest and time that allocated for giving valuable data and hints. Furthermore, I would like to thanks all the managements and employees of Emergency Relief Transport Enterprise for their support during my entire work.

I would like to express my gratitude to my parents for their support and patience, which have made my live meaningful my dad, Betru Mulatu, and my sweet sisters Edom and Kidist (Butusha).

Finally, my love and gratitude goes to my darling wife, Selam, who have always been supportive and believed in me during the entire journey.

Thank you!

Messay Betru

June 2017

LIST OF ABBREVIATIONS AND ACRONYMS

B/L	Bill of Landing
CD-ROM	Compact Disk –Read Only Memory
CT	Communication Technology
EDI	Electronic Data Interchange
ERA	Ethiopia Road Authority
EU	European Commission
FTA	Federal Transport Authority
GDP	Growth Domestic Product
GPS	Global Positioning System
GoE	Government of Ethiopia
GSM	Global System for Mobile Communication
GNP	Growth National Product
GIS	Geographic Information System
ICT	Information and Communication Technology
IT	Information Technology
ITS	Intelligent Transport System
JIT	Just In Time
Km	kilo Meter
LSP	Logistics Service Provider
RSDP	Road Sector Development Program
SFTS	Smart Freight Transport System
SCEA	Shippers Council of Eastern Africa

RH	Road Hauler
RFID	Radio Frequency Identification
SAD	Single Administration Document, a combined customs form.
SME	Small and Medium Enterprise
SPSS	Statistical Package for Social Science
TB	Transport Buyer
TM	Transport Management
UNECA	United Nation Economic Commission for Africa
WB	World Bank
VoR	Vehicle off the Road
3PL	Third Party Logistic

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

For a country like Ethiopia, that does not own its seaport; efficient and reliable cross border transport service is a key issue for the country's foreign trade in order to be more competitive in the global market place. The current rapid economic growth of the country has increased its foreign trade. The majority of the foreign trade facilitated through cross border freight transporters. However, the current cross border freight transport operation is operating at a lower level of efficiency and reliability. In order to improve the efficiency and reliability of cross border freight transport operation, this study aimed at assessing the effects of ICT on the performance of Ethiopia cross border transport firms. The study used descriptive research design to answer the research questions. Stratified sampling method used to select the samples. Hence, 85 firms were included to be the target samples from the total 166 population using proportional stratified method. To select the samples from each stratum simple random sampling method were used. Pilot test conducted to test the reliability and the validity of the questionnaire. The primary data collected through questionnaire and analyzed using SPSS. The results of the study presented in the form of tables, pie chart and graphs. Based on the findings of the study most of the firms were perform their activities through mobile, phone/fax and internet. The levels of usage of more advanced systems providing real-time information were very low. Further, majority firms performed their activities with ineffective equipments. This indicated that majority firms perform their activities with obsolete technological equipment. The results also showed that ICT affect the vehicles operational efficiency by increasing vehicles utilization rate and by assisting for managing the driver in better ways. The results indicated that implementing ICT on customer service delivery enable firms to be more reliable and predictable. The study also indicated that ICT have low impact on safety and security of vehicles. Cost of adoption, lack of adequate supplier, lack of managements and owners awareness about the potential benefits of modern ICT system were the main reasons for cross border transport operators for not using advanced ICT system.

Key words: *Information and Communication Technology, cross border transport, efficiency, reliability, customer service, safety and security, firms' performance*

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Transport is an indispensable element of development and socio-economic growth. As engines of economic integration, transport infrastructure and service facilities constitute a precondition for facilitating trade and the movement of goods and persons (UNECA, 2009). Transport system is the most important economic activity among the components of business logistics systems. The principal role of transportation is to provide access between spatially separated location for business and household sectors, for both commodity (freight) and person movement. For business sector, these involve connection between businesses and their input source, between businesses and other businesses, and businesses and their market. Transportation occupies one-third of the amount in the logistics costs and transportation systems influence the performance of logistics system hugely (Tseng, 2005).

Freight transportation represents a key factor of socio-economic development. Freight traffic volumes have significantly increased over the last decades, because of radical changes in production and distribution systems on the one hand and structural economic and geopolitical changes on the other (Marchet et al, 2009). Changes in the production and distribution systems relate to the development of just-in-time methods and stock minimization. These changes significantly affect the freight transport organization and flow patterns; shipments are now more frequent, volumes per shipment are less massive, orders are more irregular, lead times are shorter and transport distances are longer (Kapros, 2009). Structural economic and geopolitical changes relate to the globalization process, involving a significant increase of commercial exchanges, integration of new markets in the world economy, relocation of economic activities and new procedures, behaviors and user practices as well. Globalization also affects the organization of freight distribution systems and the flow patterns. Distribution networks

are more extended and outsourcing practices are more intense. Freight traffic volumes expected to increase further in the future (EC, 2007).

In this context, the management of freight transportation systems faces a great complexity. The creation of extended multi-firm networks involves a variety of actor types: shippers/producers, commercial companies, transport companies of all modes, third party logistics providers, intermodal transport operators, infrastructure operators. Transport users quality requirements, such as reliability, flexibility and safety, have significantly increased. Considering the above, achieving high productivity and efficiency, lower costs and higher service quality in transportation, became an increasingly difficult task (Tsamboulas and Kapros, 2000).

For companies competing in highly dynamic markets, the search for new sources of competitive advantage is essential. Rapid changes in technological development are forcing businesses to look continuously for innovative strategies to improve their competitiveness. In many cases, this has revolutionized the way companies operate. In recent years, the transportation industry has progressively become more competitive (Davies, Mason & Lalwani, 2007) to face the new challenges related to supply chain globalization and internationalization. Both new international players and new issues brought into the competitive arena, such as the need to look for both cost compression and service level increase when choosing their logistics providers. Transport and logistics activities have become more complex and decision support tools are increasingly necessary to coordinate and manage transport and logistics operations (Manuj and Sahin, 2011).

Rapid increasing of globalization requires constant innovation and a higher level of Information and Communication Technology (ICT) adoption especially in the areas of transport, supply chain and logistics services in general. It is well recognized that ICT facilitates the "integration of supply chain activities which enables the seamless globalization of services and can afford greater specialization for the service provider as operations become more sophisticated. Indeed, the innovative use of ICT in the supply chain context can be referred to as the use of ICT applications that support the supply chain's objectives of improved efficiency and responsiveness, based on the needs of the current stakeholders in the supply network" (Goh and Fraser, 2012).

The road transport industry characterized by a range of environmental and societal pressures, as well as ever-increasing customer demands for higher service levels at lower cost. In this scenario, road haulers are required to offer new and innovative ways to improve the efficiency of transport operations in order to fulfill the demand to move freight on time and reliably, as well as with greater visibility and lower environmental impact (Thomson, 2010). In such an environment, the competitiveness of road transport companies is increasingly dependent on their ability to embrace innovation (Wagner, 2008). One of key driver of innovation in the road freight haulage industry in ICT (McKinnon, 2009) and the main benefits associated with the adoption of ICT in road haulage include improved responsiveness to rapidly changing customer requirements and uncertainty, reduced costs through the optimization of transport operations and enhanced safety (Siror et al., 2011). The higher level of uncertainty (in the form of delays, lack of coordination, delivery constraints and variable demand), characterizing the competitive landscape in today's road haulage industry may also negatively affect costs and customer service levels (Sanchez *et al*, 2010).

The use of ICT in order to gain competitive advantage has become a key strategic issue in organizations in a fast globalizing environment (Kakabadse, Kakabadse & Kouzmin, 2005), particularly as a result of the fact that ICT plays a strategic role in the management of organizations. Rastrict and Corner (2010) and Lin and Lin (2006), among others, emphasize the positive relationship between ICT and its benefits. This implies that ICT may bring about organizational advantage. There are immense possibilities as regards ICT applications in transportation and logistics and various studies have noted several types of application, each one contributing to the transportation and logistics system in a unique way.

The application of ICT is widespread with ICT being regarded as an essential tool in the efficient administration of any organization and the delivery of services to clients. Schware (2003) maintained that ICTs have been integrated into procedures, structures and products throughout businesses, governments and communities.

The use of ICT increases the supply of information as ICT plays a key role in information sharing and dissemination. According to Spanos et al. (2002), ICT removes distance and time constraints in the accessing of required information flows. Shanker (2008) is of the opinion that the use of ICT in many organizations has assisted in reducing transactional costs and, overcoming the constraints of distance by cutting

across geographic boundaries; it has contributed to improving the coordination of activities within organizational boundaries.

There is a consensus on the fact that ICT applications can enable the exchange and sharing of critical information, thus facilitating better decision-making and firm performance (Evangelista et al, 2012). In particular, the main benefits associated with the use of ICT applications in road transport may be summarized as follows: 1) improved route planning and transport scheduling; 2) better tracking of vehicles and goods along the shipment process; 3) faster transport operations as a result of more efficient data gathering and analysis; 4) improved documentation of transactions; and, 5) higher levels of coordination and integration between different road haulers and other supply chain participants. The extant literature offers different taxonomies regarding ICT adoption in practices. For instances, Evagelista et al. (2010) classified ICT into basic and advanced but not specified the criteria for such categorization. Marchet et al. (2009) and Perego et al. (2011) classified transport related technologies into four main types from commercial company perspectives: - Transport Management Application, Supply chain Exeutation Application, Field force automation Application and Fleet and Freight Management Application.

ICT improves safety and efficiency in freight transport operations resulting from improvements in the exchange of information between the actors in supply chains (Giannopoulos, 2004; Vilko et al., 2012). ICT drives road haulage companies towards more efficient and effective operations (Cetinceviz and Bayindir, 2012). According to Stefansson and Woxeuus (2007), as it similar with many other industries, ICT are regarded as major facilitator for the improved planning and controlling of road transport activities.

Wiayak (2013) indicated that the possibility of providing online data on fleet operations represents a significant contribution to more efficient and effective fleet management with substantial benefits in the use of such information for management decision making. Ayantonyinbo (2015) showed in his research that the impact level of ICT use by freight industries which fall moderate impact on their performance as majority of them only use the low technology for information gathering. The study points to a number of key factors that inhabit the widespread adoption and use of ICT, and these include cost of technology, uncertainty over business benefits and impact and lack of relevant internal ICT expertise. The study of Stefansson and Woxeues (2007) indicated

SFTS's framework proposed numerous attributes that have to be specified to be able to increase precision, reliability and efficiency in transport execution and reporting. Further, the study showed SFTS could contribute in managing vehicles and drivers, managing in freight flow and customer contact and managing authority contacts.

African has many landlocked countries, with the result that a significant portion of road freight must travel along multinational corridors (S. Mpata, et al., 2011). As one of the landlocked country in the horn of Africa, Ethiopia uses ports of Djibouti, Sudan and Somaliland for its international trade. According to Asnake (2006), that road freight industry plays a significant role within economic development of Ethiopia in terms of national distribution of goods as well as facilitating international trade. Commercial road freight transport accounts for 95% of Ethiopian cargo movements.

Regardless of its vital importance to the country, Ethiopia's cross border road transportation operates at lower efficiently and reliably level for different reasons (Ansake 2006; Nathanael 2015; Helen 2015; Bemnet 2004 Kifle, Gebray, Adamtei and Girma, 2000). Therefore, the purpose of this study aimed to assesses the effects of ICT on the performance of Ethiopia cross border transport firms. The study seeks to inform transport operators and other stakeholders how ICT will influence the performance of their businesses.

1.2. Statement of the Problem

As one of the landlocked countries in the horn of Africa, Ethiopia currently uses ports of Djibouti, Sudan and Somaliland for its international trade. Port of Djibouti accounts for 98% of total maritime traffic and 91.5% of Ethiopia's total foreign trade, the balance (2%) passing through Port Sudan and Port Berbera (EU, 2013).

The current rapid economic growth of Ethiopia has increased the import and export trades' volume. The majority of import and export trades of the country facilitates through cross border road transporters. Efficiency and reliability of the cross border road transportation have a significant impact on the international trade and general economic development of the country. To be competitive in global market place, the cross border road transport sector need to operate at higher level of efficiency and reliability. Ethiopian government has been implemented huge road transport infrastructure and other projects to improve the efficiency and reliability of the cross

border road transport industry. Despite these measures, the cross border transport industry still operating at lower level of efficiency, reliability and high transport cost.

Regardless of the significant impact of being landlocked on the efficiency and reliability of cross border transport activities, many other factors contribute for the inefficiency and unreliability of the current cross border transport operation of the country. On other hand, because of globalization and internationalization, competition has altered transport firms to look for innovations that will keep their customers and succeed more. Because, of the need for efficiency and reliability in road transport industry, different ICT systems introduced and used mostly for commercial purpose. These systems promote customer relationship, improve operational efficiency, reduce running cost, reduce transaction time and give transport firms competitive edge.

In Ethiopia, different Information and Communication Systems being implemented by both private and state owned cross border freight transport firms to improve efficiency, reliability and their operating costs. There are few empirical researches discuss on Ethiopia road freight transport operation mainly on Addis Ababa – Djibouti corridor (Ansake 2006; Nathanael 2015; Helen; 2015; Bemnet 2004 and Kifle, Gebray, Adamtei and Girma, 2000). However, none of them discussed the impact of ICT on the relationship between improved efficiency, reliability, and operating costs, and overall performance of the transport firms.

Transport firms need to keep up with continuous technological changes taking place around the world as this has the potentiality of affecting their performance in terms efficiency and reliability. Despite this innovative information and communication technology, transport firms could not meet expectations of improved service level mandated by customers and increased market pressure to cut cost. In addition, transport firms have found it a challenge to grow and meet up with responsibilities as the volume of transaction increase every day.

Despite the vital role of cross border road transport industry and its influence on economy, environment and society, it is suffering from inefficiency, unreliability and high operating costs. Ethiopia's cross border transport strongly influenced by the fact that Ethiopia is landlocked country and that its international trade characterized by strong imbalance between exports and imports (7.34 million tones of imports and 1.34 million tons of export in 2013). The latter has direct impact on transport efficiency with

high percentage of empty truck in the direction of the neighboring foreign ports (EU, 2013). According to Kifle et al. (2000) stated that transit vehicles usually haltered for about two hour per trip on each of the four checkpoints (at Galaif border, Mille, Awash and Nazareth) with in Ethiopian territory, occasioning on average total delay of eight hours per vehicle. Road freight transportation in Ethiopia characterized by inadequate supply and aging of vehicle with low carrying capacity and low utilization rate. According to East Africa Logistics Survey report on East Africa Corridor efficiency (2012), truck turnaround time as an average truck recorder 5,000 – 6,000 km per month against an international average of between 9,000 km to 12,000 km per month.

In fact, Ethiopia cross border transport operates in competitive way with regard to other corrodes in Africa, but it still endures with inefficiency and unreliability. This research therefore, aimed to assess the effects of ICT on the performance of cross border transport firms of Ethiopia and to identify its important impact on their operation in order to assure their profitability and growth.

1.3. Research Questions

According to statement of the problem, this study answered the following research questions.

- What types of ICT adopt in Ethiopia cross border transport firm and its impact on their performance?
- What effects ICT usages have on vehicle operational efficiency of Ethiopia cross border transport firms?
- What effects ICT usages have on customer service delivery of Ethiopia cross border transport firms?
- What influences do ICT have on Safety and security of Ethiopia cross border transport firms vehicle fleets?

1.4. Objectives of the Study

General Objective of the Study

The general objective of this study is to assess the effects of ICT on the performance of Ethiopia cross border transport firms.

Specific Objectives

This research guided by the following specific objectives.

- To describe the types of ICT adopt in Ethiopia cross border transport firms and its impact on their performance.
- To describe the effects of ICT usage on vehicle operational efficiency of Ethiopia cross border transport firms.
- To assess the effects of ICT usage on customer service delivery of Ethiopia cross border transport firms.
- To describe the influence of ICT on Safety and security of Ethiopia Cross border transport firms vehicle fleets.

1.5. Significance of the Study

This study will have an implication for transport firms and academic purposes. For private and state owned transport firms, it will provide the benefits of using modern information and communication technology in their main aspect in order to increase the performance of the firms. For academic purpose, this study serves to increase knowledge concerning ICT and performance of firms to the already existing body of knowledge.

1.6. Limitations of the Study

The Researcher acknowledged that there are some limitations in this study. The first was during collection of the questionnaires that were distributed. In this study, from 85 targeted samples 65 firms were completed and returned the research questionnaires. For different reasons the remaining questionnaires were left uncompleted and could not able to collect.

Another limitation of the study relates to the literature review. The researcher had difficulty to find previous studies in the context of Ethiopia in the field of ICT and cross border transport operation. These limitations might have effects on the results of the study.

1.7. Delimitation/Scope of the Study

The study specifically discussed the effects of ICT on the performance of Ethiopia cross border road transport firms. Therefore, the scope selected was cross border road transport firms that have licensed by Federal Transport Authority and the authority. The study focused on cross border road transport firms that used different ICT systems on their operations. Top and middle management filled the research questionnaires on the selected firms and senior FTA officials monitor and supervise cross border operation interviewed.

1.8.Definition of Terms

Modes of transport: **-**are ways of transport used by transportation service providers in order to render their services such as waterways, railways and airways.

Freight Transport: - refers to the movement or transporting traded goods from place of origination to the place of consumer or buyer, using any mode of transport available or preferred.

Global positioning system (GPS): □ technology that uses the signals and data from multiple satellites to determine a location anywhere on earth. The GPS constellation consists of 24 orbiting satellites with four equally spaced around each of six different, orbiter planes.

Inland Transport: - road transportation service given using trucks and the like.

Logistics: - is an integrated flow of goods and services and information in the supply chain process.

Fleet management system: □ management tool that is also known as an intelligent fleet management system. It provides the manager with essential information through GPS technology that gives the accurate position, velocity and time data of the fleet. GPS

provides this data free of direct user charge worldwide, continuously, and under all weather conditions.

Fleet telematics: general term referring to emerging technologies in automotive communications, combining wireless voice and data capability for management information and safety applications.

Global system for mobile communications (GSM): originally short for "Group Special Mobile" which is digital wireless communication.

1.9. Organization of the Study

This study organized on five chapters. In chapter one background of the study, statement of the problem, research questions and objectives, significance, scope and limitation of the study discussed in detail. In chapter two literatures related to transportation, and international trade and globalization, overview of Ethiopia road transport and cross border transport, and ICT overview and ICT based transport systems are reviewed. In chapter three the research design and methodology for the study discussed. In chapter four the findings of the study with detail discussion presented. In the last chapter, chapter five, conclusions and recommendation drawn from the findings of the study are summarized and presented.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2. Theoretical Literature

2.1. International Trade and Transportation

Transport is an indispensable element of development and socio-economic growth. As engines of economic integration, transport infrastructure and service facilities constitute a precondition for facilitating trade and the movement of goods and persons (UNECA, 2009).

Rodrigue (2005) stated that because of the geographical scale of the global economy, most international freight flows circulate over several modes. Transport chains must be established to service these requirements, which reinforce the importance of transportation modes and terminals at strategic locations. International trade requires distribution infrastructures that can support its volume and extent. Two transportation modes are specifically supporting globalization and international trade; maritime and air transportation. Road and railways tend to account for a marginal share of international transportation since they are above all modes for national or regional transport services. In terms of weight, about 96% of the world trade is carried by maritime transportation. A large share of this trade is handled by large containerships linking producers and consumers along sea-lanes. On the other hand, P Allan Woodburn, Julian Allen, Michael Browne and Jacques Leonardi (2008) argued that technological innovations in transport and ICT are reducing the time to market for products. This is making it possible to manufacture products in distant locations from market and is making trade in products possible where it had not been previously (*e.g.* air-freighted cut flowers). High-quality, fast and reliable international freight transport systems, that have resource costs that are sufficiently low to ensure profitability, are essential in achieving this. This is opening up new opportunities for international land (road and rail) transport.

Traditionally for international goods movement, air transport has been used for products that are time-sensitive and valuable, and sea has been used for lower-value products that are less time sensitive. However, ever-longer international road and rail transport options are becoming viable because of infrastructure improvements and international agreements (which are resulting in increasing land-based international transport volumes). These land-based modes are likely to increase their modal share of international goods movements as they offer services that are cheaper (but slower) than airfreight and faster (but more expensive) than sea. However, the quantity of goods transported internationally by land modes is still very small in comparison with domestic road and rail freight movements.

The costs of transporting goods from one international location to another (the resource cost of transportation) is probably the most important cost of trade for most products. This cost varies with distance, weight and bulk density of the product, and its handling requirements in transit (Deardorff, 2005).

Time is another important factor in the cost of international trade (Deardorff, 2005). Time is required to transport the good from its origin to its destination, as well as to load and unload it, and to process the goods and the vehicle through customs clearance and border crossings (P Allan et al, 2008). It has been noted that time delays and the variability of transit times are of greater concern to shippers than direct transport costs, as they affect companies ability to meet agreed delivery schedules (Hummels, 2001).

2.2. The Impact of Globalization on International Transportation

Modern business practices, such as just-in-time (JIT) delivery systems and global supply chains, underscore the importance of timely and predictable delivery of goods across the globe (SCEA, 2012).

Globalization has been supported and expended by the development of modern transport systems. From large containerships to small delivery trucks, the whole distribution system has become closely integrated linking manufacturing activities with global markets. However, the beginning of the 21st century brings many challenges to the role of transportation in the global economy. The capacity of many segments of transport system has been stretched by additional demands tying up long distance transportation modes. Congestion in many international transport terminals such as

ports often causes delays and unreliable deliveries and there is an acute need for improving inland transportation systems, notably those linked to the major gateways of the global economy (Rodrigue, 2005). Globalization processes occurring in the world economy are not without impact on the transport and logistics sector. Transport, forwarding and logistics enterprises have to adapt to the requirements set for them by the globalizing economy as well so to submit to more and more advanced internationalization processes (Kozlak, 2008).

The operations of global and transnational companies affect the size and structure of the world exports and imports. The production process division into stages executed in different countries makes it necessary to transfer goods and services both inside a corporation (between the central unit and its branches or between specific branches) and in relations with suppliers and customers. Globalization of production and formation of complicated networks of interrelations are the reason why the demand for transport is greater and the quality requirements for the provided services are stricter. The operation and development of global business networks and the involved trends in the area of distribution affect the structure of supply chains that take the form of extensive logistics networks serving as the infrastructure for business networks. Those changes are characterized by a transition from the economy of "stocks" to the economy of "flows" where the last phase of production becomes the onset of a logistics and transport process (Liberadzki and Mindur, 2007).

Meeting the needs of customers who demand high levels of service at the lowest possible cost requires complex transport and logistics networks that are able to respond to demand in a timely, cost effective manner. Successful global production and manufacturing operations (and their respective supply chains) closely integrate their distribution activities to ensure reliable access to inbound materials as well as timely delivery to the end customer.

The complex web of global production, transportation and consumption requires greater efforts to manage. As the range of production expanded, transport systems adapted to new demands in freight distribution where the reliability and timely deliveries can be as important as costs. Logistics has consequently taken an increasingly important role in the global economy, supporting a wide array of commodity chains. First, improvement in transport efficiency expanded the geographical range of commodity chains. Second, a reduction of telecommunication costs enabled corporations to establish a better level

of control over their commodity chains. Third, technological improvements, notably for intermodal transportation, enabled an increased continuity between different transport modes and thus within commodity chains (Rodrigue, 2005). Rodrigue (2005) stated that the results have been a decrease of the friction of distance and a spatial segregation of production. This process is strongly imbedded with the capacity and efficiency of international and regional transportation systems, especially maritime and land routes. It is becoming rare for the production stages of a good to occur at the same location.

2.3. Overview of Ethiopian Road Transport Sub - Sector

Ethiopia is the second most populated country on the African continent, nearing 90 million of which 81% lives in rural areas (2014), highly scattered around the country. Only six cities have more than 200,000 inhabitants (Addis Ababa has more than 3 million people, while five cities - Mekele, Adama, Dire Dawa, Gonder and Hawassa - have each 210,000 to 280,000 inhabitants). The distribution of the population with one main city and a high percentage of rural population dispersed throughout Ethiopia's territory bring about specific geographic patterns of production, consumption and distribution, which have a major influence on domestic transport patterns. Moreover, Ethiopia's cross-border transport is strongly influenced by the fact that Ethiopia is a land-locked country and that its international trade is characterized by a strong imbalance between exports and imports (7.34 million tones of imports and 1.34 million tones of exports in 2013). The latter has a direct impact on transport efficiency, with a high percentage of empty trucks in the direction of the neighboring foreign ports (EU, 2016).

Road freight transport, or trucking, is essential to modern economies, occupying a unique socioeconomic position linking supply to demand and linking many industrial sectors. As the mode of transport that brings most goods to their final destination, it is indispensable to tourism, trade, and the well-being of any economy, and is a primary indicator of economic health—generating a significant portion of GDP, employing millions of people, and offering the primary means for moving domestic, trans-border, and international cargo. Road transport represents more than 70 percent of the land freight service at origin and destination points, connecting businesses to world markets (WB, 2009). The Road Transportation or motor-carrier industry consists of companies that provide long- and short-haul freight trucking services. A key activity of the

industry is the shipment of containerized and bulk freight, including consumer goods and a wide variety of commodities. Companies in the industry are generally asset-based, owning and operating their own fleets (SASB, 2014).

In most developing economies like Ethiopia road transport is one of the most popular and important modes of transport. In the case of Ethiopia, the physical and economic features as well as economic status of the population, make road transport the most viable mode of transport, the country must give priority to develop its socio-economic infrastructure. Besides movement within the country, road transport plays an important role to cater the international transport requirement with the neighboring countries. Major international traffic can be observed in the Addis Ababa- Djibouti corridor (Asnake, 2006). Asnake (2006) stated that road transport network service in the country is insignificant in relation to the size of the population and geographical area of the country. The distribution in the country is also uneven and therefore it could not contribute significantly to the efforts to balance the distribution of social services.

In 1997, classified road network in Ethiopia was about 26,550 km of which 3708 km federal asphalt and 12,162 km federal gravel, and 10680 km of Regional roads. In terms of density, the road network is about 0.46 km per 1000 population and about 24 km per 1000 square km area. Ever since 1997, but even more vigorously since 2007 (during the third Road Sector Development Program, RSDP-III), the GoE has identified the transport sector as a priority and Significant improvement has shown in road network development. The network has increased to 99,522km of classified roads in 1990 of which 12,640 km were Federal Asphalt, 14417 km were Federal graveled and 33,609 km regional roads and 39,056 km were woreda roads. In terms of density, the road network is about 1.1 km per 1000 population and about 91 km per 1000 square km area. (Table 1)

The road network is the backbone of the transport system in the country. The development of the (classified) road network has been impressive - in 17 years, the federal network has been extended by 69%, while the regional network length more than tripled and the total network of classified roads increased by almost 73,000 km including more than 39,000 km of Woreda roads during the last 4 years.

Table 1: Length of Road Network in Ethiopia in Kilometers

Road type / class		End of RSDP-I (5 years)	End of RSDP-II (5 years)	End of RSDP-III (3 years)	RSDP-IV (4 years)
	1997	*2002*	*2007*	*2010*	*2014*
Federal –Asphalt	3,708	4,053	5,452	7,476	12,640
Federal –Gravel	12,162	12,564	14,628	14,373	14,217
Federal Total	15,870	16,617	20,080	21,849	26,857
Regional	10,680	16,680	22,349	26,944	33,609
Woreda					39,056
Classified Network	26,550	33,297	42,429	48,793	99,522
Km/1000 population	0.46	0.49	0.55	0.58	1.1
Km/1000 sq.km	24	30	39	44	91

Source: ERA (Annual Assessments of RSDP)

According to EU 2016 report, by mid-2014, 74% of the paved roads, 58% of the gravel road and 55% of the rural roads were considered to be in good (or fair) condition. At the start of the RSDP in 1997, these figures were 17%, 25% and 21% respectively.

The present size of the national motor vehicle fleet has been estimated at 450,000 to 500,000, but according to insurance company data, the active (insured) fleet is about 350,000, which is a relatively small fleet size for providing the road user charges needed for maintenance of the rapidly extending road assets. The composition of the active national motor vehicle fleet - largely concentrated in Addis Ababa - could be roughly: 200,000 cars/taxis, 65,000 buses (all sizes), 70,000 small trucks and 15,000 large truck-combinations. The growth of the vehicle fleet and of its fuel consumption in particular is of great importance for the growth of the Road Fund (fuel levy) for road maintenance. The annual vehicle-kilo meter performance (2014) on the classified road network was estimated at 5.95 billion Vehicle-Km/year (16.3 million/day), but is likely to be at least 30% larger (7.7 billion Vehicle-Km) when including Addis Ababa and other urban traffic flows (EU, 2016).

In 2013/14, the registered number of road accident fatalities was 3,115 (244 drivers, 1,266 passengers, and 1,605 pedestrians) and around 14,000 casualties, which was about twice as many as in mid-1990's. Nevertheless, the fatality rate, calculated as

number of (registered) fatalities divided by the (estimated) 1,000 Vehicle-Kilometers/Day, has come down to 0.192 from around 0.50 in the mid-1990's (EU, 2016).

According to EU (2016) report that lately (2013/14), some 180,000 trucks (with a total of 800,000 axles) have been checked on overloading, with only 6% found exceeding legal limits, whereas this used to be more than 30% in the period until 2009. Further strengthening of Axle Load Control is expected after implementation of a network of 14 truck weighing stations (incl. relocation of 3 of the 10 existing stations), where the out-dated equipment will be replaced by WiM (single platform) equipment including a pre-selection facility to exclude empty and lightly loaded trucks.

2.3.1. Overview of Ethiopia Cross Border Road freight Transport Industry

As the only landlocked country in the horn of Africa, Ethiopia currently uses ports of Djibouti, Sudan and Somaliland for its international inlet and outlet trade. Port of Djibouti accounts for 98% of total maritime traffic and 91.5% of Ethiopia's total foreign trade, the balance (2%) passing through Port Sudan and Port Ber bera. The total foreign trade turnover of Ethiopia has shown a remarkable increase since 2003. The total trade turnover grew on average by 17% per annum between 2003 and 2012 (EU, 2013).

Cross border road freight transport industry is the dominate mode of transportation to facilitate the international trade of the country. Firms that have engaged in cross border road transport operations comprise private limited companies, share companies, associations and state owned enterprises. These cross border transport operators carrying both liquid freight and dry freight transport. Dry freight transport operators classified into different categories based on their fleet size, load capacity and their fleet age (FTA, 2017).

There is no doubt that the industry has undergone considerable change. Besides the development of transport infrastructure, increasing the effectiveness of the transport system is part of the Government effort to reduce transportation cost. To that end, the Ethiopian Government deregulated the transport sector by the proclamation number 14/1992 that issued in May 1992. This proclamation laid down the foundation for the creation of large private trucking firms and competition in the freight traffic. From time

to time, the private sector's capacity and role in the provision of transport services have been increasing. Nowadays, particularly in the Addis-Djibouti corridor, the competition and the availability of transport with reasonable price have been improving to support the need of the exporters (Afro Tsion Consult, 2009).

The main qualitative attributes of a freight service are transit time, reliability of meeting expected times, likelihood of loss, damage and theft, availability of capacity, and convenience of departure times and frequency of service. Their relative importance will vary from shipper to shipper depending on the type of commodity being shipped, its manner of shipment (e.g., refrigerated cargo space, in bulk, in container loads, less than container loads, or in small packages), and the frequency of shipment. In addition to freight charges, these attributes strongly influence the choices transport users make in deciding on a mode of transport. Better or greater levels of service usually command a premium freight rate (WB, 2009). In addition to these, Afro Tsion Consult (2009) stated that the efficient management of road transport throughout the world could summarize with the key words availability and utilization. Vehicles are very costly and ideally should be available for 95 percent of the time and used for paid work over 80 percent of this available time. Delays through bad roads, border delays, weighbridge checks, customs delays at roadside and at destination, poor scheduling for loading and unloading, road accidents, single driver operation and congestion all reduce utilization. Availability is reduced through heavy maintenance (time and cost) required on old vehicles being used beyond a reasonable working life (15 to 20 years) and unscheduled breakdowns for the same reason. In addition old vehicles cost more in fuel and maintenance, as modern vehicles are more efficient.

The prevalence of a structural imbalance (with low volume of exports on one hand and the fast growing nature of the economy on the other) tends to exacerbate the gap between import and export volumes. The outcome of this trend is a further decline or little improvement in truck load factors. The increase in the share of commodities that will require specialized heavy trucks will generally affect the demand for commercial for-hire common carrier trucks. The widening gap between volume of exports and imports has increased the vulnerability of the dry cargo transport industry, contributing to lower average load factors, due to the need to make empty haulage in the direction of the ports. In addition to these, the seasonal nature of demand for freight movement also has an influence on transport efficiency. There is high underutilization of capacity

outside the peak season, during which time there is a downward trend in freight rates. This is exacerbated by the higher increase in imports compared with exports, which generally reduce the load factor of trucks, particularly on the major international trade corridors due to imbalance between front haul and back haul movements (Afro Tsion Consult, 2009).

According to Afro Tsion Consult (2009) that for truck operations in Ethiopia overall, on average only some 55,000 km/year of paid-for transport is achieved, compared with 62,500 average from Comet, 80,000 in other African countries, 120,000 in Asia and over 200,000 in Europe. As stated, Comet claim 62,500 km/year average utilization and for the main Addis Ababa to Djibouti run they should be able to achieve more than this. Low vehicle utilization is costly as vehicles wear out more through lack of use (e.g. from condensation and rust) than they do when working hard. In addition "pure" road transport from "A" to "B" is difficult to make profitable. This is why many transport companies in developed economies offer additional services such as repacking, warehousing, servicing vehicles for others and specialized transport, such as controlled temperature transport. This benefit makes more profit than simple road movements for "hire and reward".

Reasons for the low utilization in Ethiopia are many and varied with a figure of 30 percent vehicle off-the-road (VoR) time often stated. This will have had an adverse effect as will delays from slow customs clearance. The new multimodal Through Bill of Lading (TB/L) should help speed up the process on international traffic as will the introduction of the Single Administrative Document (SAD), but customs and police checkpoints on the road may continue to cause delays.

In addition, weighbridge delays can be long and although checks are necessary, they need managed in better way. Idle time at checkpoints also means that drivers and other crewmembers are being paid to wait around. The rather porous Somali border seems a major problem for Customs but may be international trucks can be trusted to have a special pass – Customs having perhaps gained some liability assurance from the truck owners (Afro Tsion Consult, 2009). Afro Tsion Consult (2009) also stated that it is alleged (e.g., by a regional transport bureau) that drivers may work for 16 hours a day and that some of the driving is done by other crew members who are not licensed to drive. We have no direct evidence of this but the possibility of this happening cannot be ignored. Either with qualified relief drivers in the sleeper cab, where provided, or at a

"relay" station en route, better utilization could be achieved legally and more safely. With one driver, it now takes five days for the journey from Djibouti to Addis Ababa. Assuming a constant supply of work, it should be possible in 240 days work in a year to achieve 96,000 km/year. Better management of the fleet to improve utilization is essential and this could be addressed by training within the CPC. In the absence of specific legislation on drivers' hours, which is badly needed, strict enforcement of the labor law would be possible now, and this should be done for bus and truck drivers. This would be an incentive for operators to find legal ways to increase vehicle utilization, by a relay system or by having vehicles with sleeper cabs and two drivers.

Currently, there are also government policies in place that restrict investment in transport by foreign investors which inhibits the free market principles found to be effective in many other countries, in Africa and elsewhere.

Success in international trade depends, amongst other things, on distance from markets. Lack of direct access to the sea, remoteness and isolation from major markets, inadequate transport infrastructure and cumbersome transit procedures are the main factors for high trade and transport costs that hampers the ability of landlocked developing economies to grow successfully. Enhancing capacity, strengthening and expanding dry port infrastructure services, facilitating export and import trades through improved transit corridors, reducing in general logistics time and costs incurred in import and export of goods as well as improving the management of freight vehicles so as to increase frequency of travel and reducing transportation time and cost are important activities that are in the process of being carried out.

2.4. Transport Efficiency

A. Distance of Road Freight Journeys

When dividing the amount of tone-km generated by the haulers from a specific country by the amount of tones carried, one gets the average distance each tone has been transported. While in national transport such an exercise is trivial as the haulers from larger countries would as a rule cover longer distances than their colleagues from the smaller ones, in international transport, and more specifically in bilateral international transport, such an exercise can provide an indication about the distance to the main markets of a given country.

B. Empty Runs

Increasing the efficiency of the transport system is one of the most important goals of European transport policy. Empty runs of road freight vehicles are inefficient and should therefore avoided as much as possible. In 2010, almost a quarter 23.9% of all vehicle-km of heavy road goods vehicles in the EU involved an empty vehicle. This was about 1 percentage point lower than in the years 2006 to 2009, when the share of empty vehicle-km in the EU was close to 25%, without major changes. The recovery in 2010 helped improve the efficiency of the road haulage sector in the EU to some extent.

C. Average Load Factor

The load factor is another measure of the efficiency of road transport. The higher the load factor, the fewer vehicle-km are needed to generate a given amount of tone-km. Fewer vehicle-km mean less traffic and hence less congestion. In the EU, the average load factor of loaded heavy goods vehicles was 13.6 tons in 2010. Similar to the situation with empty runs, international transport operations appear to be more efficient than national ones and transport for hire or reward is more efficient than own account transport.

2.5. Overview of ICT: Definition and Concept

The knowledge and use of ICT in the modern world is one of the basic elements of the literacy and the culture of man. We are in time when computers are taking more and more place in every day's life. There was small number of those who dared to use computers in various disciplines and areas like astronomy, physics, medicine, economic, traffic, using business intelligence programs, that would take the most important things from various databases as it were "irrelevant" information, what is crucial for today's decision (Ivana and Radivoje, 2012).

Today, many machines are used by the help of computer guidance or they are parts of various plants for production of parts, equipment and devices. ICT is used in various fields of industries such as tourism, agriculture, forestry, construction, transportation system for transporting of goods and passengers. ICT offers a wide range of specific advantages: increased efficiency and productivity, sharing and storing of information, communication, faster accumulation, dissemination and application of knowledge (Ivana and Radivoje, 2012).

Gorana and Dario (2011) stated that ICT concept involves transfer and use of all kinds of information. ICT is the foundation of economy and a driving force of social changes in the 21st century. Distance is no longer an issue when it comes to accessing information; for example, working-from-home, distance learning, e-banking, and e-government are now possible from any place with an Internet connection and a computing device).

(Ivana and Radivoje (2012) stated that Information technology (IT) is a term that describes the components (hardware equipment) and programs (software) which enables us to access, retrieve, organize, manipulate and present information electronically. Communication technology (CT) is a term, used to describe telecommunication equipment through which, we can send, receive, search and access to them. All together, it is called the Information and Communication Technology.

Gorana and Dario (2011) maintained that IT (Information Technology) encompasses all of the technology that we use to collect, process, protect and store information. It refers to hardware, software (computer programs), and computer networks. Gorana and Dario (2011) explained that the acronym ICT (Information and Communication Technology) includes all technical means that are used for handling information and facilitating communication, including computers, network hardware, communication lines and all the necessary software. In other words, ICT is comprised of information technology, telephony, electronic media, and all types of process and transfer of audio and video signals, and all control and managing functions based on network technologies.

Herselman and Hay (2003) described ICT as technologies that support the communication and co-operation of "human beings and their organizations" and the "creation and exchange of knowledge while Yu (2011) considered ICT to be a range of technologies that allow the gathering, exchange, retrieval, processing, analysis and transmission of information. In other words, ICT may be described as any tool that facilitates the communication, processing, transmission and sharing of information and knowledge through electronic means. According to Rwashana and Williams (2008), ICT encompasses a range of electronic digital and analogue devices such as radio, television, telephones (fixed and mobile), computers, electronic-based media such as digital text and audio-video recording, and the internet, but excludes the non-electronic technologies.

Selwyn (2002) refers to ICT as "an umbrella term that includes computer hardware and software; digital broadcast and telecommunications technologies as well as electronic information repositories such as the World Wide Web or those found on CD ROMs". Ivana and Radivoje (2012) ascertained that combined information and telecommunication technologies in various application areas, it is possible to find innovative solutions. It is enough to design a combination of existing knowledge and solutions and be creative.

2.5.1. ICT and Transportation Industry

The proliferation of information communication technology (ICT) and e-commerce since the 1990s—in the form of mobile phones, faxes, computers, the internet, and global positioning systems or satellite navigation—has helped the industry improve customer service, trace products, reduce empty journeys, meet delivery times, and reduce processing errors and administrative costs (WB, 2009).

The rapid development of information and communication technology (ICT) has resulted in reduced investment and operational costs (Esposito and Mastroianni, 2002) and ICT applications are viewed as a key tool to improve the efficiency and responsiveness of modern supply chain operations (Hazen and Byrd, 2012). In the field of freight transport and logistics, there has been a proliferation of systems and technical infrastructures supporting various business activities (Giannopoulos, 2004). In this context, ICT has the potential to reduce costs and improve customer service, thereby enhancing overall competitive advantage (Forslund, 2012).

The use of ICT in order to gain competitive advantage has become a key strategic issue in organizations in a fast globalizing environment (Kakabadse, Kakabadse & Kouzmin, 2005), particularly as a result of the fact that ICT plays a strategic role in the management of organizations. Rastrict and Corner (2010) and Lin and Lin (2006), among others, emphasize the positive relationship between ICT and its benefits. This implies that ICT may bring about organizational advantage. There are immense possibilities as regards ICT applications in transportation and logistics and various studies have noted several types of application, each one contributing to the transportation and logistics system in a unique way.

According to Spanos et al. (2002), ICT removes distance and time constraints in the accessing of required information flows. In addition, ICT reduces the cost of production as knowledge is produced, transmitted, accessed and shared at the minimum cost, while there is also a reduction in the degree of inefficiencies and uncertainty because it enables businesses to interact more efficiently (Buhalis, 2003). Shanker (2008) is of the opinion that the use of ICT in many organizations has assisted in reducing transactional costs and, overcoming the constraints of distance by cutting across geographic boundaries; it also has contributed to improving the coordination of activities within organizational boundaries. Spanos et al. (2002) maintained that ICT enables buyers and sellers to share information and transfer goods across national borders and this, in turn, helps to increase access to global supply chains.

ICT has also led to increased transparency in organizations as it enables the networking and information sharing that results in demands for greater openness and transparency (Shanker, 2008; Kollberg & Dreyer, 2006). Jiménez, Martínez and Llamas (2006) further argued that ICT plays an important role in the acquisition, creation and management of knowledge as it enables the diffusion of the organizational data that may be crucial in effective decision making and control at all management levels. Similarly, ICT helps in organizational planning and improves organizational communication and flexibility. Currently, the extensive use of ICT is changing the way in which people and companies work. Researchers such as Hipp and Grupp (2005) and Castellacci (2006) refer ICT as a vital tool for innovation in the present era. The benefits of ICT include the saving of inputs, general cost reductions, higher flexibility and improvement in product quality (Mouelhi, 2009).

Bloom, Garicano, Sadun and Reenen (2009) ascertained that ICTs play a major role in networking and communication as firms use these technologies in order to facilitate communication among employees and reduce coordination costs. According to Hanna (2003), ICT enhances the production process in organizations as monitoring technologies may be used to reduce the number of supervisors required in the process. In addition, Arvanitis and Loukis (2009) maintained that the use of ICT has direct implications for firms, with ICT playing a role in areas such as information gathering and dissemination, inventory control and quality control.

Olugbenga (2006) argues that ICTs are being used for strategic management, communication and collaboration, customer access, managerial decision-making, data

management and knowledge management. Thus, ICTs help to provide an effective means of organizational productivity and service delivery. According to Brynjolfsson and Hitt (2003), there is a substantial long-term productivity gain with the use of ICT in organizations. Buhalis (2003) also notes that the application of ICT in businesses results in fundamental changes that can provide powerful strategic and tactical tools for organizations if properly applied and used. This, in turn, may have a significant impact on promoting and strengthening organizational competitiveness.

2.5.1.1. ICT-Based Transport Systems

The extant literature offers different taxonomies regarding ICT adoption in practices. Evangelista et al. (2010) classified ICT into basic and advanced but did not specify the criteria for such categorization. Both the works of Marchet et al. (2009) and Perego et al. (2011) classified transport-related technologies into four main types from a commercial "company" perspective:

A. Transport Management System;

B. Supply Chain Execution System;

C. Field Force Automation System; and

D. Fleet and Freight Management Systems.

A. Transport Management Systems are support management tools which mainly concentrate on planning, optimization, execution, and freight consolidation and visibility operations. They often offer load tendering, load auctioning, routing, shipment tracking, payments and account handling (Marchet et al., 2009). In addition, TM decrease the amount of paperwork, improve communication between the warehouses, decrease turnaround time and generate reports based on real time data. Thus, the use of TM systems enhance the "level of customer service, accuracy of customer and product databases, and utilization rates of facilities, equipment, manpower, cash to cash cycle time and net asset returns can be enhanced" (Pokharel, 2005).

B. Supply Chain Execution Systems are tools mainly trying to automate administration of materials and the products movements through the entire manufacturing stages to the customer delivery process. They are helpful with real time

information sharing and management like proof of delivery and order processing and tracking (Marchet et al., 2009).

C. Field Force Automation Systems are heavily based on mobile technology and their role is to connect the remote workforce with the rest of the corporate business processes. Front line operators can access the back-office's forms, reports, and statuses and can feed input from the customers back to the back-office, all in real time (Marchet et al., 2009).

D. Fleet and Freight Management Systems are finding applicability in reporting vehicle travel times, service times, delivery points visited, load temperature for frozen and liquid products, door security for products of high value and pallet and trailer location. In addition to this, It is used for "real time input to dynamic vehicle management functions to manage efficiently a fleet of vehicles during the execution of the distribution plans" (Marchet et al., 2009), integration of electronic maps in the process, order-handling systems, vehicle tracking systems, and other communication systems (Marchet et al., 2009).

2.5.2. The Role of ICT in Road Freight Transport Industry

The road transport sector is a good example of an industry characterized by extreme competitive pressures, with customers demanding higher service levels combined with lower prices. In such an environment, the competitiveness of road transport companies is increasingly dependent on their ability to embrace innovation (Wagner, 2008). One of key driver of innovation in the road freight haulage industry in ICT (McKinnon, 2009) and the main benefits associated with the adoption of ICT in road haulage include improved responsiveness to rapidly changing customer requirements and uncertainty (Normandeau*et al*., 2003; Schönberger and Kopfer, 2012), reduced costs through the optimization of transport operations (Tjokroamidjojo*et al*., 2006) and enhanced safety (Siror et al., 2011). Evangelista *et al*., (2012) argued that there is a consensus on the fact that ICT applications can enable the exchange and sharing of critical information, thus facilitating better decision-making and firm performance.

Technology employed by the road freight transport industry is changing rapidly. Over the past decade, the trend toward larger trucks has continued, reducing demand for labor and fuel per ton-kilometers performed. Competition within the industry should

ensure that the benefits of technological developments are passed onto users. Technological improvements can benefit the operator and ultimately the user of the service by raising the general quality of service, lowering the costs of providing the service, and/or improving the service offering. Technology-driven improvements that speed the line-haul segment or make handling and pick-up and delivery services more efficient could improve the reliability factor so highly ranked by shippers (WB, 2009).

2.5.3. Road Freight Transport Activities Requiring ICT-Support

In this section, demands for ICT functionality and implementation are investigated from the perspective of Road freight transporters. One way of structuring the ICT applications for freight transport suggested by Boushka et al. (2002) who divides them into asset utilization, operational efficiency, security, quality control, and customer service. The observation mentioned above states that other actors pressure the Road freight transporters, however this leads to structuring the section managing vehicles and drivers are then regarded as activities mainly internal to the Road freight transport firm. Managing the freight flow and customer contacts regards the relations between the Road freight transporters firm, the consignee, the consignor and any intermediary, while managing authority contacts relates to access, charging of infrastructure, conforming to regulations, (e.g. working hours and emissions) as well as various intermittent reporting obligations. Clemedtson et al. (2006), uses a similar division; however, this includes the driver's family and friends as users of communication with the truck.

A. Managing Vehicles and Drivers

This section focuses on the need for ICT applications and functionality used primarily within the Road freight transports' own operations. These applications are used for improving the use of the production resources in terms of vehicles, load units and drivers. The division suggested by Andersson and Lindgren (2005) – dispatcher, driver, management, administrative personnel, and vehicle maintenance personnel – is used for denoting the professional roles inside the Road freight transporters.

As opposed to the one-directional and intermittent goods flow, trucks, trailers, unit loads, and drivers depart from a base to which they return regularly and the resource utilization must be managed continuously. The ability of matching the one-way transport assignments with the two-way flow of the Road freight transporter's resources

practically differ profits from losses. Typically, one third of the road transport distance is run empty (McKinnon, 1996). Better ICT support has been advocated for improving the balances. However, imbalances are accepted in technically specialized segments like petroleum distribution to petrol stations and timber transport from forest to mills, where the TB pays also for the empty backhaul (Stefansson and Woxenius, 2007).

Planning the drivers' schedules and optimizing their delivery tasks is getting increasingly complex due to stricter working time legislation in the EU (Karis and Dinwoodie, 2005), implementation of time-dependent driving bans (Bekiaris et al., 2007) and deliveries that follow stricter time windows. Longer opening hours for deliveries in manufacturing, construction and retailing also add to complexity of driver planning. Route distribution and long hauls are particularly sensitive since they involve rather protracted activities that are complicated to divide between drivers.

According to Stefansson and Woxenius (2007) that simpler planning tasks are still handled manually, but the dispatchers face an increasing need for ICT support in the office for solving complex planning situations, such as being able to tell whether a certain driver is likely to be able to deliver within the allowed driving hours and the set time window, or if the driver can pass through a road section before a weekend driving ban applies. It can also be a tool in the driver cabin warning when the driver approaches the allowed driving time or as a planning tool for routing and re-routing after changes in transport assignments or in road conditions.

Data logged in the vehicle and transferred to the office is also useful for the administrative personnel for calculating driver salaries or consolidating it for reports to the authorities. In addition, management will use the data for improving the firm's general efficiency, and for deciding on market and capacity issues or changes in semi-fixed pick-up and delivery routes.

Furthermore, there is a need for more technical data for managing the vehicles themselves to control fuel consumption, emissions and maintenance/repairs. Drunk driving and driving behavioral concerns are other areas of technical surveillance. These applications have been taken up by RHs during the last years, since they often lead to a direct cut of the fuel costs or damage to property or image. This more technical data is also useful for management when deciding upon vehicle replacement.

B. Managing the Freight Flow and Customer Contacts

This section focuses on the interaction between the vehicle and the goods, and the related contacts between the RH and its customers. According to Stefansson and Woxenius (2007), these are either TB's directly or for some segments other LSPs, such as forwarders, third party logistics providers and operators based in other traffic modes. In the latter case, the RH must coordinate with the LSP as well as the consignor and the consignee. From an RH perspective, the aim of the applications in this category is to improve the effectiveness of the vehicle operations in relation to its customers.

In traditional road haulage operations, the dispatcher instructs the truck driver to pick up goods at a consignee, but much of the data relating to the transport assignment is not available and has to be collected by the driver. Physical copies of the consignment note are later transferred to the administrative personnel and to the consignor. The data collected, including the proof of delivery signed on the consignment note, is then entered manually into different information systems, e.g., for invoicing of the goods and the transport service (Stefansson and Woxenius, 2007).

According to (Stefansson and Woxenius, 2007), ICT applications obviously have a significant role in improving the operations, and many applications are in widespread commercial use. Related to the goods flow, the RHs' need for ICT support divided into:

- improve efficiency; for cutting costs in operations and administration;
- make data visible; for improving planning by the RH and the customers;
- improve safety; for reducing errors to improve the value for customers and reduce claims and error corrections; and
- improve security; for more secure work environment for drivers and less claims

By reducing the number of times the data is entered manually, administrative costs can be significantly reduced and much of the toilsome error correction can be avoided. This obviously also improves the competitiveness of the RH. RHs would also benefit from more accurate information about the physical properties of the goods to transport. If they Lack this information, they cannot pre-plan the loading very well, and they often need to use excessive resources to cope with any deviations from what is booked by the TB. If the status data continuously made available to the actors in the supply chain,

much of the verbal communication that consumes time for dispatchers and administrative personnel would be avoided.

The ICT applications must support a wide variety of road transport services. Special cases are the transport of hazardous material, international transport requiring customs clearance and transport of temperature sensitive products. For the latter category, logging and communicating temperature data during transport allows RHs to monitor and adjust their operations to ensure that the products are not obsolete in transit and thus reduce claims for replacements (Josefsson and Philipsson, 2004). By logging the temperature curve rather than just alerting that the maximum or minimum temperature has been violated, a reduction of the durability of the product can be calculated rather than treating the product as obsolete. This is however, not applicable if the temperature violation has lead to an irreversible change of physical features in the product.

Road is often the modal choice for transport of theft sensitive products. Since thieves get increasingly brutal, it is a correspondingly increasing problem for a driver's work environment. RHs can use ICT applications for making the transport safer by sending alarms if the truck deviates from the planned transport pattern, referred to as geo fencing, or if a seal is broken (Clemedtson and Jansson, 2006). The ultimate aim is to reduce the attractiveness to steal the goods.

Still, most of the improved ICT capabilities in the road transport industry benefit the LSPs or the TBs more than the RHs themselves. For RHs, investments in ICT applications are often seen as fulfilling demands qualifying for doing business with certain customers rather than a deliberate effort to improve the activities. According to Arnäs (2007), the customer demand for electronic invoicing is seen by the RHs as an incentive for further use of the data.

C. Managing Authority Contacts

The third category where ICT can play a significant role for RHs is contacts with authorities, primarily as providers of infrastructure but also in the roles of regulation and law enforcement. Road safety with inspection of the technical standard of the vehicle and the status and behavior of the driver is obviously in the core, but driver safety, environment and security issues are attracting increasing attention by authorities. The market segment of hauling containers to and from seaports is particularly affected

by the stricter legislation on security (Tsai, 2006). The ICT applications in this field aim at smoother and more equitable charging, but also for more efficient administration of reports; e.g. statistics, working hours and salaries paid as basis for taxation.

Congestion is the external effect most costly to society. According to the European Commission (2006), road congestion incurs costs corresponding to 1% of the GNP in the EU, and RHs both contribute to and suffer from this problem. Allocating road slots to individual vehicles is currently only realistic for selective bottlenecks, such as bridges, tunnels and bus lanes.

ICT solutions can then support the prioritization of which trucks to use the scarce capacity. Rather detailed and dynamic data, like urgency of the goods delivery, current loading status and fuel used will be needed for a decision based on the highest benefits to society. RHs can also cooperate with authorities by reporting the congestion status from their vehicles. They can also get back aggregated data from many vehicles as basis for re-routing decisions (Arnäs, 2007). Road passage is important, but access to parking and loading docks in urban areas is also a common nuisance and cause of efficiency losses for RHs. Public ICT applications can here be used for more advanced slot allocation and for verifying the right of access and possibly charging (Stefansson and Woxenius, 2007).

There are also examples of private companies offering services corresponding to infrastructure for the RH; e.g. private toll roads, ferry and rolling highway operators are other modes used in infrastructure roles. For some of these services, slot allocation is the standard procedure.

2.6. Adoption of ICT in Road Freight Transport Industry

Despite the potential benefits of ICT usage, a number of studies suggest that the level of ICT adoption in the road freight transport industry has not kept pace with the rapid technological advances and decreases in the cost of technology (Higginbottom, 2002; Golob and Regan, 2002; Stefansson and Woxenius, 2007; McKinnon, 2009). In addition, the unequal access to ICT usage and benefits between large and small companies has produced huge digital divide (Bruno et al., 2011) in the EU transport and logistics service industry as documented in a study of the European Commission (e-Business Watch, 2008). Large companies have derived substantial benefits from

technology usage, as they are able to adopt more sophisticated ICT systems and applications than their smaller counterparts. Small operators, however, are hard put to find a business case for adopting these technologies when associated costs are high and skill sets are new and demanding. They are particularly slow to adopt internet technology and cannot set themselves up for E-commerce, particularly the expensive and cumbersome electronic data interchange (EDI) (World Bank, 2009).

Despite these potential benefits, investment levels in ICT have been relatively modest in the sector. McKinnon (2009) demonstrated that the rate of diffusion of ICT tools (such as digital tachograph, vehicle tracking systems and fuels economy improvement technologies) in the road freight transport sector has been relatively slow. He also noted:

"…when new equipment and systems are acquired, haulers often fail to exploit their full potential. The reluctance to innovate and the failure to maximize the benefits of Innovation can be attributed to a range of factors, some internal to haulage businesses, others externally controlled" (McKinnon 2009, p. 2).

The study of CSST and Cranfield University (2002) indicated low penetration of telematics in the road transport sector mainly due to high implementation and running costs, and associated long investment payback periods. Another survey conducted by the Italian Freight Leaders Council (2003) showed that the telephone was the most widely used communication tool in road haulage firms, while the use of web-based technologies was still limited.

2.7. Empirical Literature

The study of Ayantonyinbo (2015) was aimed at assessing the impact of ICT on the performance of freight distribution in term of supply chain, logistic and fleet management on 77 ICT users from Manufacturing , 3PL, freight forwarder, warehouse operators, wholesalers and retailers in some selected areas of lagos and ogun state, Nigeria. The data is collected through survey interview and descriptive statistical analysis used for the study. One of the major finding of the study is the impact level of ICT use by freight industries, which fall moderate impact on their performance as majority of them only use the low technology for information gathering. The study

points to a number of key factors that inhabit the widespread adoption and use of ICT, and these include cost of technology, uncertainty over business benefits and impact and lack of relevant internal ICT expertise.

The study of Langer and Vaidyanthan (2014), discussed the applications of ICT to save energy by improving the efficiency of freight vehicle operation, making better use of the freight network, and reducing ton-miles traveled without compromising businesses objective. The paper consider three types of strategies to make freight transportation more efficiencies; vehicle-level improvement, better use of the freight network, and change in the distance freight travel. The result indicated each categories benefited already form ICT based efficiency measure; ITS at the vehicle or multivehicle level, load consolidation to improve network efficiency, and route optimization to reduce ton miles traveled.

The research of Zhelyazkov (2012), aimed at assessing the problem which small road freight businesses encounter and how these affect the logistics industry in Australia. In addition to this, the author analyses the most popular ICT system available in the market, the main driving force for adoption by road transport SMEs, their functional features, whether or not these features address the problems of the small road freight businesses and finally suggests an ICT system currently available on the Australian market, that suit most of road transport SMEs needs. The author conducted structure interview with six companies from manufacture, road transport companies and from logistics brokers in Victoria, Australia. The result indicated that the most important benefits of ICT system adoption by road transport SMEs are cost reduction and improved competitiveness for small road transport businesses; cost reduction, error reduction, improved competitiveness and customer integration. On the other hands the result of the study indicated the most common inhibitors for ICT adoption by road transport SMEs are the high cost, lack of management imitative and support, lack of common communication standard and lack of an ICT system that can fulfill the companies needs and perceived reason for adoption. In addition, the study identified the most used ICT systems, which are web enabled booking, tracking, call center, EDI and labeling.

The study of Wiayak (2013) aimed to evaluate the effectiveness of modern fleet management system in improving the logistics of transporting staff, goods and materials in Kenya power and lighting company, a utility firm in power distribution. The study

used both the descriptive study approach and survey research strategy were adopted to enable the collection of data in a manner that allowed in depth examination while gathering information that explained the relationship between constraints, in particular, cause and effect relationships. The results indicated that the possibility of providing online data on fleet operations represents a significant contribution to more efficient and effective fleet management with substantial benefits in the use of such information for management decision making.

Despite the potential of ICT in this sector, there have been no study investigates into this issue in the Ethiopia cross border road freight industry. However, the literature has shown there are few studies that investigate the relationship between ICT and the performance of freight transport firms. This strongly points to the need for an in-depth understanding of the effects of ICT on the performance of Ethiopia cross border road transport industry.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1. Research Design

This study adopted descriptive research design. Descriptive research design is most appropriate method to answer the research questions of this study. Cooper & Schindler (2003) explained that descriptive research is employed to provide descriptions of phenomena or characteristics concerning a subject of a population, estimates of the proportions of the population that have those characteristics and to discover associations between different variables.

3.2. Population and Sampling Technique

The Population of the study includes all cross border transport firms that have registered under Federal Transport Authority and the authority itself. According to unpublished data of Federal Transport Authority (2017), there are 166 registered cross border transport firms within Ethiopia. These firms are divided into two main categories liquid and dry freight transport. Liquid freight transport firms transport the country liquid bulk cargoes from different port to inland depots. There are 76 liquid freight transport firms within the country. Dry freight transport firms transport the country import and export dry bulk cargo mainly. There are 90 dry freight transport firms within the country. Dry freight transport firms are further divided into four categories; Level 1 dry freight transporters, Level 2 dry freight Transporters, Level 3 dry freight transporters and Level 4 dry Freight transporters, based on their vehicles age, vehicles loading capacity, number of vehicles and the formation of the firms. Level 1 dry freight transport firms are those that have vehicles with loading capacity of 30 tones and above, vehicles age less than 10 years and have vehicles more than 125. Level 2 dry fright transport firms are those that have vehicles with loading capacity of 20 tones and above, vehicles age between 10 to 20 years and have vehicles more than 100.

Level 3 dry freight transport firms are those that have vehicles with loading capacity of 20 tones and above, vehicles age between 20 to 30 years and have vehicles more than 75. Level 4 dry freight transport firms are those that have vehicles with loading capacity of 20 tones and above, and firms under this category are mainly private limited companies and enterprises with different vehicles loading capacity and age, and have less vehicles.

Table 2: Ethiopia Cross Border Transport Firms Categorization

Categories		**Number of Firms**
Liquid Freight Transporters		**76**
Dry Freight Transporters	Level 1 Dry Freight Transporters	**34**
	Level 2 Dry Freight Transporters	**19**
	Level 3 Dry Freight Transporters	**25**
	Level 4 Dry Freight Transporters	**12**
Total Dry Freight Transporter		**90**
Total Cross border Transport Firms		**166**

Source: Own compilation based on FTA data, 2017

3.2.1. Sampling Techniques

In this study, the population were divided into four subgroup (strata) based on the types of freight transport, vehicles age and loading capacity. Therefore, to select the samples from the population the study used stratified sampling method. To select the subsamples from each stratum, simple random sampling method is used. According to Charney (1996), Stratified sampling is used when representatives from each subgroup within the population need to be represented in the sample. The first step in stratified sampling is to divide the population into subgroups (strata) based on mutually exclusive criteria. Random or systematic samples are then taken from each subgroup. Two senior officials from FTA were selected using purposive sampling method. According to Sekaran (2003), purposive sampling method involves the choice of subjects who are most advantageously placed or in the best position to provide the information required.

3.2.2. Sample Size

The samples for the study are drawn using proportional stratified sample. Proportional stratified Sample is stratified sample in which the number of sampling units drawn from each stratum is in proportion to the population size of that stratum. The population of the firms in this study falls into five grouping, four dry freight transport and one liquid freight transport, accordingly to the type of freight transport, vehicles age and loading capacity. In addition, each of the five groups of the firms has very similar characteristics among individuals within the group. The target samples for this study were $n = 85$ for the total population$N = 166$, and selected random sample of $n = 39$ from liquid freight transporters, $n = 17$ from Level 1 Dry Freight Transporter, $n = 10$ from Level 2 Dry Freight Transporter, $n = 13$ from Level 3 Dry Freight Transporter and $n = 6$ from Level 4 Dry Freight Transporter using the most popular formula proposed by Bowley (1926).

$$\sum_{i=1}^{h} N_h = N_1 + N_2 + \cdots + N_h = N$$

$$\sum_{i=1}^{h} n_h = n_1 + n_2 + \cdots + n_h$$

$$n_{h=} {}_{N_h} \frac{n}{N}$$

3.3. Types of Data and Tool/ Instrument Data Collection

In the following sections types of data, sources of data and data collection instruments used for the study described in detail.

3.3.1. Types of Data and Sources of Data

The study gathered data from both primary and secondary sources. Primary data refer to information obtained firsthand by the researcher on the variables of interest for the specific purpose of the study. The primary data was collected from cross border

transport firms and federal transport authority officials. Secondary data refer to information gathered from sources already existing. The study collected data from secondary sources, as for example, company records or archives, government publications, web sites, the Internet, and so on.

3.3.2. Instrument of Data Collection

In this study, questionnaires were the main data collection tool to collect primary data from firms. According to Nkapa (1999), a questionnaire is a carefully designed instrument for collecting data in accordance with the specification of the research questions. Questionnaires were suitable to collect the primary data for this study. To collect secondary data, the study reviewed secondary data sources that support the study.

3.4. Procedure of Data Collection

Prior to the commencement of the data collection process, the researcher carried out all the necessary activities that were required for successful completion of the data collection process. An appropriate research tools for the study were designed and duplicated. The researcher obtained support letter from the University for Ease of data collection processes. Following a brief explanation of the research purpose by the researcher, the questionnaire was provided to the sampled individuals who were firm mangers or senior officials of the selected firms. The researcher followed up the data collection processes closely and collected the research tools. To conduct the interviews with selected authority official the researcher made rigorous effort to set right time for the interview and conducted the interviews. During the data collection and handling phases all the necessary ethical considerations are undertaken.

3.5. Reliability and Validity Analysis

Validity and Reliability are terms that refer to the quality of the measures uses in a research study. Validity deals with whether an instrument is measuring what it is supposed to measure. The research instruments were validated using construct validity and content validity. Construct validity was sought for in this study through an extensive use of well-grounded theory and literature from other studies. This provides theoretical relationship and cumulativeness with previous work. The content validity is

developed by giving a set of draft questionnaire to few selected General Managers, IT Managers and Operation Managers in cross border transport firms and academicians in the field in transport. These experts reviewed the content and gave suggestions that assisted the researcher to present the items within the linguistic understanding of the respondents.

Reliability indicates the accuracy or precision of the measuring instrument (Norland, 1990). The use of reliability types (test-retest, split half, alternate form, internal consistency) depends on the nature of data. Among these measures of reliability, Cronbach's alpha is used to measure reliability (i.e., internal consistency). Internal consistency concerns the reliability of the test components. Internal consistency measures consistency within the instrument and questions how well a set of items measures a particular behavior or characteristic within the test. The reliability coefficient (Cronbach's alpha) can range from 0 to 1, with 0 representing an instrument with full of error and 1 representing total absence of error. A reliability coefficient (Cronbach's alpha) of .70 or higher is considered acceptable reliability.

Reliability was established using a pilot test by collecting data from 21 individuals from 5 firms not included in the actual sample. The test was carried out for questions prepared in likert five scale formats to check the internal consistency of those questions in the questionnaire. Data collected from pilot test analyzed using SPSS (Statistical Package for Social Sciences).

Table 3: Reliability Statistics

Cronbach's Alpha	N of Items
.871	24

Source: Own Survey, 2017

According to Table 3, the Cronbach's alpha value obtained is 0.871. From the rule of Cronbach's alpha value point of view, this value could be taken as a good value. The value confirmed the internal consistency of the variables used.

3.6. Methods of Data Analysis

In this study, the primary data that was collected through the questionnaire analyzed using descriptive statistics method by the statistical software called Statistical Package for the Social Science/SPSS/. By using descriptive statistics, the study described the variables numerically. Descriptive statistics include frequencies, measures of central tendencies (mean, medium or mode) and measures of dispersion (standard deviation, range or variance). The study used frequency and percentage to describe the variables.

CHAPTER FOUR

RESULTS & DISCUSSION

4.1. Results/Findings of the Study

In this part of the study, the data collected from primary sources presented, analyzed and discussed in detail. The data collected from the questionnaire including two open-ended questions that summarized and coded, and analyzed using one of statistical software known as SPSS, except two other open-ended questions out of four. In presenting and analyzing the collected data descriptive statistical method used in the study. Frequency and percentage used to describe the variables. Tables, pie charts and other graphs used to present the result of the study.

From 166 targeted populations, 85 were selected for the study. Form these 85 sampled firms which was supposed to be participated in the study 65(76%) of the firms competed and returned the research questionnaire to the researcher.

4.1.1. General Information

In this section, both demographic data of the respondents and the company's profile analyzed and interpreted.

4.1.1.1. Summary of Demographic Data

The finding in table 4 shows that out of 65 respondents who participated in this study 75.4% were men and the remaining 24.6% of the respondents were Female. This indicates that men dominated top managements and senior positions in the industry.

From the findings in the table below, 35.4% of the respondents were between 46 – 55 years of age and 30.8% of the respondents were between 36 – 45 years of age.

Among respondents that their age groups between 27 – 35 years of age, and 56 and above were 15.4% and 18.5% respectively. The finding indicates that majority of senior and managerial position in Ethiopia cross border transport firms were between 36 years to 55 years of age.

This study also sought to know the educational background of the respondents. From the findings in the table 4 below, majority of the respondents (95.4 %) hold their first degree and only 4.6 % of the respondents have College Diploma. The findings indicate that almost all Senior and managerial persons in the industry have acquired at least first degree.

In order to get more data that are reliable from this study the researcher distributed the questionnaires to managerial persons in each firms. The findings in the table 4 indicate that 58.5 % of the respondents were Operation Managers and 38.5 % of the respondents were General Managers. This indicates that Operation Managers and General Managers that were expected to know more about the industry filled the majority of the questionnaires, while only 3.1% of the respondents were senior operation officers.

The study further sought to know how long the respondents have worked in their firms. This question assisted the researcher in determining their knowledge and experience about the firms. From the findings in table 4, only 1.5% of the respondents have worked between 1 to 4 years in the firm, 3.1% have worked between 11 to 15 years in the firms, 12.3% have worked between 16 to 20 years and 10.8% have worked more than 20 years in the firms. However, majority of the respondent 72.3 % have worked between 5 to 10 years in the firms. This indicates that majority of the respondents participated in this study have long experience and knowledge about the firms.

The aforementioned results indicate that most the questionnaires that were distributed filled by top and senior managements who knew more about the operations, the industry and the firm. Majority of the respondents have been working for in the firms for long period. In addition, the results indicated that lower level turnover at top and senior management positions.

Table 4: Summary of Respondents Background Data

Sex of the Respondents					
	Sex	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	49	75.4	75.4	75.40
	Female	16	24.6	24.6	100
	Total	65	100	100	
Age of Respondents					
	Age	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	27 - 35	10	15.4	15.4	15.4
	36 - 45	20	30.8	30.8	46.2
	46 - 55	23	35.4	35.4	81.5
	56 and above	12	18.5	18.5	100
	Total	65	100	100	
Educational Background of the Respondents					
	Education level	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	First Degree	62	95.4	95.4	95.4
	College Diploma	3	4.6	4.6	100
	Total	65	100	100	
Job position of the Respondents					
	Position	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	General Manager	25	38.5	38.5	38.5
	Operation Manager	38	58.5	58.5	96.9
	Operation Section Head	2	3.1	3.1	100
	Total	65	100	100	
Respondents Work Experience in the Firm					
	Years	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 – 4	1	1.5	1.5	1.5
	5 – 10	47	72.3	72.3	73.8
	11 – 15	2	3.1	3.1	76.9
	16 – 20	8	12.3	12.3	89.2
	More than 20 years	7	10.8	10.8	100
	Total	65	100	100	

Source: Own Survey, 2017

4.1.1.2. The Type of Freight Transport Service the Firms Provide

Finding in table 5 shows that 66.2% of firms in the study provide dry freight cross border transport service, while 33.8% of firms provide liquid freight cross border transport service. This indicated that specifically from target samples for liquid freight transport firms, which were 39 firms, only 22(56%) liquid freight transport firms returned the research questionnaires. From target samples for dry freight transport firms, which were 46 firms, 43(93%) dry freight transport firms returned the research questionnaires. The results indicated that there were low response rate from liquid freight transporters.

Table 5: The Type of Freight Transport Service

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dry Freight	43	66.2	66.2	66.2
	liquid Freight	22	33.8	33.8	100.0
	Total	65	100.0	100.0	

Source: Own Survey, 2017

4.1.1.3. The Firms Grade Category

According to FTA, cross border transport firms divide into two major categories; liquid and dry freight transport. The later also divide into 4 sub categories based on loading capacity and age of the vehicles. For liquid freight transport, FTA does not categorized the firms further based on their vehicles loading capacity and age. The findings in table 6 indicate that 33.8% of the firms in this study were liquid freight transport firms, and 24.6% of the firms were from level 1 dry freight transport, 13.8% of the firms were from level 2 dry freight transport, 20% were of the firms were from level 3 dry freight transport and 7.7% of the firms were from level 4 dry freight transport. The target sample for Level 1 dry freight transport were 17, Level 2 dry freight transport were 10, Level 3 dry freight transport were 13 and Level 4 dry freight transport were 6 firms, and 16(94%), 9(90%), 13(100%) and 5(83%) dry freight transport firms returned the research questionnaires respectively. This indicates that response rate in each categories of dry freight transport were very high.

Table 6: The Firms Grade Category

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Liquid Freight Transport	22	33.8	33.8	33.8
	Level 1 Dry Freight Transport	16	24.6	24.6	58.5
	Level 2 Dry Freight Transport	9	13.8	13.8	72.3
	Level 3 Dry Freight Transport	13	20.0	20.0	92.3
	Level 4 Dry Freight Transport	5	7.7	7.7	100.0
	Total	**65**	**100.0**	**100.0**	

Source: Own Survey, 2017

4.1.1.4. Firms Fleet of Vehicles

Table 7 depicts that the number of vehicles that the firms' have. The findings from table 7 shows that 29.2% of the firms participated in this study own vehicles between 1 to 50, while 30.8% own vehicles between 51 to 100, majority of firms 32.3% in this study own vehicles between 101 to 200. Firms in this study own vehicles between 201 to 300, and 301 and above represented 3.1% and 4.6% respectively. From the firms participated in this study, all Level 1 dry freight transport operators own vehicles more than 50. This indicates that level 1 dry freight transporters operate large fleet of vehicles. From Liquid freight transport participated in this study majority of the firms own vehicles less than 50 vehicles.

Table 7: Firms Fleet of Vehicles

Firm Categories			Firms number of vehicles					Total
			1 -50	51 – 100	101 - 200	201-300	300 and above	
	Liquid Freight Transport	Count	13	6	3	0	0	22
		% of Total	20.0%	9.2%	4.6%	.0%	.0%	33.8%
	Level 1 Dry Freight Transport	Count	0	5	10	0	1	16
		% of Total	.0%	7.7%	15.4%	.0%	1.5%	24.6%
	Level 2 Dry Freight Transport	Count	3	1	3	0	2	9
		% of Total	4.6%	1.5%	4.6%	.0%	3.1%	13.8%
	Level 3 Dry Freight Transport	Count	2	5	4	2	0	13
		% of Total	3.1%	7.7%	6.2%	3.1%	.0%	20.0%
	Level 4 Dry Freight Transport	Count	1	3	1	0	0	5
		% of Total	1.5%	4.6%	1.5%	.0%	.0%	7.7%
Total		Count	19	20	21	2	3	65
		% of Total	29.2%	30.8%	32.3%	3.1%	4.6%	100.0%

Source: Own Survey, 2017

4.1.1.5. Number of Employees in the Firms

Table 8 shows that the number of employees that are working in the firms and the corresponding number of vehicles operate under them. The findings from table 8 show that firms that operate vehicles between 1 – 50 and have employees between 1 -10 represented 18.5% of total firms, firms that operate vehicles between 51 – 100 and have employees between 1 -10 represented 18.5% of total firms, firms that operate vehicles between 101 – 200, and have employees between 1 - 10 represented 12.3% of total firms. In addition, firms that operate vehicles between 1 – 50 and have employees between 11 - 50 represented 7.7% of total firms, firms that operate vehicles between 51 – 100 and have employees between 11 - 50 represented 10.8% of total firms, firms that operate vehicles between 101 - 200 and have employees between 11 - 50 represented 18.5% of total firms, firms that operate vehicles between 201 - 300 and have employees between 11 - 50 represented 3.1% of total firms, and firms that operate vehicles between more than 300 and have employees between 11 - 50 represented 4.6% of total firms . Findings in table 8 show that firms with vehicles number between 1 – 50 and 101 – 200 and have employees between 51 – 100 represented 1.5% and 1.5% respectively. The remaining firms with vehicles number between 1 – 50 and 51 – 100 operate by employees more than 100 and these represented 1.5% and 1.5% respectively. Hence, majority of firms in this study with a large number of vehicles operated by few employees. This indicates that majority of the firms operate large number of vehicles with few employees, and with low level and obsolete technologies.

Table 8: Number of Employees in the Firms

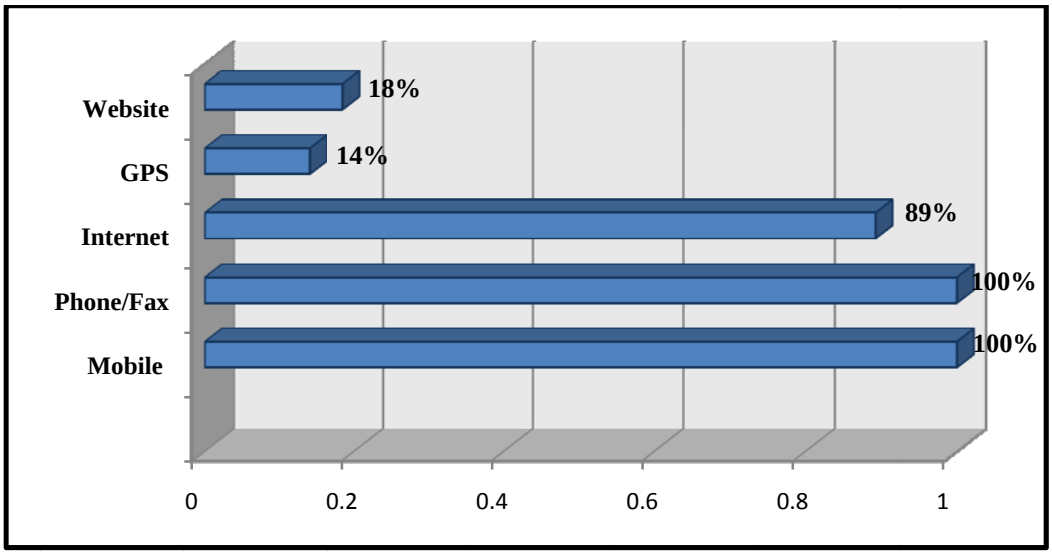
Firms Employees Number			Firms Fleet of Vehicles					Total
			1 -50	51 – 100	101 – 200	201- 300	300 and Above	
	1 -10	Count	12	12	8	0	0	32
		% of Total	18.5%	18.5%	12.3%	.0%	.0%	49.2%
	11 – 50	Count	5	7	12	2	3	29
		% of Total	7.7%	10.8%	18.5%	3.1%	4.6%	44.6%
	51 – 100	Count	1	0	1	0	0	2
		% of Total	1.5%	.0%	1.5%	.0%	.0%	3.1%
	More than 100	Count	1	1	0	0	0	2
		% of Total	1.5%	1.5%	.0%	.0%	.0%	3.1%
Total		Count	19	20	21	2	3	65
		% of Total	29.2%	30.8%	32.3%	3.1%	4.6%	100.0%

Source: Own Survey, 2017

4.1.2. The Types of ICT Adopted and its Impact on the Firms Performance.

The first objective the study was to describe the types of ICT adopt in Ethiopia cross border transport firms and its impact on their performance. Figure 1 shows that the types of ICT that has adopted in Ethiopia cross border transport firms. Out of 65 Ethiopia cross border transport firms who were participated in this study, 100 % of them uses both mobile and phone/Fax to perform their activities, 89% of the firms in this study use internet to perform their activities, while 18 % and 14 % of the firms use website and GPS systems to perform their activities respectively. This indicates that all firms use low-level technology to perform their operations.

Figure 1: The Types of ICT Adopt in Ethiopia Cross Border Transport Firms



Source: Own Survey, 2017

The findings in table 9 below depict that from the total number of firms of all categories, majority (84.61%) of the firms in this study do not use online tracking systems on their operational activities to monitor their vehicles, while 15.34% of the firms from all categories use online tracking systems on their operational activities to monitor their vehicles. from firms using online tracking system 7.7% were liquid freight transporters and 4.6%, and 3.1% were from level 1 dry freight transporters and level 3 dry freight transporters. No firm from level 2 dry freight transporters and level 4 dry freight transporters adopted these system. The findings indicate that the adoption of online tracking system by the firms in all the categories were very low.

Table 9: The Level of Online Tracking System Adopted

Firms Categories			Adopted online tracking system		Total
			yes	No	
	Liquid Freight Transport	Count	5	17	22
		% of Total	7.7%	26.2%	33.8%
	Level 1 Dry Freight Transport	Count	3	13	16
		% of Total	4.6%	20.0%	24.6%
	Level 2 Dry Freight Transport	Count	0	9	9
		% of Total	0.0%	13.8%	13.8%
	Level 3 Dry Freight Transport	Count	2	11	13
		% of Total	3.1%	16.9%	20.0%

	Level 4 Dry Freight Transport	Count	0	5	5
		% of Total	.0%	7.7%	7.7%
Total		**Count**	**10**	**55**	**65**
		% of Total	**15.4%**	**84.6%**	**100.0%**

Source: Own Survey, 2017

From Table 10 below, All (100%) of the firms in this study use paper based systems to monitor their vehicles, 15.38% of the firms use paper based system, substation and patrol control together to monitor their vehicles, 27.69% of the firms use paper based system and patrol control system to monitor their vehicles, and the remaining 23.08% of the firms use paper based system and substation to monitors their vehicles. The findings indicate that firms prefer to use paper based system, patrol control and substation to monitor their vehicle than advanced ICT systems.

Table 10: Vehicles Monitoring Systems other than Online Tracking Systems

Cases						
Vehicles monitoring systems other than online tracking systems	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Paper based system, substation, and patrol control	10	15.38	55	84.62	65	100.00
Paper based system and substation only	15	23.08	50	76.92	65	100.00
Paper based system and patrol control only	18	27.69	47	72.31	65	100.00
Paper based System only	65	100.00	0	0	65	100.00

Source: Own Survey, 2017

From table 11 below, majority of the respondents 81.6 % agreed that the management in their company encourage the use of ICT to perform activities, 7.7% of the respondents were undecided about the same statement, and while 10.8% disagreed that, the management support the use of ICT to perform activities in their companies. For statement that asked about their employees have adequate capabilities to perform their tasks using ICT; 36.9% agreed and 46% strongly agreed about that their employees

have adequate capabilities to perform their activities using ICT, 13.8 % of the respondent undecided about their employees capabilities to perform their activities using ICT, while 3.1% of the respondents in this study disagreed that their employees have adequate capabilities to perform their activities using ICT. On aggregate, 83.1 % of respondent agreed that the employees within their organization do not resist the usage of ICT, 10.8% were undecided, and while 6.1% of the respondents agreed that, the employees within their company resist the usage of ICT. Majority of the respondents 81.6 % agreed that using ICT improve their company quality and efficiency both in service and operation, 9.2% of the respondents were undecided, and 1.5% and 7.7% of the respondents disagreed and strongly disagreed that using ICT in their company improve quality and efficiency both in service and operation respectively. On aggregate, 41.5 % of the respondents agreed that ICT equipments within their company are effective to perform their activities, 29.2 % of the respondents were undecided about their ICT equipments effectiveness within their company, while 28.2 % of respondents do not agreed about their companies ICT equipments to perform activities effectiveness. From the findings, about 63.1% of the respondents agreed that their cost reduce since the usage of ICT as compared to manual management systems, 13.8% of the respondents undecided, while 23.1% of the respondents disagreed about ICT reduce costs as compared to manual managements system. On aggregate, 69.2% of the respondents agreed that using ICT increase revenue and profit of their company, 30.8% of the respondents were undecided about the use of ICT increase the revenue and profit of their organization. On aggregate, 38.5% of the respondents do not agreed that the cost of adopting modern ICT is not higher than its benefits, 33.9% of the respondents agreed that the cost of adopting modern ICT is higher that its benefits, while the remaining 27.7% of the respondents were undecided.

Table 11: Types of ICT and its Impact on the Performance of Firms

No.	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total percentage
13	The management in your company encourages the use of ICT to perform activities.	0%	10.8%	7.7%	26.2%	55.4%	100.0%
14	Employees within your company have adequate capabilities to perform their tasks using ICT.	0%	3.1%	13.8%	36.9%	46.2%	100.0%
15	Employees within your company resist the usage of	50.8%	32.3%	10.8%	1.5%	4.6%	100.0%

	ICT.						
16	Using ICT in your company improve quality and efficiency both in services and operations.	7.7%	1.5%	9.2%	30.8%	50.8%	100.0%
17	The ICT equipment's within your company are effective to perform activities	15.4%	13.8%	29.2%	20.0%	21.5%	100.0%
18	Costs reduce since the usage of ICT as compared to manual management systems.	0%	23.1%	13.8%	32.3%	30.8%	100.0%
19	Using ICT increase revenue and profit within your company.	0%	0%	30.8%	47.7%	21.5%	100.0%
20	The cost of adopting Modern ICT systems is higher than benefit.	20.0%	18.5%	27.7%	18.5%	15.4%	100.0%

Source: Own Survey, 2017

4.1.3. The Effects of ICT Usage on Vehicle Operational Efficiency

The second objective that the study sought to describe was the effects of ICT usage on vehicle operational efficiency of Ethiopia cross border transport firms.

From table 12 findings, on aggregate, 66.2% of the respondents agreed that using ICT systems reduce the operating expense than using manual management systems and 10.8% of the respondents agreed that using ICT does not reduce operating expense as compared to manual management system, while 23.1% of the respondents were undecided about the same statement. Around 64.6 % of the respondents agreed that ICT systems help them to make informed decision and schedule trip more efficiently, thus reducing the down time of their vehicles and 30.8% of the respondents disagreed that ICT systems help them to make informed decision and schedule trip more efficiently, thus reducing the down time of their vehicles, while 4.6% of the respondents were undecided about the same statement. Majority of the respondents 62.1% supported that ICT systems maximize their vehicle utilization rate by reducing vehicle idle time and unscheduled trip than manual management systems and 33.8% of the respondents were undecided, while 3.1% of the respondents did not agree that ICT systems maximize the vehicle utilization rate by reducing vehicle idle time and unscheduled trips than manual management systems. Further majority of the respondents 64.6% agreed that ICT systems enable them in managing their drivers effectively, and 10.7% of the respondents disagreed that ICT systems helps them in managing their driver effectively, while 24.6% of the respondents were undecided for the same statements. The respondents option on ICT systems help them in better planning and increase the

number of trips. On aggregate, 68.2% of the respondents agreed that ICT systems help them in better planning and increase the number of trips, 23.1% of the respondents option were undecided, while 7.7% of the respondents disagreed on that ICT systems help them in better planning and increase the number of trips.

Table 12: The Effects of ICT Usage on Vehicle Operational Efficiency

No.	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total Percentage
25	Using ICT systems reduce operating expenses as compared to manual management system.	0%	10.8%	23.1%	47.7%	18.5%	100.0%
26	ICT systems help you to make informed decision and schedule trip more efficiently, thus reducing the downtime of your vehicles.	0%	30.8%	4.6%	41.5%	23.1%	100.0%
27	ICT systems maximize the vehicle utilization rate by reducing vehicle idle time and unscheduled trips than manual management systems.	0%	3.1%	33.8%	36.9%	26.2%	100.0%
28	ICT systems help your company in managing the drivers effectively.	9.2%	1.5%	24.6%	30.8%	33.8%	100.0%
29	ICT systems help you in better planning and increase the number of trips.	0%	7.7%	23.1%	61.5%	7.7%	100.0%

Source: Own Survey, 2017

4.1.4. The Effects of ICT Usage on Customer Service Delivery

The third objective that the study sought to assess was the effects of ICT usage on customer service delivery of Ethiopia cross border transport firms. From the findings in table 13, on aggregate 60% of the respondents agreed that implementing ICT systems on customer service delivery allow them to respond to customer service call quickly and reach them on time and 36.9% undecided about the same statement, while 3.1% of the respondents disagreed that implementing ICT systems on customer service delivery allow them to respond customer service call quickly and reach their customer on time. Majority of the respondents 60% agreed that using ICT allow them to be more predictable and reliable, by providing their customer accurate delivery time, real time info and other customer details, 24.6% of the respondents disagreed that using ICT systems allow them to be more predictable and reliable, by providing their customer accurate delivery time, real time info and other customer details, while 15.4% of the

respondents undecided about the same statement. Around 69.2 % of the respondents agreed that the time to service their customer will reduce significantly with incorporation of ICT on customer service delivery than manual management system, and 3.1% of the respondents disagreed on that the time to service their customer will reduce significantly with incorporation of ICT on customer service delivery than manual management systems, while 27.7% of the respondents option on the same statement were undecided. On aggregate, 58.5% of the respondents agreed on delivering their service through ICT systems increase their customer satisfaction than manual management systems, 13.8% of the respondents disagreed on delivering their service through ICT systems increase their customer satisfaction than manual system, while 27.7% of the respondents were undecided. From total respondents 13.8%) of them disagreed on delivering service to their customers through ICT systems improve their company performance, while 55.4% of the respondents agreed that on delivering service to their customers through ICT systems improve their company performance and 30.8% of the respondents were undecided. On aggregate, 70.7% of the respondents agreed that implementing ICT system that can ultimately add value to their customer and improve experience with the company and 13.9% of the respondents disagreed on implanting ICT system that can ultimately add value to the customers and improve their experience with the company, while 15.4% of the respondents were undecided.

Table 13: The Effects of ICT Usage on Customer Service Delivery

No.	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total percentage

30	Implementing ICT systems on customer service delivery allow you to respond to customer service call quickly and reach your customer on time.	0%	3.1%	36.9%	21.5%	38.5%	100.0%
31	Using ICT systems allow your company to be more predictable and reliable, by providing your customer accurate delivery time, real time info and other customer details.	0%	24.6%	15.4%	15.4%	44.6%	100.0%
32	The time to serve a customer will reduce significantly with incorporation of ICT on customer service delivery than manual management system.	0%	3.1%	27.7%	41.5%	27.7%	100.0%
33	Delivering your service through ICT, systems increase your customer satisfaction than manual management systems.	0%	13.8%	27.7%	30.8%	27.7%	100.0%
34	Delivering service to your customers through ICT systems improve your company performance.	0%	13.8%	30.8%	32.3%	23.1%	100.0%
35	Implementing ICT systems that can ultimately add value to the customer and improve his or her experience with your company.	7.7%	6.2%	15.4%	53.8%	16.9%	100.0%

Source: Own Survey, 2017

4.1.5. The Influence of ICT on Safety and Security

The last objective that the study sought to describe was the influence of ICT on Safety and security of Ethiopia Cross border transport firms' vehicles. From the findings in table 14, on aggregate, 81.6% of the respondents disagreed on accident rate reduce significantly when using modern ICT systems, while on aggregate 9.2% of the respondents agreed on modern ICT systems reduce accident rate significantly, and the remaining 9.2% of the respondents were undecided. Majority of the respondents 64.6% agreed that with modern ICT system, they can locate their stolen and lost vehicles easily and effectively and 23.1% of the respondents disagreed with modern ICT systems, they can locate their stolen and lost vehicles easily and effectively, while the remaining 12.3% of the respondents were undecided. On total 32.3% of the respondents agreed on ICT system enable them to reduce vehicle break down and results in lower maintenance cost and on aggregate, 32.2% of the respondents disagreed on ICT systems enable they to reduce vehicle break down and results in lower maintenance cost, while 35.4% of the respondents were undecided. On aggregate, 53.8% of the respondents

disagreed on ICT systems increase customer confidence because of safe journey, and 23.1% on aggregate agreed that ICT systems increase customer confidence because of safe journey, while 23.1% of the respondents were undecided. On aggregate, around 26.1% of the respondents agreed that ICT systems improve vehicle availability days by reducing accident rate and improve the performance of their company. However, 46.1% of the respondents disagreed on ICT systems improve vehicle availability days by reducing accidents rate and improve the performance of their vehicles, while 27.7% of the respondents were undecided.

Table 14: The Influence of ICT on Safety and Security of Vehicles

No.	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total percentage
36	Accident rate reduce significantly when using Modern ICT systems	30.8%	50.8%	9.2%	4.6%	4.6%	100.0%
37	With Modern ICT systems, you can locate your stolen and lost vehicles easily and effectively.	0%	23.1%	12.3%	23.1%	41.5%	100.0%
38	ICT systems enables to reduce vehicle break down and result in lower maintenance cost	10.8%	21.5%	35.4%	27.7%	4.6%	100.0%
39	ICT systems increase customer confidence because of safe journey.	16.9%	36.9%	23.1%	16.9%	6.2%	100.0%
40	ICT systems improve vehicle availability days by reducing accident rate and improve the performance of your company.	9.2%	36.9%	27.7%	9.2%	16.9%	100.0%

Source: Own Survey, 2017

4.1.6. Results of Open-ended Questions

In the questionnaire, there were four open-ended questions. Among the questions two of them in section C, vehicles operational efficiency, their answers summarized and coded, and then analyzed using SPSS. The findings from the remaining two open-ended questions in the last section presented below.

From the question forwarded to the respondents to mention the main challenges that they have faced to implement advanced ICT systems; the cost of adoption, lack of adequate supplier, lack of managements and owners awareness about the potential

benefits of modern ICT system were the main reason. In addition, problems with the network connection, uncertainty about the benefits of modern ICT systems, insufficient transportation market to cover the cost of ICT, lack of government policy that support the adoption of modern ICT system by the firms, inadequate professionals in the sector and organizational cultures that do not support the usage of modern ICT system were the other reasons forwarded by the respondents that challenged them to implement modern ICT system.

The last question was about respondents' opinions how to improve the quality and efficiency of cross border transport using modern ICT system. Majority of the respondents suggested that providing training and education about the potential benefits of modern ICT system to workers, managements and owners and other stakeholders in the sector would increase the usage of modern ICT system, thus improve the service and efficiency of the sector. Improving the current organizational structure of associations operating under few employees and limited tasks, improving ICT infrastructures, demonstrating practical benefits of ICT system to the stakeholders by government and the government need to improve its policy towards the sector by providing incentive packages to adopt modern ICT system were another solutions that forwarded by the respondents.

4.2. Discussion

This section discusses key findings emerging from the study. The main finding from this study is that most of the firms in the survey perform their operational activities through mobile, internet and phone/fax technologies. The levels of usage of more advanced applications providing real-time information are very low. The results support the finding by McKinnon (2009) that demonstrated the rate of diffusion of ICT tools (such as digital tachograph, vehicle tracking systems and fuels economy improvement technologies) in the road freight transport industry has been relatively slow. The results also support the findings of Higginbottom, 2002; Golob and Regan, 2002; Stefansson and Woxenius, 2007 that the level of ICT adoption in the road freight transport industry has not kept pace with the rapid technological advances. Another finding in this study is that majority of senior personnel and managers agree that ICT improve their company quality and efficiency both in service and operation. Further, Majority of the respondents agree that using ICT system improved their revenue and profits. The

findings support the findings by Melville et al. (2004) state that the use of ICT brings about customer satisfaction by improving service quality thereby offering new opportunities for companies.

In this study, less than half of the firms perform their activities with effective that ICT equipments. This indicates that majority firms perform their activities with obsolete technological equipments. The results also confirm that the adoption advanced technological product in the industry is relatively low.

The study also reveal that majority of the respondents agree ICT reduce cost as compared to manual management systems. The results support the summaries by Pokharel (2009) the benefits of ICT systems adoption from the literature, it performs a supportive role for human activities, enhances organizational (or personal) efficiency and effectiveness, helps to execute activities faster, supports autonomous decision-making processes, enables distributive operations, achieves higher logistics efficiency, adds transparency to the stakeholders, leads to the adoption of better business practices to meet the customer service levels, increases organizational capability to respond to a dynamic environment and reduces the cost of operation by as much as 50% over traditional business practices. The results also support the findings by Hengst and Sol (2001) that ICT enables organizations to decrease costs and increase organizational capabilities and that it assists in the shaping of inter-organizational coordination. Another finding in this study is that equal percent of the respondents agree and disagree on the cost of adopting ICT is higher that its benefits. This indicates that there is a knowledge gap about the potential benefits of ICT among the respondents. The results supports the findings by world bank (2009) that large companies have derived substantial benefits from technology usage as they are able to adopt more sophisticated ICT systems and applications than their smaller counterparts. Small operators, however, are hard put to find a business case for adopting these technologies when associated costs are high and skill sets are new and demanding.

From main findings in this study, in majority of the firms ICT system improves their vehicles operational efficiency by maximizing vehicles utilization rate. Further, majority of the respondents agree that ICT system enables them to monitor their drivers more effectively. The findings are consistent with the findings by King (2011) that modern ICT systems aid in the completion of administrative tasks and, as a result, fewer man hours are spent on tasks such as compiling fuel sheets and therefore improving the

profitability of the business. One of the major benefits of these types of system is that they enable a managers to have a complete understanding of the exact location of every single vehicle and this then facilitates personnel management, as any workers who are either driving in a dangerous way or are using a company vehicle for unauthorized purposes may be dealt with quickly and effectively. In addition, by having information on the driving habits of workers, it is possible to advise drivers on how to drive in a more fuel-efficient manner, for instance, by reducing speeding and idling time.

Another major finding in this study is that majority of the respondents agree that ICT systems allow their company to be more predictable and reliable, by providing the customer accurate delivery time and other customers detail. In addition, Majority of the respondents also agree that delivering service through ICT increase customer satisfaction. Hence, allow them to retain satisfied customers as a result, it improves the performance of the firms. These enable the firms to increase their customers number. From the findings in this study, majority of the respondents confirm implementing ICT systems on customer service deliver allow them to respond to customer call quickly and reach customers on time. On the other hand, majority of the respondents in this study assure that time to serve customer reduce with incorporation of ICT on customer service delivery than manual management system. The results are consistent with the findings by Melville et al. (2004) maintain that the use of ICT brings about customer satisfaction by improving service quality and, thereby, offering new opportunities for companies. From total respondents majority of them agree that delivering service to customer through ICT system improve their company performance. The findings support the findings by Apulu and Latham (2010) claim that ICT enables customers to receive immediate feedback and this, in turn, enables companies to react speedily customer demands and to recognize new market niches.

From the main findings in this study, majority of the respondents disagree on using modern ICT systems reduce accident rate significantly; only few respondent agree on modern ICT systems reduce accidents significantly. The results contradict with the findings by Insurance Research council (2015) suggest that having telematics devices installed in vehicles can play a beneficial role in promoting safe driving and reducing the frequency of auto accidents and their associated costs. The finding in this study indicates that majority of the firms did not use modern ICT systems and lack awareness about modern ICT systems importance in the sector. Another finding indicate that the

same percentage, but few respondents support and contradict on ICT system enable them to reduce vehicle break down and results in lower maintenance cost. The findings consist with the findings by Stefansson and Woxeues (2007) indicates that maintenance cost reduce through better driving behavior.

More than half of the respondents disagree on ICT systems increase customer confidence because of safe journey, while only few respondents agree that ICT systems increase customers' confidence result of safe journey. Finally, around half of the respondents disagree on ICT systems improve vehicle availability days by reducing accident rate and improve the performance of their company.

From the results high cost of adoption, lack of adequate supplier, lack of managements and owners awareness about the potential benefits of modern ICT system were the main reasons for cross border transport operators for not using modern ICT system. From the findings that delivering training and education about the potential benefits of modern ICT system to workers, managements and owners and other stakeholders in the sector would increase the usage of modern ICT system, thus improve the service and efficiency of the country cross border transport operation.

CHAPTER FIVE

CONCLUSIONS & RECOMMENDATIONS

5.1. Conclusions

This study have indicated that ICT systems have a potential to improve the efficiency and reliability of Ethiopia cross border transport operation, which are currently operating at lower level of efficiency and reliability.

From the findings of the study, the following conclusions are drawn.

- The current adoption of ICT based systems is mainly limited to mobiles and phone/fax technologies and internet. These systems enable the firms to perform better and improve their performance.
- The level of more advanced ICT systems usage, as online tracking systems were very low.
- The underlying reasons that inhibited the widespread use of advanced ICT systems include the cost of technology, lack of adequate supplier and lack of managements and owners awareness about the potential benefits of modern ICT system.
- Majority of the firms perform their operational activities with ineffective ICT equipments. Few firms perform their activities with effective equipments.
- In majority of the firms, ICT improves their vehicles operational efficiency by maximizing vehicles utilization rate and increase number of trips. In addition, ICT enables the firms to manage their drivers in better way.
- For majority of the firms ICT system increased their predictability and reliability by providing the customers accurate delivery time and other customers' detail.

- ICT systems have low influence in safety and security of vehicles. Few firms agree that ICT systems enable them to reduce vehicle break down and results in lower maintenance cost.

5.2. Recommendations

Based on the findings of the study the following recommendations forwarded. The researcher believes that if the following recommendations undertaken by the firms, remarkable changes would see in the industry.

- The cross border transport firms should improve their ICT equipments to perform their activities effectively, the more advanced ICT systems firms adopt the more they become efficient and effective. Therefore, they could have more opportunities to growth and profitability.
- To increase the current ICT systems that have adopted by the firms to more advanced system different stakeholders should have work together.
- The government needs to support cross border transport firms to adopt modern ICT system through different ICT incentive packages.
- Firms should have implement online tracking system on the vehicles more widely to improve their utilization rate to higher level and manage their drivers' better than ever. These could increase the number of vehicles round trip and improve the firm's performance.
- Firms should have increase the adoption of ICT systems in more of their customer service deliveries as these improve their reliability and predictability and could lead improved performance.
- Further studies need to be undertaken to analyze the cost and benefits of modern ICT systems mainly on online tracking system.

REFERENCE

AsnakeTadesse, (2006). Road Freight Transport in Ethiopia with Special Emphasis along Addis Ababa Djibouti Corridor.Unpublished Master Thesis, Addis Ababa University.

Ayantoyinbo, B. (2015). Assessing the impact of Information and Communication Technology (ICT) on the performance of freight distribution.European Journal of Logistics, Purchasing and Supply Chain Management Vol.3, No.4, pp.18-29, November 2015.

Bowley, A. L. (1926). Measurements of precision attained in sampling. *Bull. Int. Stat. Inst.*, Amsterdam, v.22, p.1-62.

Cooper, M.C., Lambert, D.M. and Pagh, J.D. (1997).Supply chain management: more than a new name for logistics. International Journal of Logistics Management, Vol. 8, No. 1, 1-13.

Coronado Mondragon, AE, Lalwani, CS, Coronado Mondragon, ES, Coronado Mondragon, CE &Pawar, KS 2011.'Intelligent transport systems in multimodal logistics: A case of role and contribution through wireless vehicular networks in a sea port location'. International Journal of Production Economics.

Clarke P.M. (1998). Virtual logistics.An introduction and overview of the concepts.International Journal of Physical Distribution & Logistics Management, Vol. 28, N. 7, pp. 486-507.

Crowley, A.G. (1998). Virtual Logistics: Transport in the Market space. International Journal of Physical Distribution & Logistics Management, 28 (7) 547-574.

Davies I., Mason R., Lalwani C., (2007). Assessing the impact of ICT on UK general haulage companies.International Journal of Production Economics. 106, 12-27.

UNECA, (2009).The Transport Situation in Africa.Sixth session of the Committee on Trade, Regional Cooperation and Integration.

European Commission, (2007).“Freight transport logistics action plan”.

Evangelista, P., Mogre, M., Perego, A., Raspagliesi, A., Sweeney, E., (2012).A survey based analysis of IT adoption and 3PLs' performance. Supply Chain Management: An International Journal. 17(2), 172-186.

Shippers Council of Eastern Africa, (2012).Cost, Time and Complexity of the East African Logistics Chain.East Africa Logistics Performance Survey.

Giannopoulos G.A, (2004). The application of information and communication technologies in transport. European Journal of Operational Research, 152, 302-320.

Goh, M & Fraser, K 2012, ’Innovative ICT Applications in Transport and Logistics: Some Evidence from Asia’in AM Pietro Evangelista, Edward Sweeney, Emilio Esposito (ed.) Supply Chain Innovation for Competing in Highly Dynamic Markets: Challenges and Solutions Igi Global, 2012.

Kapros S (2009). “La logistique”, Questions-clefs pour l’Europe des transports, M. Savy (ed). La Documentation Française.

Kapurubandara, M. & Lawson, R. (2006).Barriers to adopting ICT and e-commerce with SMEs in developing countries: An exploratory study in Sri Lanka. University of Western Sydney, Australia.

Lin, W.T. & Lin, H.J. (2006).International productivity paradox of IT in commercial banking: A cost efficiency analysis.The Business Review, 5(1), 246–252.

Manuj, I., Sahin, F., (2011).A model of supply chain and supply chain decision-making complexity.International Journal of Physical Distribution & Logistics Management, 41(5), 511-549.

Marchet, G, Perego, A &Perotti, S (2009).’An exploratory study of ICT adoption in the Italian freight transportation industry’, Int. J. Phys. Distrib. Logist. Manag., vol. 39, no. 9-10, pp. 785-812.

McKinnon, A., (2009). Innovation in road freight transport: achievements and challenges. Paper prepared for the International Transport Forum/IMTT Seminar on Innovation in Road Transport: Opportunities for Improving Efficiency. 2nd October 2009, Lisbon, Portugal.

Norland-Tilburg, E. V. (1990). Controlling error in evaluation instruments.*Journal of Extension*, 28(2).

Perego, A., Perotti, S., Mangiaracina, R., 2011.ICT for logistics and freight transportation: a literature review and research agenda.International Journal of Physical Distribution and Logistics Management. 41(5), 457-483.

Tsamboulas, DA, Kapros, S. (2000). "Decision-Making Process in Intermodal Transportation".Transportation Research Record No 1707, pp. 86-93.

Uma Sekaran, (2003). Research Methods for Business 4th Edition).USA: Southern Illinois University.

Rastrict, K. & Corner, J. 2010.Understanding ICT based advantages: A techno savvy case study.Interdisciplinary Journal of Information, Knowledge and Management, vol. 5.

Rwashana, A.S. & Williams, D.W. (2008).Enhancing immunization healthcare delivery through the use of information communication technologies.International Journal of Education and Development Using ICT, 4(2): 144–156.

Therese Langer and Shruti Vaidyanathan, (2014).Smart Freight: Applications of Information and Communications Technologies to Freight System Efficiency.An ACEEE White Paper.

Thomson, F., (2010).Truck IT Report. A brief analysis of eye for transport's recent survey 2010.Eye for Transport Research Series.Georgetown, UK, Eye for Transport.

Sanchez-Rodrigues, V., Potter, A., Naim, M., (2010).Evaluating the causes of uncertainty in logistics operations.The International Journal of Logistics Management. 21, 45-64.

Siror, J.K., Huanye, S., Dong, W., (2011). RFID based model for an intelligent port. Computers in Industry. 62(8-9), 795-810.

Stefansson, G., Woxenius, J, 2007. The concept of smart freight transport systems - The road haulier's perspective. Proceedings of the 19th Annual NOFOMA Conference, 7-8 June, Reykjavik, Iceland, 1007-1023.

Stough R.R. (2001). New technologies in logistics management, in Brewer et al. (edited by) Handbook of Logistics and Supply Chain Management. Elsevier Science Ltd, p. 517.

Schware, R. 2003. Information and communications technology (ICT) agencies: Functions, structures, and best operational practices.Info, 5(3): 3–7.

S. Mpata, (2011). Evaluation of the COMESA/SADC transit management systems.Final Report, Lilongwe, Malawi.

Shanker, D. (2008).ICT & tourism: Challenges and opportunities. Conference on Tourism in India: Challenges Ahead, 15–17 May, IIML.

Spanos, Y.E., Prastacos, G.P. &Poulymenakou, A. (2002).The relationship between information and communication technologies adoption and management.Information and Management, vol. 39: 659–675.

Wagner, S.M., (2008). Innovation management in the German transportation industry.Journal of Business Logistics. 29(2), 215-231.

Waiyaki E. C., (2013). Leveraging Techonology for business Fleet Application: A Case of Fleet Management System implemented in Kenya Power & lighting Company limited.

Zikmund, W.G., Babin, B.J., Carr, J.C. & Griffin, M. (2010).Business research methods (8th ed.). Canada: South-Western/Cengage Learning.

APPENDICES

APPENDIX A

St. Mary's University

School of Graduate Studies

Department of Business Administration

Survey Questionnaire

Dear Sir/Madam,

I am conducting research study on the effects of ICT on the performance of Ethiopia cross border transport firms. The aim of this questionnaire is to gather data that will be used in this study and you are kindly requested to participate in responding the questions below. This study is undertaken as a partial requirement for completion of Master of Business Administration/MBA/ in General Management.

All the data and information that will be gathered through this questionnaire will be used for academic research purpose only and keeps confidential.

Section A: General Information

(Please use the blank space for the questions that need to write and to answer questions that need to put "X"/ "√" in the boxes tick the either signs to answer the questions).

1. Name of the company

   _____

2. Sex

   Male ☐ Female ☐

3. Age

   18- 26 ☐ 27 -35 ☐ 36 – 45 ☐ 46 – 55 ☐ 56 and above ☐

4. What is your educational level?

   ☐ Certificate ☐ First degree

   ☐ College diploma ☐ Master degree

   ☐ PhD ☐ Other please specific_____

5. What is your position in the company? _____

6. How long have you been working in the company? _____

7. Which road freight transport service does your firm provides?

   ☐ Dry freight

   ☐ Liquid freight

   ☐ Other please specify_____

8. What is your firm grade?

   ☐ Liquid Freight Transport

   ☐ Level 1 Dry Freight Transport

   ☐ Level 2 Dry Fright Transport

   ☐ Level 3 Dry Freight Transport

   ☐ Level 4 Dry Freight Transport

9. How many vehicle fleets does your firm have? _____

10. How many Staffs does your firm have? _____

Section B: The types of ICT

(Please use the blank space for the questions that need to write and to answer questions that need to put "X"/ "√" in the boxes tick the either signs to answer the questions).

11. What kinds/types of ICT systems do you use in your company?

☐ Mobile phone	☐ Internet
☐ Tel/Fax	☐ Electronic data exchange/EDI
☐ Radio communication	☐ Website
☐ Global positioning system/GPS	☐ Customer Relationship Manager
☐ Geographic information System	☐ Other please specify_____
☐ Radio frequency Identification/RFID	

Please indicate to what extent do you agree with the following statements by **encircling** the appropriate number **(1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree).**

The types of ICT adopt and its impact on the performances of firms.

12	The management in your company encourages the use of ICT to perform activities.	1	2	3	4	5
13	Employees within your company have adequate capabilities to perform their tasks using ICT.	1	2	3	4	5
14	Employees within your company resist the usage of ICT.	1	2	3	4	5
15	Using ICT in your company improve quality and efficiency both in services and operations.	1	2	3	4	5
16	The ICT equipment's within your company are effective to perform activities	1	2	3	4	5
17	Costs reduce since the usage of ICT as compared to manual management systems.	1	2	3	4	5

18	Using ICT increase turnover and profit within your company.	1	2	3	4	5
19	The cost of adopting Modern ICT systems is higher than benefit.	1	2	3	4	5

Section C: Vehicle operational efficiency

(Please use the blank space for the questions that need to write and to answer questions that need to put "X"/ "√" in the boxes tick the either signs to answer the questions).

20. Do you track your vehicles through online tracking system?
Yes ☐ No ☐

21. If Q 21 is yes, do you use it in all your vehicles?
Yes ☐ No ☐

22. If Q 22 is no, why not?
_____
_____
_____
_____.

23. If you do not use online tracking system to monitor you vehicles what other methods do you use? Please, list them.
_____
_____
_____
_____.

Please indicate to what extent do you agree with the following statements by encircling the appropriate number **(1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree).**

24	Using ICT systems reduce operating expenses as compared to manual management system.	1	2	3	4	5
25	ICT systems help you to make informed decision and schedule trip more efficiently, thus reducing the downtime of your vehicles.	1	2	3	4	5
26	ICT systems maximize the vehicle utilization rate by reducing vehicle idle time and unscheduled trips than	1	2	3	4	5

	manual management systems.					
27	ICT systems help your company in managing the drivers effectively.	1	2	3	4	5
28	ICT systems help you in better planning and increase the number of trips.	1	2	3	4	5

Section D: Customer service delivery

Please indicate to what extent do you agree with the following statements by **encircling** the appropriate number **(1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree).**

29	Implementing ICT systems on customer service delivery allow you to respond to customer service call quickly and reach your customer on time.	1	2	3	4	5
30	Using ICT systems allow your company to be more predictable and reliable, by providing your customer accurate delivery time, real time info and other customer details.	1	2	3	4	5
31	The time to serve a customer will reduce significantly with incorporation of ICT on customer service delivery than manual management system.	1	2	3	4	5
32	Delivering your service through ICT systems increase your customer satisfaction than manual management systems.	1	2	3	4	5
33	Delivering service to your customers through ICT systems improve your company performance.	1	2	3	4	5
34	Implementing ICT systems that can ultimately add value to the customer and improve his or her experience with your company.	1	2	3	4	5

Section D: Safety and security

Please indicate to what extent do you agree with the following statements by **encircling** the appropriate number **(1-Strongly Disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree).**

35	Accident rate reduce significantly when using Modern ICT systems	1	2	3	4	5
36	With Modern ICT systems, you can locate your stolen and lost vehicles easily and effectively.	1	2	3	4	5
37	ICT systems enables to reduce vehicle break down and result in lower maintenance cost	1	2	3	4	5
38	ICT systems increase customer confidence as a result of safe journey.	1	2	3	4	5
39	ICT systems improve vehicle availability days by reducing accident rate and improve the performance of your company.	1	2	3	4	5

40. Based on your own experience would you list some of the major challenges that you have faced to implement Modern ICT systems in your company?

_____
_____
_____
_____

41. In your own opinion what should have been done in order to improve the quality and efficiency of the Cross border transport's operation through ICT?

_____
_____
_____
_____

Thank you

APPENDIX: B

St. Mary's University

School Graduate Studies

Masters of Business Administration

Structured Interview Questions

Check List for in-depth Interview Questions for Cross border transport operation Division Head

1. What are the benefits that cross border transport operations have for the country's economy?
2. How many firms operate in cross border transport operation? How do they organize? How many vehicles do they operate?
3. What roles do Ethiopia cross border transport associations have on their members?
4. How do you express the performance of Ethiopia cross border transport operations?
5. How do you see the efficiency and reliability of service that cross border transport service providers deliver to cross border transport users/customers?
6. How do you assess the rate of accidents and vehicle losses that are occurring during cross border transport operation?
7. How does FTA supervise and monitor Ethiopia cross border operations?
8. What roles does modern ICT system provide to improve the efficiency and reliability of Ethiopia cross border transport operation?
9. Does FTA have a plan or system that enforce cross border transport firms to implement online tracking systems such as GPS?
10. Does FTA provide any support to cross border transport firms to implement online tracking system like GPS? If not, why? Does the authority have any plan in the future to support them?
11. What efforts FTA do in order to create awareness about the potential benefits of modern ICT system to the stakeholders? If, not why? What does FTA thinks for the future?

Thank you

APPENDIX: C

Ethiopia Cross border transport firms structure, fleet of vehicles and total loading capacity

Types of firms	No. of firms			No. of vehicles with trailer			Total load capacity	
	Liquid	**Dry**	**Total**	**Liquid**	**Dry**	**Total**	**Liquid**	**Dry**
Associations	3	69	72	615	21,610	22,225.00	12,156,724.90	4,352,189.20
Share Company	2	6	8	339	968	1,307.00	7,502,671.60	217,046.89
Private Limited company	71	12	83	2,380	4,012	6,392.00	49,377,137.00	852,916.41
State owned Enterprise	-	3	3	-	1,025	1,025.00	-	202,268.80
Total	**76**	**90**	**166**	**3,334**	**27,615**	**30,949.00**	**69,036,533.50**	**5,624,421.30**

Source: Own compilation based on FTA data, 2017

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of _____. All sources of materials used on this thesis work have acknowledged duly. I further confirm that this thesis work has not submitted in part or in full to any other higher learning institution for earning any degree.

_____ _____

Name Signature

St. Mary's University, Addis Ababa **June 2017**

ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as the University advisor.

_____ _____

Advisor Signature

St. Mary's University, Addis Ababa **June 2017**