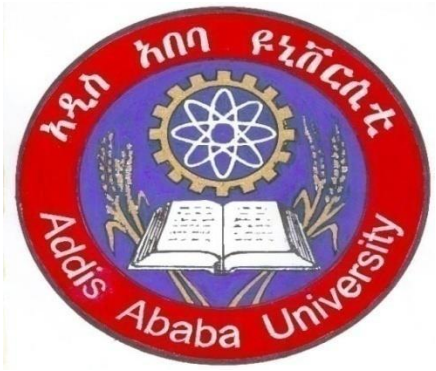

THE ROLE OF INFORMATION COMMUNICATION TECHNOLOGY ADOPTION ON SUPPLY CHAIN PERFORMANCE OF THE ETHIOPIAN SHIPPING AND LOGISTICS SERVICES ENTERPRISES

BY

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Approved by Board of Examiners

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Advisor	**Signature**	**Date**
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External Examiner	**Signature**	**Date**

CERTIFICATE

This is to certify that **Ermias Girma Haile** has carried out his thesis work on the topic entitled **"The Role Of Information Communication Technology Adoption On Supply Chain Performance Of The Ethiopian Shipping And Logistics Services Enterprise".** The work is original in nature and is suitable for submission for the award of Master's Degree in Logistics and Supply Chain Management.

_____	_____	_____
Advisor Shiferaw Mitiku (PhD)	**Signature**	**Date**

STATEMENT OF DECLARATION

I,**Ermias Girma Haile** the undersigned, declare that this thesis **"The Role Of Information Communication Technology Adoption On Supply Chain Performance Of The Ethiopian Shipping And Logistics Services Enterprise "**is my own original work and has not been presented in any other University. All sources of materials used for this thesis have been duly acknowledged.

Declared by

Name: Ermias Girma Haile

Signature: _____

Date: May, 2019

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Ermias Girma

ACRONYMS AND ABBREVATIONS

EDE: Electronic Data Exchange

ERP: Enterprise Resource Planning

ESLSE: Ethiopian Shipping and Logistics Services Enterprise

GDP: Gross Domestic Product

GPS: Global Positioning System

ICT: Information and Communication Technology

IT: Information Technology

PMS: Performance Management System

RFID: Radio Frequency Identification

SAP: System Application Program

SCM: Supply Chain Management

SCPM: Supply Chain Performance Management

VMI: Vendor Managed Inventory

WMS: Warehouse Management System

4PLs: Fourth Party Logistics

SCOR: Supply Chain Operations Reference

LIST OF TABLES

LIST O FIGURES

ABSTRACT

Information and Communication Technology solutions in supply chain management have often been approached from various dimensions with a focus on the overall effect on efficiency, customer value and cost. Efficiency and reliability in the logistics industry through various modalities such as adoption of Information and Communication Technology solutions has seen improvements in customs management systems, security tracking and tracing shipments and information sharing. However, many sectors of the logistics industry still run on traditional or manual systems and this could be attributed to their ineffective and inefficient performance. There exists a research gap on this area of the role of Information and Communication Technology adoption on supply chain performance in Ethiopian Shipping and Logistics Services Enterprise. The study employed a descriptive research design. The population comprised of 335 employees in Ethiopian Shipping and Logistics Services Enterprise. The stratified sampling techniques was applied after the population divided in to the appropriate strata and a proportionate sampling was taken from each strata to represent all the strata .258 employees were found to appropriately match the population size of 335 and selected for this study from the shipping ,freight forwarding and port and terminal handling sectors including Information and Communication Technology department. Factor analysis was used to reduce the variable dimension and descriptive statistics was used to identify the challenges on the adoption of Information and Communication Technology on supply chain performance. Correlation and Regression analysis approaches were used to investigate the relationships between the variables and the extent to which the independent variables explained supply chain performance. Finding shows that lack of education and training were the major Information and Communication Technology adoption challenges and to alleviate the challenge a careful assessment of education and training needs should minimize this problem. Therefore Ethiopian Shipping and Logistics Services Enterprise need improve Information and Communication Technology adoption and Information and Communication Technology capability in order to improve on the supply chain performances operations especially in the areas of documentation, cargo tracking, warehousing, transportation, freight forwarding, port and terminal handling and shipment operations.

Key Words: Information and Communication Technology adoption, Information and Communication Technology capability, supply chain performance.

TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

This chapter consists of background of the study, statement of the problem, objective of the study, research questions, scope of the study, delimitation of the study, limitation of the study, significance of the study, and organization of the study.

1.1 Background of the Study

The pivotal roles of logistics firms in economic growth and development have been acknowledged by scholars, professionals and researchers globally. Research has shown that logistics industry has a considerable share in Gross Domestic Product (GDP) of the world. Sevgi & Tezcan (2017) argue that logistics industry has considered as a significant tool for competition, which in turn increased the interest for the industry, especially in developed countries. Hayaloglu (2015) confirms that countries have currently increased their investments in logistics sector since it has become prominent as a segment which proliferates. However, global competition is forcing logistics firms around the world to reshape their logistics operations and systems with aims to reduce costs and improve customer satisfaction.

Information Technology (IT) has offered solutions that make logistics and supply chain management, even more, streamline and efficient than it has ever been. According to Weill (2002) provident IT-infrastructural investments make it possible for enterprises to react rapidly and cost-effectively to electronics-based challenges. Enterprises which have better infrastructure can react more quickly, as well as to reach better growth rate, better sales and to realize a shorter return on investment. Tatoglu , Bayraktar & Golgeci (2016) also argue that effective information flows within and across organizations are essential to managing supply chains, and such Supply Chain Management operations cannot be possible without IS management. Information technology (IT) is the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data. (Wong Keng & Mark (2016) define information technology as a critical factor to enhance the supply chain performance, and the huge advances in information technology over the past

two decades enabled the emergence of modern supply chain management, with its power to provide timely, accurate, and reliable information, to enhance collaboration and integration between partners, and to improve the agility and flexibility of both the focal firm and the partners in the supply chain Fawcett ,Wallin , Allred ,Fawcett & Magnan (2011).

Organizations can use ICT solutions in the management of supplier networks, facilitating traceability and managing distributions networks. Nowadays, competition is no longer company to company but supply chain to supply chain, Christopher (2011). Industries find that they have to rely on effective supply chain management to compete globally. The globalization of supply chains has forced companies to look for better and more inter-linked systems between SCM competencies, multiple SCM strategies and the implementation processes and SCM capabilities to coordinate the flow of materials into and out of the company as opposed to the fragmented systems, which have characterized many organizations.

In logistics many new technologies are used in developed country while in Ethiopia adoption process is very slow. However due to initiation of the Ethiopian economy the competitive pressure is building up and the only option to face the competition is to go in for technology operation

1.2 Statement of Problem

Modern supply chains are very complex, with many parallel physical and information flows occurring in order to ensure that products are delivered in the right quantities, to the right place in a cost-effective manner. ICT offers powerful advanced technology solutions to support and enhance nearly every facet of a business Klein and Rai (2009). In the dynamically competitive environment, many logistics companies have adopted ICT in emerging supply chain trends in improving business performance. Considering the need for competitive advantage and global competition, many logistics firms are adopting the latest ICT solutions in their operations (Evangelista & Sweeney, 2006).

Asabere, Oppong & Sarpong (2012) conducted a review of the role of ICT in supply chain operation for companies. In the study, it was noted that e-SCM has become the common language in reference to the electronic processes that should characterize modern supply chain operations. Sweeney (2005) evaluated the usage of “Point”, “Best of Breed”, “Enterprise” and

"Extended Enterprise" solutions as approaches towards achieving business competitiveness in SCM. From their results, the ensuing challenge is the fact that use of ICT applications in SCM do not necessarily translate into efficiency and greater performance of the process. In Ethiopia, logistics companies have strived to implement various ICT applications in their supply chain processes. Ayugi (2007) examined the effectiveness and efficiency of the supply chain model in Wrigley's East Africa. He indicated that efficient supply chain activities would increase the organization's performance significantly.

Cheruiyot (2013) conducted a study on the impact of integrated supply chain on performance at Kenya Tea Development Agency. The findings indicated that the supply chain integration was positively associated with supply chain performance. Apiyo & Mburu (2012) did a study on the role of ICT tools in supply chain performance and found that ICT tools can have revolutionary impact on supply chain performance and that viewing ICT tools as an incremental improvement of supply chain performance can turn out to be the best thing to all organizations that are involved in logistics and manufacturing.

Magutu (2013) carried out a study on supply chain strategies, technology and performance of large-scale manufacturing firms in East Africa which established that when ICT tools are well implemented, the company will benefit from them and as a result, the organization will be able to save on costs and eventually make high profits.

Dawit (2017) carried out a study on impact of information technology investment on performance of commercial banks in Ethiopia based on the findings of the study the researcher concluded that, the negative significant relation between IT investment and financial performance is consistent with the productivity paradox theory for commercial banks in Ethiopia.

Mengistu (2016) studied on information communication technology adoption in UPAREZ Business PLC that engaged retailing pharmaceuticals and the finding were the barriers to adopt the ICT were of inadequate ICT strategy, lack of government incentive, lack of perceived economic or other benefits to the unit, reluctance of personnel to use ICT, lack of localization-Amharic user interface, lack of training & consulting, new versions of existing software

introduced too often (support fee) and expensive hardware/software, which creates inconsistent ICT adoption in strategic business units (SBUs) and departments on UPAREZ.

Yalew (2015) studied on the impact of Information and Communication Technology on performance of Ethiopian Private Banks using Dashen Bank S.C. and United Bank S.C. as a case study and the finding showed that Information and Communication Technology has positively impacted performance of Ethiopian private banks.

Efficiency and reliability in the logistics industry through various modalities such as adoption of ICT solutions have seen improvements in customs management systems, security (tracking and tracing shipments) and information sharing. However, many sectors of the logistics industry still run on traditional or manual systems and this could be attributed to their ineffective and inefficient performance. Not many studies have been carried out to establish the influence of ICT on SCM performance among logistics firms in Ethiopia is the research gap. It was in this light that the study sought to answer the following research question: What is the role of ICT adoption on supply chain performance in ESLSE?

1.3 Research Questions

The study sight to answer the following research questions

- What are factors triggering the adoption of ICT in ESLSE?
- How ICT is capable in supply chain performance of the ESLSE?
- What are the roles of ICT adoption on supply chain performance of ESLSE?
- What are major challenges of ICT adoption in supply chain management of ESLSE?

1.4 Objectives of the Study

The study was guided by the following research objectives:

- To determine factors triggering ICT adoption in ESLSE.
- To assess ICT capability in supply chain performance of the ESLSE.
- To examine the role of ICT adoption on the supply chain performance of ESLSE.
- To identify major challenges of ICT adoption in supply chain performance of ESLSE.

1.5 Scope and Delimitations of the study

The study only examine the role of ICT on the supply chain performance of ESLSE, identify major challenges of ICT adoption in supply chain performance of ESLSE .The study is encircled only in Shipping sector, Freight forwarding sector ,Port and Terminal sector and ICT department in head office ESLSE in Addis Ababa .The research has been subject to some limitations. First, although the sample size of the questionnaire survey is satisfactory, a larger sample size could have provided a broader assessment, deeper insights and a firmer basis for generalization. Second, the focus of the study is exclusively on ESLSE. For this reason, the validity of evidence presented in this study is limited to in ESLSE

1.6 Significance of the Study

The findings in this study provided supply chain managers with critical information on the need for ICT solutions in enhancing the efficiency of the process. Such information is critical in making decisions on how to go through the evaluation and implementation processes. This study would provide clear evidence with or against the studies that indicated a positive impact of ICT on supply chain performance. The study help to identify determinants of organizational SCM dimensions that impact overall organizational performance.

An understanding of the ICT impact on SCM help the top management and decision makers within the ESLSE to focus on achieving these conditions and desired effects. The study enable shipping and logistics firms to evaluate the benefits of implementing ICT solutions and the challenges arising thereof. The logistics industry benefit from the improved efficiency in operations.

The results of the study provide material for researchers and academicians interested in understanding the concept of ICT in supply chain performance. It also forms the foundation for further research into the topic. The study provides insights for future researchers to apply the research findings to different areas.

1.7 Organizations of the study

The first chapter consists of background of the study, statement of the problem, objective of the study, significance of the study, definition of terms, research design and methodology,

organization of the paper. The second chapter provides a review of the literature related to the study area. The literature included studies conducted by other researchers on the impact of ICT on SCM performance. Chapter three addresses research methods which explain the design, sample procedures, instrument and data analysis techniques issued to achieve the purpose of the study. The fourth part analyzed the research problem using the specified methodology. Lastly, the fifth part put forward plausible concluding and recommendations.

1.8 Ethical Consideration

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

CHAPTER TWO

RELATED LITERATURE REVIEW

2.1 Introduction

This study investigates the role of ICT on supply chain performance of ESLSE. The chapter provides a review of the literature related to the study area. The literature included studies conducted by other researchers on the role of ICT adoption on SCM performance. The areas of focus include ICT and supply chain performance and ICT in logistics operations. More importantly, the chapter provided a review of ICT and supply chain, supply chain, supply chain performance, impact of ICT adoption on supply chain performance and the conceptual framework of the study.

2.2 Theoretical Literature Review

A theoretical framework consists of concepts and, together with their definitions and reference to relevant scholarly literature, existing theory that is used for your particular study. The theoretical framework must demonstrate an understanding of theories and concepts that are relevant to the topic of your research paper and that relate to the broader areas of knowledge being considered.

2.2.1 Supply Chain

Supply chains encompass the companies and the business activities needed to design, make, deliver, and use a product or service. Businesses depend on their supply chains to provide them with what they need to survive and thrive. Every business fits into one or more supply chains and has a role to play in each of them. A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. According to Chopra & Peter (2004) the supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within each organization, such as manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and

customer service. A supply chain is dynamic and involves the constant flow of information, product, and funds between different stages.

Supply Chain Management aims to link all the supply chain agents to jointly cooperate within the firm as a way to maximize productivity in the supply chain and deliver the most benefits to all related parties Finch (2006). Adoption of Supply chain management practices in industries has steadily increased since the 1980s. Over the past decade, the traditional purchasing and logistics activities have emerged and shifted into broader strategic approach to materials and distributions management known as supply chain management. It is currently a major issue as organizations realize the substance of developing an integrated connection with their suppliers and final users. Theoretically, as described by Mentzer (2001), a supply chain can be defined as a set of three or more organizations directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer.

The main goal and important aspect of supply chain is leveraging the expertise, experience, skills and capabilities of the supply chain professionals who comprise this competitive network Mentzer (2001). The performance of a firm depends not only on how efficiently it cooperates with its direct partners, but also on how well these partners cooperate with their own business partners. Net work theory (NT) can be used to provide a basis for the conceptual analysis of reciprocity in cooperative relationships. Here, the firm's continuous interaction with other players becomes an important factor in the development of new resources Haakansson and Ford (2002). Supply chain is a complex process which requires the best practices to achieve the desired organizational goal which is basically the optimization of profits.

Supply Chain management revolves around efficient integration of suppliers, manufacturers, warehouses, and stores; it encompasses the firm's activities at many levels, from the strategic level through the tactical to the operational level. The competitive criteria generally differ during the different phases of product life cycle; for instance, availability and technology are needed at the introduction phase, and cost, quality and speed are needed at the maturity phase Chang (2006). Supply chains and distribution channels today battle more on the basis oftime and quality, having defect-free products to customers faster and more reliably than the competitor is no longer seen as a competitive advantage but just as a market place prerequisite.

Customers constantly demand that products are delivered quicker, on time, and with no defects. This is achieved with proper synchronization of efforts by connecting systems and processes to create synergy Christopher (2005). The global orientation and increased performance-based competition, combined with rapidly changing technology and economic conditions, all contribute to market place uncertainty. This uncertainty requires greater flexibility on the part of the individual companies and distribution channels, which in turn, demands for more flexibility in channel relationships. For this to be achieved, a firm must have a fit between SCM, logistics and e-commerce within its operations. This will enhance competitive advantage of the business and improve corporate performance.

2.2.2 ICT & Supply Chain

There has been a rapid development in the use of ICT in SCM and logistics. Many organizations are adopting ICT solutions in a range of operational areas. Such solutions continue to provide new ways and opportunities in storage, processing, distribution and exchange of information within companies and with suppliers and customers across the supply chain. In SCM, ICT has been an important enabler of information sharing by eliminating the bullwhip-effect Evangelista & Sweeney (2003). Various new SCM initiatives such as vendor managed inventory (VMI) rely greatly on the automation of the flow of materials and finished goods as well as the flow of information across organizations Gunasekaran, Patel & McGaughey (2004). From an operations management perspective, organizations seek to enhance their supply chains by sharing information to match demand and supply through demand forecasting, short- and long-term production planning and capacity planning (Huang, 2012).

The impact of ICT in supply chains can be demonstrated in relation to the changes in performance and relationships. SCM provides a variety of tools and techniques which help organizations to navigate around the business environment. Effective supply chains therefore provide opportunities to create sustainable competitive advantage Tracey, Lim & Vonderembre (2005). SCM focuses on availing the right goods at the right time at the right place Slem (2005). As electronic businesses gain importance across various sectors, new opportunities emerge especially in information technology Haag & Stephen (2010).ICT also emerges as an important source of competitive leverage for organizations whichhave adopted it especially in the logistics sector such as DHL and Airlines.

Logistics companies are now adopting Information Technology as a vital operational tool Lysons & Farrington (2006). In SCM, time and customer satisfaction are core and getting information on time is especially important. Accurate and on-time information increases service level thus decreasing costs and lead time Boltani (2008). Improvements in ICT infrastructure have enabled logistics companies to embrace opportunities to substitute paper-based processes by electronic interchanges Raisinghani (2008). This optimizes the flow of information within and across organizations taking full advantage of the diffusion and e-business software systems. ERP systems provide such paperless platforms where a supplier can exchange data related to orders.

Nevertheless, there is still a huge gap in the logistics sector in relation to the diffusion of ERP systems. In freight transport and logistics, e-Commerce is facilitated through initiating and tracking shipments online. By using GPS systems, a person equipped with the receiver can locate and move on land, sea, air and space around the earth. The GPS system has gained considerable application in the civilian sector and created a huge commercial development in many areas; shipping, road transport and tracking. By using GPS systems, transporters can easily track the locations of a vehicle at any time thus anticipate any delays in deliveries. The system also helps in reducing theft and locating the best transport routes(Zhang,2007).

2.2.3 Technology Adoption Model

The Technology Acceptance Model (TAM) is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it. Luaren and Lin (2005) used the technology acceptance model in an effort to understand customer intention to use technology. Pedersen (2005) favored the use of the decomposed theory of planned behavior in his study on internet usage. He further points out that there exists few studies based on information systems theories applied to supply chain technology .On the other hand Lauren and Lin (2005) employed the technology acceptance model in his study because he views technology as an innovation for an organizations.

According to Yan (2009), the technology acceptance model (TAM) is a widely used model in information system field and presents a theoretical contribution towards understanding technology acceptance. TAM aims to provide an explanation of the determinants of the

technology acceptance that are general, capable of explaining user behavior across a broad range of technologies and user populations while at the same time being both parsimoniously and theoretically justified (Davis, 1989).

TAM focuses on the attitudinal explanations of intention to use specific technology Nysveen (2005). Five variables are included in TAM which is; perceived usefulness, perceived ease of use, and attitude towards using, behavioral intention and actual use. The two specific variables namely perceived ease of use and perceived usefulness are hypothesized to be the fundamental determinants of user acceptance Davis (1989).Perceived usefulness is defined as the expectation that the technology will enhance job performance and service delivery and perceived ease of use is defined as the belief that using technology will be free of effort Davis (1989).

2.2.4 ICT Adoption

According to Michael Hurns (2002) supply-chain problems cost companies between 9 and 20 percent of their value over a six-month period. The problems range from part shortages to poorly utilized plant capacity. When you place this in the context of the over-all business-to-business (B2B) market expected to reach US$7 trillion by 2004 (37 percent of which is projected to be e-commerce sales), it's easy to see that effective supply-chain management (SCM) tools could save companies billions of dollars.

Attempts to automate solutions to these problems are complicated by the need for the different companies in a supply chain to maintain the integrity and confidentiality of their information systems and operations.

According to Wieder (2006) the objective of an enterprise resource planning (ERP) solution is to unify and standardize business processes. Centralizing information makes it easier to collect, access, and manage data across the enterprise. But the critical value businesses reap from ERP is expanded visibility into data that can be used to better inform their business decisions and operational proficiency. The Enterprise Resource Planning (ERP) phenomenon provides an opportunity to drastically rethink supply chain strategies.

ERP system can cope with different functional area, such as, sales, accounts receivable, accounts payable, engineering, inventory management, production, purchase, quality management, human resources, production, and distribution planning. Basically, ERP systems competent to integrate optimize, and coordinate physical, cash, and information flow in the above-mentioned functional area as well as within the entire supply chain of the company (Zheng, 2000).

ERP systems aims at understanding the key drivers of the ERP phenomenon, the determination of costs and anticipated benefits, the principal challenges during the implementation project, and the maintenance of the software once it is in place. Such an understanding would provide valuable guidance to managers who are currently undertaking such far-reaching projects. Bradford and Florin (2003) draw upon Diffusion of Innovation and Information Systems Success theories to determine that the level of employee training in the ERP system and competitive pressure to adopt the system positively impact implementation performance.

Implementing all modules of ERP system is not affordable by many companies and this is because of the large sum of money that the company needs to pay in order to implement the whole package of ERP system and then obtain all functionality of the system Parr and Shanks (2000); Sheikh (2003). Companies usually implement some modules of ERP system and not all modules. The selection of the modules depends on the requirement of the company and on what functionality they need to be provided within the company as well as on the need of specific modules that can fit to particular requirements and therefore satisfy the business objectives Parr and Shanks(2000); Sheikh(2003). For instance, when companies need to improve their financial performance they implement modules related to finance and when they need to improve SCM performance they implement modules related to SCM SAP, 2006 (Davenport) and Brooks (2004) noted the large impact of ERP system on SCM in helping companies to share information with other partners.

ERP system is generally conceived as an important precursor to SCM performance and a very useful tool for its improving Zheng (2000). With ERP system companies are able to integrate all functional units, standardize and manage information sharing within their entire departments and then extended it to suppliers and customers in order for suppliers to expedite the delivery of necessary raw materials and also in order for customers to place an order faster and smoother.

Usually the implementation of ERP system will be linked to business process reengineering in order to focus on business process activities in entire company Subramoniam (2009). There is a wide consensus among many authors on the importance of ERP system in the improvement of supply chain performance. For instance Wieder(2006) found that, there are positive impacts of ERP system on supply chain performance. Zeng and Pathak (2003) stated that, there are several records of success indicating that the integration of supply chain can enhance and improve the performance of the supply chain to be effective and competitive in the global business environment. Moreover, Hitt (2002) pointed out that, investment in ERP system improves productivity and business performance.

Cotteleer (2002) found that, ERP system is able to improve operational performance within the supply chain. Themistocleous (2002) come up with a conclusion that ERP system supported SCM since long time. On the other hand, there is a large argument among several authors in ERP literature about the section or the area that ERP system improves inside the company as well as within the whole supply chain. Rom and Rohde (2006) argue that, ERP system can support data collection and management accounting better than other systems such as strategic enterprise management system. Spathis & Constantinides (2004) noted that, ERP system improves flexibility in information generation, as perceived by many companies, and it is able to decrease operational costs and cycle time and thus increase customer satisfaction and loyalty. Tarn (2002) pointed out that, ERP system able to expedite information sharing within SCM in order to enable closer cooperation among supply chain partners and to reduce the cost of transaction.

The overall supply chain performance could be improved through the channel coordination, information sharing, operational efficiency, and integrated communication within the supply chain. ERP system provides integration for better communication and coordination within the company and its supply chain. The success of ERP system and the supply chain highly depends on the process of integration achieved in the company and this could be achieved smoothly with the core functionality of ERP system which provides web linkage, facilitateselectronic data interchange, and integrates the entire supply chain in order to support effectively the company's supply chain activities Olson (2005); Park &Kusiak(2005). According to a study conducted in Thailand on Thai-owned and multinational companies, ERP system able to improve scheduling,

tracking, and managing inventories and raw materials. It also able to save costs, improves business processes and internal integration, reduce human error and staff costs, enhance visibility and accessibility to data, and increase responsiveness (Arunthari, 2000).

2.2.5 ICT Application

Information and communication technologies (ICT) are one of the most important enablers of effective supply chain management Jack (2006). A great deal of interest in supply chain management stems from the availability of information and the methods to analyze this information to reach meaningful results. As electronic business gain importance, new opportunities exist, and the wide spread use of internet is increasing the interest for the information technologies Haag and Stephen (2010). ICT tools are a source of competitive power for many companies. Especially for service industries such as big retailers, transportation companies such as DHL and airline companies where they are now using information technologies them widely as a result, information technologies have earned a vital role in many organizations Lysons & Farrington (2006). In supply chain management, time and opportunities to get information on time is very important. Accurate and timely information will enable the organization to increase service level and as a result decrease the costs and lead times Bottani (2008). Along with this, many companies are offering information technologies based services to their customers in order to gain competitive edge and sustain long term relationships with them.

Logistics and distributors and virtually every other type of industry are using bar code to replace keyboard data entry. The warehouse, when the goods enter through a conveyor, they are further scanned by the hand held scanner or scanner fixed alongside the conveyor. The information decoded by the scanner is immediately logged in the central computer which helps real time update of inventory records Witt (2004). During the production process the identification of in-process and finished items become easier due to bar coding. The various bathes at different stages of production can be easily tracked. During distribution, barcode helps in identifying and tracking the transit of finished goods to the customers. Bar codes according to Jones (2004) have many features and benefits likely to stimulate and facilitate substantial change within numerous industry supply chains.

According to Glidden (2004) Bar codes also offer the potential to gain several additional key business advantages including labor savings from eliminating manual bar code scanning or keypad entry, theft and loss prevention capabilities; streamlined inventories and cost reduction; reduced turnaround time and responsiveness; increased efficiency by minimizing unnecessary handling; potential for production adjustment to real-time downstream inventory level reports; and on-demand replenishment at the distribution center or retail store level. Barcodes have influenced almost every aspect of Supply Chain Management. The use of barcodes makes business integration processes in supply chain management simpler and more efficient. Barcodes are an effective identification tool that helps track products and greatly reduce errors.

Barcode technology has a range of advantages such as being affordable, easy to handle, and accurate. These advantages make barcodes widely used in supply chain management and accepted across the world. According to Quagliariello (2004) employing barcode technology in inventory practices enables timely and accurate information that helps to operate with greater warehouse efficiency and lower inventory on hand. One of the problems associated with Bar Code is that, these are prone to environmental conditions, such as temperature, dirt, or hazardous contamination making it difficult for reader to scan the items. Barcode may be useful in some cases, where time is not that much crucial but cost is a major concern.

2.2.6 Perceived ease of use

Perceived ease of use is defined as the “the degree to which an individual; believes that using a particular system would be free from physical and mental effort” Davis (1991). It has also been defined as a user’s subjective perception of the effortlessness of a computer system. This follows from the definition of the word “ease”: “freedom from difficulty or great effort.” Effort is a finite resource that a person may allocate to the various activities for which he or she is responsible Radner & Rothschild (1975). All else held constant, an application perceived to be easier to use than another is more likely to be more accepted by users. Perceived ease of use explains the user’s perception of the amount of effort required to utilize the system or extent to which a user believes that using a particular technology will be effortless Davis (1989). Perceived ease of use has been established from previous research to be an important factor influencing user acceptance and usage behavior of information technologies Igbaria, Livari, & Maragahh (1995). Perceived ease of use consists of the following determinants: easy to use, easy to read, using

understandable terms, able to link to search for related information and easy to return to previous page. This includes support, complexity and change management.

Venkatesh (2000) reported perceived ease of use 'describes the individual's perception of how easy the innovation is to learn and to use'. Given that some fraction of a user's total job content is devoted to physically using the system *per se,* if the user becomes more productive in that fraction of his or her job via greater ease of use, then he or she should become more productive overall. Users believe that a given application may be successful, but they may, at the same time, believe that the technology is too hard to use and that the performance benefits of usage are outweighed by the effort of application Davis & Arbor (1989).Gefen and Straub (2000) suggested managers and co-workers need to realize that the same mode of communication maybe perceived differently by the sexes. This argument is strengthened by the studies on the effects of gender and their ease to use a new technology. Venkatesh (2000) found gender differences in individual adoption and sustained usage of technology in the workplace. In their study, men's decision in this regard were more strongly influenced by their attitude towards using the new technology, while women were more strongly influenced by their subjective norm and perceived behavior control. Harrison and Rainer (1992) also found some relationship between gender and computer skills. Male associates had higher computer skills, while their female counterparts recorded a higher level of computer anxiety.

2.2.7 Perceived Usefulness

Perceived usefulness been defined as a person's subjective perception of the ability of a computer to increase job performance when completing a task, which affects their perceived usefulness thus having an indirect effect on user's technology acceptance. It is defined as the degree to which a person believes that using a particular technology will enhance his or her job performance Davis (1986). In the words of Davis, Bagozzi, and Warshaw (1992), perceived usefulness refer to consumers' perceptions regarding the outcome of an experience. This follows from the definition of the word useful: "capable of being used advantageously. Within an organizational context, people are generally reinforced for good performance by raises, promotions, bonuses, and other rewards Pfeffer (1982); Schein (1980); Vroom (1964). A system

high in perceived usefulness, in turn, is one for which a user believes in the existence of a positive use-performance relationship.

People tend to use or not to use a system application to the extent they believe it will help them perform their job better Davis (1989). Usefulness can also be defined as the prospective adopter's subjective probability that applying the new technology from foreign sources will be beneficial to his personal and/or the adopting company's well being Phillips (1994). Or that using the technology would improve the way a user could complete a given task. Perceived usefulness explains the user's perception to the extent that the technology will improve the user's workplace performance Davis (1989). This means that the user has a perception of how useful the technology is in performing his job tasks. This includes decreasing the time for doing the job, more efficiency and accuracy.

2.2.8 IT Capability and its Dimensions

According to Lai (2008), capability is where by a firm is highly organized and managed in a way that enables it to exploit the full potential of its resources. In relation to this, IT capability is the ability to mobilize and deploy IT-based resources in combination or co-present with other resources and capabilities Lai (2008). It is the extent to which a firm embeds a certain set of technologies in its processes and makes them fully operational for being used Pieto (2012). It therefore involves the application of and ability to use hard ware, software, and network to enhance information flow and facilitate decisions (Lai ,2008).

IT Capability has been defined in terms of its managerial capabilities Sambamurthy & Zmud, (1992); Ross, Beath, & Goodhue (1996) and technical skills Teo & King (1997). IT Capabilities are looked at as a firm`s ability to acquire, deploy, and leverage its IT investment in combination with other resources and capabilities as well as to support and enhance its distinctive competencies and skills in other business functions in order to achieve business objectives through its implementations Sambamurthy & Zmud (1992); Ross, Beath, &Goodhue, (1996). It is viewed as a multidimensional construct which consists of six models Sabharwal & Kirs (1994); Sabherwal (1999); Byrd & Turner (2000). The six models have been summarized into IT architecture, IT infrastructure, IT Human resource, and IT relationship resource.

2.2.9 Impact of Supply Chain Technology Adoption

According to Tippins and Sohi, (2003) Technology adoption in supply chain can defined as the extent to which a firm adopts the most advanced available technology and involves proactive adoption of the state of art IT to build new technical solutions for supply chains. Supply chain technology embraces the degree of diffusion of information technology within a firm's activities. However, Supply chain technology adoption is a distinctive concept from information technology. Supply chain technology enables a firm to adopt new technologies ahead of competitors.

Barney (2004), points out that supply chain technology adoption cultivates organizational capabilities that enable the firm to outperform their competitors. However, adoption of information technology alone may not be a source of competitive advantage because of their wide availability in the market, only when the information technology is embedded in to organizational processes (e.g. strategy making), it is expected to offer sustainable benefits. The increasing role of supply chain technology has contributed to the evolution of the competitive supply chain management. According to Regan and Song (2001), the following trends are evident as a consequence of the impact of technology adoption in supply chain management, development of new services, new functions, formation of new alliances etc. One of the first visible effects associated with the increasing dissemination of supply chain technology in service industry is the integration of traditional services such as transportation and warehousing with information based services like booking, freight rate computation, routing and scheduling. Over the last few years such companies have made significant progress in the adoption of new technologies, particularly those linked to the internet. Today, the main transport and logistics service firms are able to provide a variety of information via the internet and to secure transactions online with customers through their web sites (Ellinger ,2004).

The dissemination of supply chain technology has opened up new opportunities for the development of new roles in the supply chain. Their main purpose is to give added value to supply chain functions through greater efficiency and information transparency. They run internet portals which bring together various members of the supply chain UNCTAD (2000).Another feature emerging alongside the internet and supply chain technology is the

creation of a new category of service provider called fourth party logistics (4PLs). A 4PL is a supply chain integrator who assembles and manages the resources, capabilities and technology of its organization with those of complementary service providers to deliver a comprehensive supply chain solution Bade (1999). The 4PLs enable customers to outsource the management of the entire logistics network to a single organization and to re-engineer supply chain processes.
Often 4PLs have been set up through alliances formed with management consulting companies, financial Service companies and technology providers. According to Regan and Song (2001)with the emergence of 4PLs, there is an ongoing trend in the logistics service industry to form alliances with firms operating in other industries.

2.3 Empirical Literature Review

Empirical literature review deals with original research (such as scientific experiments, surveys and research studies). They are researches based on experience and observation, rather than on systematic logic Malang (2012).

2.3.1 Supply Chain Performance

The study of Mishra, (2012) focused on the role of Information technology (IT) in supply chain management. It also highlights the contribution of IT in helping to restructure the entire distribution set up to achieve higher service levels and lower inventory and lower supply chain costs. The broad strategic directions which need to be supported by the IT strategy are increasing of frequency of receipts/dispatch, holding materials further up the supply chain and crashing the various lead times. Critical IT contributions and implementations are discussed. Fundamental changes have occurred in today's economy. These changes alter the relationship we have with our customers, our suppliers, our business partners and our colleagues. It also describes how IT developments have presented companies with unprecedented opportunities to gain competitive advantage. So IT investment is the pre-requisite thing for each firm in order to sustain in the market.

The Study of Dong (2009) aimed to better understand the value of information technology (IT) in supply chain contexts. Grounded in the resource-based theory in conjunction with transaction cost economics, they developed a conceptual model that links three IT-related resources (back end integration, managerial skills, and partner support) to firm performance improvement. The

model differs from previous studies by proposing a moderating effect of competition on the resource-performance relationships. Using data of 743 manufacturing firms, their analysis indicates significant contribution of IT to supply chains, which is generated through development of the digitally enabled integration capability and manifested at the process level along the supply chain. The technological resource alone, however, does not hold the answer to IT value creation. In fact, managerial skills, which enable adaptations on supply chain processes and corporate strategy to accommodate the use of IT, are shown to play the strongest role in IT value creation.

A number of beneficial changes were made, including the implementation of a major new business system replacing the old accounting system. In all these developments, the work of a teaching company associate, now known as knowledge transfer partnerships associate supported the analysis, but the full participation and support of all key personnel within the company was essential. Although there were problems during the implementation, these have being resolved and Beale and Cole now has a fully supported and integrated IT system which will maintain their competitive advantage and facilitate their continued growth and profitability. The study of David (2004) indicated that the supply chain management is critical since firms always confront the competition on their supply chain efficiency.

Specialized tools address the critical issues in food production management including product tracing, quality management, product identification and specification, expiration dates, production lots, date codes and hold management. Lead time being the time between order and placement of materials and the actual delivery, he shorter the lead time the better the supplier. Every logistics company is comfortable when the lead time is shortest possible. Long lead time has time has the impression that the specific supplier is less efficient or he just has some more customers than he can serve thus delaying deliveries Beamon (2005). Organization technologies have led to a host of innovations which seem to be radically changing the nature of manufacturing industry.

The increasing replacement of mass production, specialized single –purpose, fixed equipment by computer aided design and engineering capabilities (CAD/CAE). robots, automatic handling and transporting devices, flexible manufacturing systems (FMS), computer aided/ integrated

manufacturing(CAM/CIM),cellular manufacturing, just in time (JIT) techniques, materials resource planning(MRP), and telematics has allowed firms to produce a larger variety of outputs efficiently in smaller batches and less time Kaplisky (2006). State-of –the art supply chain management systems can be obtained from the supply chain operations Reference Model for business applications, advancement and practices.

Problematic management processes in standard process reference model form improves competitive advantage, communication, dimensions, management, control and alter to a specific purpose among the supply chain management processes. SCOR (Supply Chain Operations Reference) is a reference framework that models supply chains, developed by the Supply Chain Council, set in 1996 by Pittiglio. Rabin,Todd McGrath (PRTM) and MR Research. SCOR models supply chain by these complementary perspectives, approach, functional domains and levels of analysis Stewart (1997). SCOR has been developed for applying and advancing state-of-the art supply chain management systems and practices through its structured framework and approach. It provides a comprehensive methodology to improve the overall supply chain operations. SCOR, is a flexible framework and has common language that can help companies improve their SC internally and externally, were developed by real-world supply chain experiences.

SCOR evaluates the objective, effectiveness of reengineering, performance, quantification, testing and future planning as well as specific process operations in SC. It is not possible to have a perfect SCM model but a closely adapted model is being applied at PTC, which is a first in the history of SCOR at the factory level Gulledge, Cavusoglu & Kessler (2010). Complex management processes can be transformed in standard process reference model form to achieve competitive advantage, communication, measurement, management, control systems and alterations for a specific purpose. Since SCM systems can be represented in the form of a model which represents the real world situation .It is necessary to study modeling approaches for the integration of each function through SCM concepts.

According to Archie & Kevin (2004) SCOR includes main functional domains, with a concept similar to GEF and porter’s value chain planning processes, Plan the supply chain: operations planning (similar to GEF), Execution Processes, Source: equivalent to Porter’s Inbound

Logistics; Make: equivalent to Porter's Operations ,includes the realization of products via blending, separation, mechanical work, chemical transformation; Deliver, equivalent to porter's outbound Logistics +Porter's Sales; and Return: return of materials by the customer to the supplier, e.g. because they have not been positively tested. SCOR includes also a wide class of "enabling processes", that are intended to prepare, file, handle information needed to planning and execution processes.

Gulledge (2010) argues that SCOR process elements are described by a thick Manual, that contains diagrams and cards that list their properties in terms of Text description; Metrics by which business performances of a process, element are measured in terms of reliability, responsiveness, flexibility, cost, asset; Best practices, that mentioned reference solutions to perform or computerize the process element considered, and also, mention excellence criteria, e.g. planning is excellent if balances supply and demand. The SCOR method is a customization of the reference framework processes, problematic management processes, lead time being the time between order and placement of material and the actual delivery, the shorter the lead time, the better the supplier. Every logistics company is comfortable when the lead time is shortest possible. Long lead time has the impression that the specific supplier is less efficient or he just has more customers than he can serve thus delaying deliveries Beamon (2005). Organization technologies have led to a host of innovations which seem to be radically changing the nature of manufacturing industry.

The increasing replacement of mass production, specialized, single-purpose, fixed equipment by computer aided design and engineering capabilities (CAD/CAE), robots, automatic handling and transporting devices, flexible manufacturing systems (FMS), computer aided/integrated manufacturing (CAM/CIM), cellular manufacturing, just-in-time (JIT) techniques, materials resource planning (MRP) and telematics has allowed firms to produce a larger variety of outputs efficiently in smaller batches and less time Kaplinsky (2006). The implementation of ICT affects supply chain performance in various ways as outlined in the following section.

2.3.2 Role of ICT on the Supply Chain Performance

The subject of ICT in supply chain and logistics has attracted many researchers who have conducted studies on different areas of the subject. In its report on transport and logistics, the European Commission noted that the use of ICT software positively drives organizational changes European Commission (2008). The study tested the hypothesis that ICT usage positively correlates to organizational changes and it was noted that ICT skills and software have different implications on the conduct and performance of organizations. In the same study, it was again noted that whereas ICT hardware is necessary for an organization, it does not automatically guarantee business transformation. Positive change comes from ICT skills coupled with the use of innovative software to manipulate operations. The success derived from ICT investment from a logistics companies therefore largely hinges on innovation, skills and software used.

In a feasibility study of an integrated ICT-based logistics system for the Friuli Venezia Giulia region in Italy, Danielis (2008) finds that intermodal transport needs can be enhanced by connecting the regional stakeholders with an ICT system. By interviewing 20 stakeholders, the researchers noted that a generic ICT system might not be applicable to the region. It was realized that a successful ICT system must be implemented in phases beginning with the sharing of information on the benefits of the system. From the findings, it emerged that an ICT-based system in logistics operations greatly reduces transportation costs, energy usage and carbon emission. Transportation management System (TMS) helps in planning and executing external flows thereby optimizing transportation while taking account of multimodal transport, and international trade.

In the East African Logistics Performance Survey (2012), the Shippers Council of Eastern Africa did a field assessment of the challenges faced by logistics companies in the region. 54.4% of the respondents indicated that they always experienced delays arising from insufficient ICT infrastructure. In addition, it was seen that the security of cargo is a major challenge to the shippers as it is not always guaranteed in the supply chain. In this regard, the ability of the companies to track and trace their shipments becomes an important issue. The respondents were also asked how easily they could always track their shipments while intransit. 31.25% said they

use electronic means of cargo tracking while the rest rely on telephone as the main way of tracking.

Zhelyazkoz (2008) studied the impact of ICT systems on road logistics for companies in Australia. The research identified the major reasons and inhibitors to the adoption of ICT by logistic companies. Considering the cost implications and technical features of ideal ICT systems, it was realized that it was not always certain that ICT investment fulfils the needs of companies. Technology constraints were identified as major barriers due to the lack of standard communication platforms between different suppliers and buyers. It was realized that different ICT applications adopted in the market meant that companies always invest heavily in order to communicate to all parties. It is therefore seen that ICT only influences an organization's supply chain system when used appropriately and in the presence of supporting infrastructure. This study focuses on effects of ERP, RFID, Bar coding and GPS on supply chain performance.

2.3.3 Expected Performance Outcomes of ICT Adoption

A variety of expected performance outcomes of ICT adoption are touted in the literature. As such, EDIand RFID diffusion studies often suggest that anticipation of benefits derived from the implementation ofICT is a key antecedent to adoption e.g. Crum (1996); Premkumar (2003). Benefits investigated inthe literature range from reduced order cycle times and inventory levels Leonard & Davis (2006) toreduced labor costs and increased profits Samad (2010). Some suggest that this wide range ofbenefits related to ICT adoption seems to have perpetuated many inconsistencies in construct development and measurement in the literature Narayanan (2009). This problem is exacerbated by the fact that LIT research is published in academic journals representing nearly 100 different subject categories Irani (2010). Therefore, in order to adequately investigate this study's research questions, these numerous performance outcomes must be categorized in such a way as to allow for proper analysis.

To this end, we adapt a typology of outcomes proposed in recent literature Karimi (2007).
Although each individual technology boasts a unique set of anticipated benefits, we suggest that the vast majority of the performance outcomes (both anticipated and actual) resulting from the adoption of any ICT may be categorized into one of three higher-order outcomes. We define a

performance outcome as any result that affects a business function of the organization, whether in a positive or negative manner. In this study, performance outcomes are classified within one of the following four categories efficiency, effectiveness, flexibility and responsiveness.

2.3.4 Efficiency

Organizational efficiency is defined as an internal standard of performance Pfeffer and Salancik (1978) and is approximately a construct for doing the things right. From resource dependence perspective efficiency is an independent measure for evaluating organizational productivity. Output produced per resources utilized should equal 100 % inclusive losses. Efficiency seen in this formula is a good measure of a closed system's output, such as an organization from a machine-bureaucratic perspective when produced output is the same as profit .However, making evaluations of activity systems, as supply chains, rather than organizations is more complex as boundaries is flux Hoek (1998);Håkansson and Prenkert (2004)conceptualize efficiency based on a dyadic system's exchange value. Exchange value is evaluated by the two actors regarding the activity system's utilization of resources. A supply chain is an activity system, i.e. an exchange system of producing/using activities as well as a networking activity system. If we elaborate that one firm use its resources to 100 %, it seems to be efficient. However, in a producing/using activity system, as a supply chain, this might be inefficient due to expensive inventory costs. Efficiency is thus a quantitative as well as a qualitative evaluation in a supply chain as goals have to be negotiated.

Efficiency is seen as a "value free" quantifiable measure – highly valued as a rationale for activities such as improvement programs or as a base for rewards. This is problematic for social systems Pfeffer and Salancik (1978) as efficiency is two dimensional (input and output)and social systems usually have several dimensions in their output. An example of this is the interdependencies within as well as among supply chains that cause efficiency in one supply chain and inefficiency in overlapping supply chains Dubois (2003). This means that efficiency within a supply-chain system is difficult to optimize due to limited knowledge of interdependencies within the supply chain as well as towards other supply chains. This is evident in the ramp-up phase of Volvo's S80 model. Despite a trade-off where Volvo's suppliers balanced between efficiency (through scale) and unique solutions they contributed to the supply

chain efficiency Corswant (2004). This implies that the supply chain is a specific activity system, where the efficiency goal is compound and negotiated along the chain. This is seen in findings from Volvo Car Corporation evaluation of their suppliers Fredriksson and Gadde (2003). The efficiency is therein described as a compound evaluation of quality, delivery, cost, and overall capability that is not only planned and reviewed in the relationship but also a measure of the relationship. The efficiency of the producing/using system is influenced by serial interdependencies through relationships. Efficiency is thus evaluated of several parties within the exchange system and negotiated interdependencies determine efficiency goals.

Two variables are left to elaborate on from the formula of efficiency: Resources utilized and losses. These variables capture lots of efficiency goals targeted in JIT, Kaizen and lean production. Volvo Car Corporation uses a JIT-production, which is mirrored in their use of efficiency evaluation. Utilization of scarce resources has cost implications but also implications regarding capability to innovate Fredriksson and Gadde (2003). This implies that losses in an evaluation of one firm or one relationship are efficiency to the supply chain.

Efficiency thereby means exploitation of interdependencies, reliability and control of resources. This means that efficiency is neither value-free nor easily quantifiable measure. Thus, the supply chain efficiency as an internal standard of performance differs from the organizational efficiency as the activity system's boundaries shifts. Activities are also a problematic unit of analysis as they are interdependent and changes influence dynamically several outcomes. And finally the meaning of efficiency is ambiguous as very high resource utilization is not necessarily perceived as efficiency.

2.3.5 Effectiveness

Organizational effectiveness is defined as an external standard "of how well an organization is meeting the demands of the various groups and organizations that are concerned with its activities" Pfeffer and Salancik (1978) which approximately is a construct "for doing the right things" or having validity of outcome Hines (2000). A conceptualization of effectiveness as use value is interesting to highlight that *how well* as well as *demands* in the above definition is vague. Håkansson and Prenkert (2004) seem to refer use value to evaluation of the network's

utilization of resources. In resource dependence perspective is effectiveness seen as an independent measure for evaluating organizations. Meeting demands of various evaluators means that conflicting as well as compatible demands areprevalent. Pfeffer and Salancik (2003) foresee conflict when one stakeholder's demand constraints other stakeholder's demand, which is the case for the supply chain actors. Conflict but also co-operation gives "lessons learnt" in one exchange process that is leveraged in other exchange processes. The evaluators we are concerned with are customers; customers seen in the producing/using activity system as well as in the networking activity system. Suppliers are effective if they deliver what is asked for, no matter if they are bound to fill their warehouses to manage, i.e. if they manage the task inefficiently. In supply chain management research is effectiveness equalized with supply chains' flexibility and agility to customer demand. Ineffective supply chains are loosely integrated with poor management of existing interdependencies.

Effectiveness is by definition a qualitative measure set by evaluator. Möller and Törrönen(2003) argue that effectiveness "refers to an actor's ability to invent and produce solutions that provide more value to markets (customers) than existing offers". This definition seems to equalize effectiveness to entrepreneurial activity as the ability to invent new solutions with added value is emphasized. In a supply chain context seems this definition to be counterproductive as it is based on an assumption that relationships are compared to competitors offers rather than evaluated in relation to customer's and their customers' demand. In practice is the evaluator, who is interdependent with the supplier, influenced by the relationship, by the supply chain and by the network. Effectiveness is created in a relationship in a process of attention to different interdependencies, i.e. the evaluator is influenced in its evaluation. We would propose that effectiveness, as a use value in a supply chain, is a combination of indirect benefits gained through the supplier and the supplier network Walter (2001). Ineffectiveness is an experienced misfit of resources in a resource pattern. This means that existing problems might be overlooked and that a relationship is evaluated as effective as long as there is potential of the exchange system to fulfill demands. It means also that effectiveness is goal oriented on a strategic level Liljegren(1988). The effectiveness is a co-created measure that is changed due to an increase in demand or a strategic change rather than regularly in short-term intervals. In these occurrences buyers evaluate the fit between supplier capability and buyers' need.

2.3.6 Flexibility in supply chains

In the history of SCM literature, high speed and low cost supply chains have been important drivers for companies. Depending on the market the firm is in, these supply chains work perfectly in steady conditions since the entire supply chain is focused on economies of scale, delivering quick supply for the least amount of money. However, these supply chains are not able to react on sudden changes in demand.

Several articles explain how current market conditions require supply chains that are capable of dealing with sudden changes of demand and strategies instead of a cost and/or speed oriented view solely. Changing market demand, differing supplier lead time, product quality and information delay Giannoccaro (2003)are sources of uncertainty that create a need for building 'flexible'- supply chains that can deal with these changes and preferably in a better way then their rivals. In doing so, a competitive advantage can be achieved. Literature about flexibility in supply chain management describes several definitions about this concept. Viswanadham & Raghavan (1997) describe this concept as the ability of a business process to effectively manage or react to changes with little penalty in time, cost, quality or performance. Lee (2004) explains the flexible ability of a company in terms of three distinctive components. These components are general characteristics of flexible supply chains since it is not described how these components influence the functional operations in the supply chain:

Adaptable: Adjust the supply chain's design to meet structural shifts in markets, modify supply network strategies, products and technologies (Lee, 2004).
Alignment: Create incentives along the partners within the supply chain for better overall performance (Lee, 2004).
Agility: The ability of a supply chain to respond to short-term changes in demand or supply quickly and handle external disruptions smoothly (Lee, 2004).
Although alignment is considered to be one of the aspects of flexibility Lee (2004), we consider this aspect as a prerequisite for a supply chain in order to deal with uncertainty: a supply chain can only deal with changes when common agreement is made between all the supply chain

partners and change of strategies is necessary. As a conclusion of the above we define flexibility in supply chains as:

Flexibility in supply chains is the possibility to respond to short term changes in demand or supply situations of other external disruptions together with the adjustment to strategic and structural shifts in the environment of the supply chain. Flexibility thus combines agility and adaptability (Lee, 2004).

2.3.7 Responsiveness

Responsive supply chain strategy can be defined as the determination of major customer requirements in terms of range, frequency, cost, time-to-market, demand variability, and innovation of product offering Gunasekaran (2008). Hitachi consulting suggests that it is the ability of firm to response the fluctuating of the customer demands Brant (2009). They argue that being operationally efficient does not lead directly to long term profitability. Therefore, Hitachi consulting clearly explains that the strategy of the supply chain should be both operationally excellent as well as market responsive.

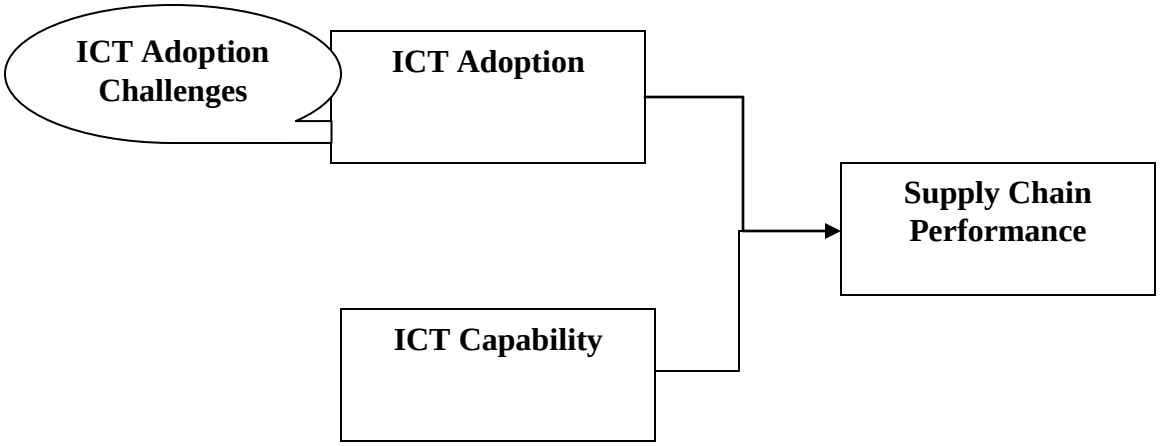
Responsive supply chains mainly are concentrated on how quickly they can respond to the customer needs and the facilities such type of manufacturing operations which can produce variable capacity. In short, responsive supply chain handles the issue of aggressive reduction into lead time by sacrificing the cost occurred. Quality aspects like flexibility and speed with which they deliver, decide the fate of vendors who bid for supplier contracts is only possible through the responsive supply chain (Brant , 2009).

Catalan and Kotzab (2003) define responsiveness of a supply chain as the ability to respond and manage time effectively based on the ability to read and understand actual market signals. Fisher (1997), Christopher (2000) and Grossmann (2005) suggested that responsive supply chain is an essential strategy to gain competitive advantage. Hines (1998) also explained how the responsive supply chains facilitates for a new generation of product, new product development, within a shorter time period and are thus able to achieve an edge over their competitors in terms of capturing market shares.

2.4 Conceptual Framework

Conceptual frame work is researcher's map that explains graphically or in narrative form the main areas to be studied the key factors or variables by establishing relationship among them. Miles and Huberman (1984). In this study the relationship between dependent and independent variables demonstrated conceptually in the below diagram.

Figure 2. 1: Conceptual framework of ICT adoption in ESLSE



Source: Davis (1983) Adopted by Author

Figure 2.1 Variables measuring dimensions

Variables	Dimensions	Authors
ICT Adoption	Perceived Ease of Use and Perceived Usefulness	Davis(1989)
ICT Capability	Human capital , ICT Infrastructure and ICT Capacity, Knowledge Source & IT Relationship	Chieh (2007)
ICT Adoption Challenges	Human related, Technical and Management	Pujan (2013)
Supply Chain Performance	Efficiency, Effectiveness, Responsiveness and Flexibility	Lee (2004)

Source: own survey (2019)

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.1 Description of the Study area

The study area focus on the role of ICT adoption on the supply chain performance of ESLSE, this chapter sets out various stages and phases that will follow in completing the study. It involves a blueprint for the collection, measurement and analysis of data. This section is an overall scheme, plan or structure conceived to aid the researcher in answering the raised research questions. The research identifies the procedures and techniques that used in the collection, processing and analysis of data. The subsections included are research approach and design, population and sample design, data source and type, data collection procedure, ethical consideration, method of data analysis and presentation and finally reliability and validity test.

3.2 Research approach and design

The research approach this study believed both qualitative and quantitative approached scan contributes greater to the wholeness of the investigation at hand. The quantitative approach involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion. Qualitative approach to research is concerned with subjective assessment of attitudes, opinions and behavior Kothari (2004).The study adopted a descriptive research design and descriptive study is concerned with determining the frequency with which something occurs or the relationship between variables Bryman & Bell (2003). Since the study was meant to test rather than generate theory, it adopted a quantitative approach which focused on describing and drawing inferences from the findings on the relationships and describes show ICT adoption affects supply chain performance in ESLSE. Correlation and regression analysis approaches were used to investigate the relationships between the variables and the extent to which the independent variables explained supply chain performance in ESLSE.

3.3 Population and sample Design

According to human resource department of ESLSE human resource department (2019) there were 683 permanent employees in head office of Addis Ababa out of which 124 were in the sector of shipping, 131 were freight forwarding, 42 were port and terminal and 38 were ICT department which was 335. The target respondents included staff at different levels i.e. executives, managers, departmental heads and any other staff .The stratified sampling techniques was applied after the population divided in to the appropriate strata and a simple random sampling was taken from each strata to represent all the strata .Using Krejcie and Morgan (1970) Tables of sample determination, 258 employees were found to appropriately match the population size of 335 and selected for this study. Finally the 183 questionnaires were collected which was 71% of the total sample, some of the questioners were not properly filled and the other was not returned because of the respondent unwillingness and busy with trainings.

Table 3. 1: Sample size determination

	Sample Size Determination			
Sector	Population Size	Sample size	Sample %	Collected Questioner
Shipping	124	95	37	75
Freight Forwarding	131	100	39	69
Port and Terminal Handling	42	32	12	21
ICT Department	38	29	11	18
Total	335	258	100	183

Source: own survey (2019)

3.4 Data source and type

The type of data collected includes both primary and secondary type of data. The instrument includes for the primary data, questionnaire and interview are the main one while for the secondary data, review of different manuals, and journal with regard to how the use of ICT

affects supply chain performance in ESLSE will study in more detail. The primary data is collected from employee of the ESLSE.

3.5 Data collection Procedure

The data was collected with the help of open ended close ended questionnaire and anchored on a 5 likert scale was conducted from selected individuals that took place in different department within Shipping Freight Forwarding and terminal and port handling Sector and ICT department of ESLSE head office in Addis Ababa.

3.6 Ethical Considerations

According to Belmont Report (1974) the three basic ethical principles relevant to research involving human subjects. Respect for persons, beneficence and justice. Accordingly, in this research, the researchers adhere to all ethical and legal issues and handle it professionally. Things such as confidentiality, respect of the respondents right to participate or quite the research at any point is protected.

3.7 Method of data analysis and presentation

Data collected quantitatively and it analyzed by descriptive analysis. The descriptive statistical tools such as Statistical Package for Social Sciences (SPSS) help the researcher to describe the data and determine the extent. Data analysis use frequencies, percentages, mean and other central tendencies. Tables use to summarize responses for further analysis and facilitate comparison. The researcher applied factor analysis to reduce the variable dimension and a correlation analysis to establish the strength of the relationship between the study variables. The researcher carried out a regression analysis so as to determine role of ICT adoption and ICT capability on supply chain performance in ESLSE. Descriptive analysis was applied in order to see major challenges of ICT adoption in supply chain Performance of the ESLSE and to identify triggering factors of ICT adoption in ESLSE.

3.8 Validity and Reliability Test

To establish the validity of the research instrument the researcher sought opinion of experts in the field of study especially the researcher's supervisor and lecturers in the school of Commerce. This was facilitated the necessary revision and modification of the research instrument thereby enhancing validity. According to Bryman and Bell (2007), reliability analysis is concerned with the internal consistency of the research instrument. As multiple items in all constructs were use, the internal consistency/reliabilities of ICT capability, role of ICT adoption, and ICT impact in supply chain performance and challenges of ICT adoption were assess with Cronbach's Alpha and the reliability values for all constructs show that the instrument was reliable since the coefficients were above 0.7 Nunnally (1978) in Table 3.2.

Table 3. 2: Reliability Test

	Reliability Test	
Items	Cronbach's Alpha Based on Standardized Items	Number of Items
ICT Adoption	0.815	27
ICT Capability	0.711	17
ICT Adoption Challenge	0.717	18
Supply Chain Performance	0.934	34
Over all Reliability Statistics	0.913	96

Source: own survey (2019)

CHAPTER FOUR

RESULT, DISCUSSION AND INTERPRETATION

4.1 Introduction

To present sample characteristics, frequency distributions were used to indicate variations of respondents based on age, experience, qualification, sector or department, position, ICT course taken, period of computer usage, period internet usage. The sample characteristics were presented basing on the responses from ESLSE head office in Addis Ababa. The results are presented Tables.

4.2 Demographic profile of the respondent

As per the results, there were 51 male and 29 female respondents. This means that more female are employed by the Clearing Firms compared to the number of female as showed by 63.8% and 36.3% respectively. The results show that the majority of the respondents (57%) were aged below 30 years. The least number of respondents (0.5%) were 50 years and above. The rest of the respondents who were between31-40 represented 36.1% whereas the respondents who were in the age bracket of 41-50 were 5.5%. This possibly suggests that ESLSE employed more staffs who are below 30 years of age and the least employed age bracket is 50 years and above.

The results show that the majority of the respondents 88.5% have attained degree while the least have attained Diploma 1.6%. The rest of the respondents were post graduate degrees 9.8%. The findings indicate that ESLSE employee majority of them obtained Bachelor's degree of education.

The result show 59.6% of the employees have between 0 up to 5 years experience in ESLSE and 40.4% of the employees were between 5-10 years of experience which shows most of the employees were not much experience which support the above finding most of them were less than 30 years old. From shipping sector 40.9%, ICT department 9.8% and port and terminal handling sector 37.7% employees were found.

The total of the employees position 16.9% were Executive staffs , 10.9% were managers and the rest 72.1% were is officers and the finding shows that most of the them were officers, Due to the

busy schedules of top managers, directors were not easily accessible in most cases and were always delegating the filling of the questionnaire to officers .

Table 4. 1: Demographic profile of the respondent

Age of Employees		Frequency	Percent
	< 30 Years	106	57.90
	31-40 Years	66	36.10
	41-50 Years	10	5.50
	>50 Years	1	0.54
	Total	183	100.00
Experience of Employees			
	0-5 Years	109	59.60
	6-10 Years	74	40.40
	Total	183	100.00
Qualification of Employees			
	Diploma	3	1.60
	Bachelor Degree	162	88.50
	Masters Degree	18	9.80
	Total	183	100.00
Sector Or Department of employees			
	Shipping Sector	75	40.90
	ICT Department	18	9.80
	Port And Terminal Sector	21	11.40
	Freight Forwarding Sector	69	37.70
	Total	183	100.00
Position of Employees			
	Executive	31	16.90
	Manager/Head Of Department	20	10.90
	Officer	132	72.10
	Total	183	100.00

Source: own survey (2019)

With respect to the ICT support training and courses 95.1% of them were took at least one course and 4.9% of the ESLSE employees did not take any ICT support courses ,the finding shows almost most of the staffs were taken the courses.

4.3 Respondents ICT related information

The result shows Period of computer usage were 71.6 % of them use computer more than 10 hours per week and 28.4% of them were use computer less than 10 hours per week. and the period of internet usage were 83.6% of the employees more than 8 hours per weeks ,11.5% of them between 0 up to 3 hours and 4.9% of them were used between 4 up to 7 hours per week and the finding shows most of the employees tasks were related with computer and internet .

Table 4. 2: ICT related information

	ICT Related Information of Respondent		
ICT Course taken		Frequency	Percent
	Yes	174	95.10
	No	9	4.90
	Total	183	100.00
Period Of Computer Usage			
	0 Up To 9 Hours	52	28.40
	>= 10 Hours	131	71.60
	Total	183	100.00
Period Internet Usage of Employees			
	0 Up To 3 Hours	21	11.50
	4 Up To 7 Hours	9	4.90
	>= 8 Hours	153	83.60
	Total	183	100.00

Source: own survey (2019)

4.4 Factor analysis of variables

Factor analysis was conducted using the principal components analysis (PCA) approach with varimax rotation to establish the underlying pattern in the data. PCA was chosen because it is the simplest of the true eigenvector-based multivariate analyses that often reveals the internal structure of the data in a way that best explains the variance by providing the user with a lower-

dimensional picture when viewed from its most informative viewpoint. Varimax rotation generally yields more stable results and is easier to interpret Ahimbisibwe (2014). A number of meaningful factors explaining a larger percentage of the common item variance emerged and all items loaded cleanly exceeding 0.50 as presented in the following tables.

The extraction of principal components or factors in principal component analysis takes place by calculating the eigenvalues of the matrix. As Rietveld & Van Hout (1993) state that the number of positive eigenvalues determines the number of dimensions needed to represent a set of scores without any loss of information. Hence, the number of positive eigenvalues determines the number of factors/components to be extracted. The construction of the factor itself is then calculated via a transformation matrix that is determined by the eigenvectors of the eigenvalues.

4.4.1 Variance (Eigenvalues)

If you use principal components to extract factors, the variance equals the eigenvalue. You can use the size of the eigenvalue to determine the number of factors. Retain the factors with the largest eigenvalues. For example, using the Kaiser criterion, you use only the factors with eigenvalues that are greater than 1.

4.4.2 Factor triggering ICT adoption in ESLSE

Factor analysis results for ICT adoption factor which were perceived usefulness and perceived ease. The extraction of principal component analysis of Perceived usefulness had three positive eigenvalues determine the number of dimension needed to represent a variable.

4.4.2.1 Perceived usefulness as a triggering factors of ICT adoption

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings interpreted the factors as follows:

Table 4. 3: Factor analysis and descriptive statistics of perceived usefulness

Rotated Component Matrix[a]				Mean	Std.D
	Factor 1	Factor2	Factor3		
Give Knowledge and Information				**4.12**	**0.97**
IT provides reliable security controls we need	0.920			3.93	1.26
We use IT for making inquiries	0.885			4.07	0.94
We find IT use to be flexible to interact with	0.873			4.09	0.87
Saving data in a large capacity	0.736			4.26	0.81
Enhance ICT knowledge and information	0.735			4.23	0.98
Accomplish task quickly				**4.17**	**1.06**
Using the IT is better than processing the documents manually		0.851		4.34	1.15
Using IT enables us to utilize services more quickly		0.773		4.18	0.89
Using IT simplify entry processing by our company		0.717		3.92	1.25
IT enhances our interaction with branch offices		0.697		4.25	0.94
Use resource efficiently				**4.36**	**0.83**
Speed up the communication process			0.845	4.54	0.76
Save Money			0.782	4.22	0.84
We recommend everybody to use IT due to its usefulness			0.715	4.45	0.80
We save time in entry processing when using IT			0.646	4.24	0.91
Eigenvalue	7.45	2.002	1.058		
% of Variance	57.308	15.397	8.14		
Cumulative %	57.308	72.706	80.846	**4.21**	**0.95**

Source: own survey (2019)

IT provides reliable security controls we need (0.920), we use IT for making inquiries (0.885), and we find IT use to be flexible to interact with (0.873) have large positive loadings on factor 1, so this factor describes IT provide reliability and flexibility in the ESLSE .

Using IT is better than processing the documents manually (0.851), Using IT enables us to utilize services more quickly (0.773), and Using IT simplify entry processing by our company(0.717) have large positive loadings on factor 2, so this factor describes accomplish task quickly.

Speeds up the communication process (0.845) and save money (0.782) have large positive loadings on factor 3, so this factor describes use resource efficiently.

Together, all three factors of variables explain 0.808 or 80.84% of the variation in the data as shown in Table 4.2.

Factor 1: Give Knowledge and Information
Factor 2: Accomplish task quickly
Factor 3: Use resource efficiently

Finding from Table 4.2 perceived usefulness was one of triggering factor to adopt ICT in ESLSE and use resource efficiently had highest mean value with score of 4.36 and accomplish task quickly mean score was 4.17 and giving knowledge and information was 4.13.The total mean value was 4.21 and standard deviation 0.95 .

The finding shows the major triggering factor to adopt ICT in ESLSE were ICT adoption help to use resource efficiently and ICT help to accomplished task as quickly as possible than using manually which improve customer service.

Similar to this study with respect to perceived usefulness Pietro E., Heli K. (2007) study showed that improving customer service level and improving control and planning are important motivators for the ICT implementation in the Northern Europe. Improving control and planning was found an important motivator in the Northern European survey.

Pokharel (2005) studies attributed higher importance to factors improving internal efficiency such as operational cost and inventory management. The findings indicate that factors improving supply chain interactivity and service customization are considered important drivers to facilitate ICT adoption.

Kirk & Thomas (2003) identified transaction climate represents the trust and commitment between the responding firm and its supply chain partners. The research model hypothesis is that a positive transaction climate would lead to greater technology adoption, as constructive relationships with supply chain partners would encourage firms to invest in equipment and technology.

4.4.2.2 Perceived Ease of use as a triggering factor of ICT adoption in ESLSE

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, the factors interpreted the as follows:

Table 4. 4: Factor analysis and descriptive of perceived ease of use

Rotated Component Matrixa					**Mean**	**Std.D**
	Factor1	Factor2	Factor3	Facto4		
Easy to use make skillful					**4.40**	**2.40**
We find it easy to become skillful at using IT	0.846				3.99	0.70
We have a positive attitude towards using IT	0.706				4.42	0.64
We find it easy to do what we want to do with IT	0.693				3.86	0.81
IT offers freedom, flexibility and convenience in the time of document processing	0.677				5.65	9.14
Overall we find IT system easy to use	0.635				4.07	0.73
User friendly and easy to learn					**3.99**	**0.81**
IT is user friendly		0.831			4.05	0.81
Simplicity involved in using IT encourages us to use the system		0.744			4.13	0.77
Learning to use IT is easy for us		0.699			3.78	0.86
Have satisfaction and Enjoyable					**3.83**	**0.93**
We need continuous learning in order to use IT effectively			0.924		4.11	1.08
It is easy to use IT software			0.615		3.52	0.78
Using the IT is satisfying and enjoyable			0.528		3.86	0.91
Not require lot of training					**2.85**	**1.13**
Using IT does not require a lot of training				0.882	2.99	1.25
We rarely forget our pass words				0.732	2.70	1.02
Eigenvalue	4.687	2.188	1.376	1.242		
% of Variance	33.476	15.627	9.83	8.871		
Cumulative %	33.476	49.103	58.93	67.803	**3.89**	**1.46**

Source: own survey (2019)

We find it easy to become skillful at using IT (0.846), we have a positive attitude towards using IT (0.706), and we find it easy to do what we want to do with IT (0.693) have large positive loadings on factor 1, so this factor describes IT is easy to use and make skillful in ELSLE .

IT is user friendly (0.831), simplicity involved in using IT encourages us to use the system (0.744), and using IT simplify entry processing by our company (0.717) have large positive loadings on factor 2, so this factor describes ICT is user friendly and easy to learn in ESLSE.

We need continuous learning in order to use IT effectively (0.924),It is easy to use IT software (0.615) and Using the IT is satisfying and enjoyable (.528)have large positive loadings on factor 3, so this factor describes ICT usage have satisfaction and enjoyable.

Using IT does not require a lot of training (0.882) have large positive loadings on factor 4, so this factor describes ICT requires not many training.

Together, all four factors explain 0.754 or 75.48% of the variation in the data as shown in Table
Factor 1: Easy to use make skillful
Factor 2: User friendly and easy to learn
Factor 3: ICT usage has satisfaction and enjoyable
Factor 4: Not require lot of training

Finding from Table 4.3 of perceived ease of use was one of triggering factor to adopt ICT in ESLSE and easy to use and make skillful had highest mean value with score of 4.40 and user friendly and easy to learn mean score was 3.99, have satisfaction and enjoyable 3.83 and not require lot of training 2.85.The total mean value was 3.89 and standard deviation 1.46 .The finding interpreted as ESLSE assumed using ICT make skillful and easy to use help the adoption of ICT in ESLSE but the respondent not agree that learning how to use IT is easy.

As Kirk, Curtis & Thomas (2003) suggested, information technologies allow firms to more quickly and accurately share demand data, sales projections and production schedules which provides adopting organizations greater flexibility and responsiveness in the face of a constantly changing environment. This study also have similarity finding with IT offer freedom, flexibility and convenient in the time of document processing.

4.4.3 ICT capability in supply chain management

Factor analysis results for ICT Capability contains four categories to measure the capability of ICT on supply chain performance which were interpreted as human Capital, ICT Infrastructure, ICT Capacity and ICT Knowledge and IT Relationship.

4.4.3.1 ICT capability from human capital perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Table 4.5: Factor analysis and descriptive statistics of ICT capability

Rotated Component Matrix[a]			
	Component		
Employees ICT usage attitude and training	**Factor 1**	**Mean**	**Std.D**
Our employees have been able to adopt new ICT applications for their work	0.879	3.17	0.74
Our company has provided sufficient training when implementing new ICT systems and applications.	0.753	3.04	0.84
Our staff frequently undergo IT refresher training	0.748	2.91	0.69
Our employees have been able to innovate new ideas and approaches to work effectively by adopting new ICT applications	0.619	3.01	0.78
Our employees have shown little resistance to adopt new ICT systems and applications	5.01	2.79	0.82
Grand Mean		**2.98**	**0.77**
Eigenvalue	2.421		
% of Variance	48.427		
Cumulative %	48.427		
ICT Infrastructure	**Factor 2**		
We have a computer laboratory; Direct trade input (DTIs) for employees instructions and data capture	0.813	3.05	1.01
We often uses IT facilities such as Computers, fax, Printers, and phones to transact with customers	0.723	3.73	0.94
Our computer systems are linked with servers to network to all ESLSE branch offices.	0.708	3.10	1.34
Grand Mean		**3.30**	**1.09**
Eigenvalue	1.685		
% of Variance	56.153		
Cumulative %	56.153		
ICT Capacity	**Factor 3**		

Portfolios which are a set of different types of IT application with business processes	0.89	3.37	0.93
We restructure IT work processes to leverage opportunities	0.841	3.37	0.68
We provide our services to customers 24 hours a day	0.563	2.43	1.11
Grand Mean		**3.05**	**0.91**
Eigenvalue	1.816		
% of Variance	60.543		
Cumulative %	60.543		
Knowledge source and linkage and Collaboration	**Factor 4**		
There is a climate that encouraging risk taking and experimentation with IT	0.914	3.34	0.97
Management has the ability to understand value of IT investment	0.892	3.44	1.14
We have technology based links with customers	0.864	3.09	1.10
We have technology based links with suppliers	0.783	2.98	1.06
There is clarity of vision regarding how IT contributes to business value	0.717	3.54	1.03
We use IT based entrepreneurial collaborations with external partners	0.947	3.42	0.90
Grand Mean		**3.30**	**1.03**
Eigenvalue	4.82		
% of Variance	80.332		
Cumulative %	80.332		
Total Mean		**3.16**	**0.95**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Source: own survey (2019)

Our employees have been able to adopt new ICT applications for their work (0.879). Our company has provided sufficient training when implementing new ICT systems and applications. (0.753), and our staff frequently undergo IT refresher training (0.748) have large positive loadings on factor 1, so this factor describes Employees ICT usage attitude. Together, factor explains 0.484 or 48.42% of the variation in the data as shown in Table 4.5.

4.4.3.2 ICT capability from infrastructure perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

We have a computer laboratory; direct trade input (DTIs) for employees instructions and data capture (0.813), and we often uses IT facilities such as computers, fax, printers, and phones to transact with customers. (0.723) have large positive loadings on factor 1 only, so this factor describes ICT infrastructure.

Together, factor explains 0.561 or 56.15 % of the variation in the data as shown in Table 4.5.

4.4.3.3 ICT capability from capacity perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Portfolios which are a set of different types of IT application with business processes (0.890), and we restructure IT work processes to leverage opportunities (0.841) have large positive loadings on factor 1only, so this factor describes ICT Capacity.

Together, explains 0.605 or 60.54% of the variation in the data as shown in Table 4.15.

4.4.3.4 ICT capability from knowledge source and IT relationship perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

There is a climate that encouraging risk taking and experimentation with IT(0.914), and We Management has the ability to understand value of IT investment(0.892) and We have technology based links with customers(.864) have large positive loadings on factor , so this factor describes knowledge source & IT relationship in Table 4.13.

Together, all two factors explain 0.803 or 80.33% of the variation in the data as shown in Table 4.5.

Factor 4: Knowledge source and linkage and collaboration

Zeynab, Reza & Viktor (2018) the study on model to evaluate supply chain technology implementation influence on organizational performance revealed that the IT capabilities have the most and organizational variable has the least impact on supply chain technology implementation. For saving employee's time and making use of working hours in a way, which is better for supply chain performance, the organizations also use IT.

Rajiv (2016) studied technology is vehicle to enhance supply chain competitiveness and performance by enhancing the overall effectiveness and efficiency of logistics system. Hence choosing the right technology for various logistics activities or sub-processes is very crucial to any business to gain competitive advantage in today's competitive market.

Waseem , Hameed ,Salman , Muhammad , Ali R, & Rabia (2018) has revealed that firm's IT capability had significant contribution to improve staff service quality and website design. A good IT capability provides a better communication system among employees and customers, employees and employees which can enhance the overall performance.

In order to change management in a firm, and manage knowledge efficiently and effectively, one needs IT capabilities. Studies show IT capabilities impact on a performance of a firm. On the other hand, there are unwrapped mechanisms that by using them, IT improves its performance (Zeynab, Reza &Viktor, 2018).

Therefore, shipping and logistic companies should focus on firm's IT capability and information communication technology. A well managed information technology system can resolve various issues and enhance the overall performance.

4.4.4 Supply chain performance measuring dimensions

Factor analysis results for supply chain performance factor which were measured by efficiency, effectiveness, responsiveness and flexibility.

4.4.4.1 Supply chain performance from efficiency perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Table 4. 6: Factor analysis and descriptive statistics of Efficiency

Rotated Component Matrix				
	Component			
Optimal use of resource	**Factor 1**		**Mean**	**Std.D**
We provide an automatic billing system and updates customers on time	0.927		3.20	0.92
We use on line operation system to reduce costs and maximize profits	0.922		3.13	1.08
The resources have been optimally utilized	0.823		3.10	0.83
We use IT facilities to provide quick information to customers	0.726		3.26	1.14
We use computerized systems to shorten transaction time	0.703		3.34	1.04
Grand Mean			**3.21**	**1.00**
Deliver quality service		**Factor 2**		
We promptly invoice and receive cash by electronic transfer system which eases transaction		0.503	3.10	1.14
We provide financial and technical advice to clients		0.947	3.37	0.78
We provide convenient service charges to customers		0.904	3.21	0.97
We have a quicker computerized information processing system and optimum decision		0.807	3.36	0.94
Value creation for stakeholders has been promoted		0.603	3.17	0.78
Grand Mean			**3.24**	**0.92**
Eigenvalue	6.421	1.362		
% of Variance	64.214	13.618		
Cumulative %	64.214	77.831		
Total mean			**3.22**	**0.96**

Extraction Method: Principal Component Analysis.

Source: own survey (2019)

We provide an automatic billing system and updates customers on time (0.927), we use on line operation system to reduce costs and maximize profits (0.9222) and the resources have been optimally utilized (.823) have large positive loadings on factor1, so this factor describes optimal use of resource.

We provide financial and technical advice to clients (0.947), we provide convenient service charges to customers (0.904) and we have a quicker computerized information processing system and optimum decision (.807) have large positive loadings on factor 2, so this factor describes deliver quality service with reasonable price.

Together, all two factors explain 0.778 or 77.83% of the variation in the data as shown in Table 4.5.

Factor 1: Optimal use of resource

Factor 2: Deliver quality service

Ruth & Ana (2010) studied ICTs contribution to global logistics sustainability. Aside from facilitating inter modality, the application of ICTs to logistics systems has allowed reducing inefficiencies and optimizing processes in all stages of freight transport.

Asghar & Ganesh (2008) study result showed technology enables an organization to significantly change its business processes, not only to increase its efficiency which results in lower costs, but also increase its effectiveness, i.e. improving mission performance and makes the implementing organization more resilient and better able to assign accountability, as well as responding to customer requirements to use information technology to support supply chains and other applications.

4.4.4.2 Supply chain performance from effectiveness perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Table 4. 7: Factor analysis and descriptive statistics of effectiveness

Rotated Component Matrix[a]	Component			
Use online system and accurate information	**Factor 1**	**Factor 2**	**Mean**	**Std.D**
We use on line system to handle customer request on time	0.902		3.45	0.92
We ensure accuracy and completeness of information	0.844		3.61	1.07
We often carry out consistent staff performance review	0.843		3.19	0.79
Our Firm has modern equipment to process customer's orders	0.746		3.05	0.89
Our firm promptly responds to customer's inquiries and orders on time	0.671		3.46	0.93
Our Employees are willing to help customers	0.603		3.60	1.05
Grand Mean			**3.39**	**0.94**
Competitiveness is enhanced by innovation		**Factor 2**		
We keep our records accurately		0.892	3.53	1.26
The overall quality of services provided by our Firm is excellent.		0.888	3.25	1.01
The Firm`s competitiveness is enhanced innovation and profitability has been realized		0.738	3.01	0.62
We monitor service performance satisfactorily		0.648	3.25	0.82
Grand Mean			**3.26**	**0.93**
Eigenvalue	6.62	1.088		
% of Variance	66.205	10.883		
Cumulative %	66.205	77.088		
Total Mean			**3.33**	**0.93**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Source: own survey (2019)

We use on line system to handle customer request on time (0.902), We ensure accuracy and completeness of information (0.844) and We often carry out consistent staff performance review

(.843) have large positive loadings on factor 1 , so this factor describes use online system and accurate information .

We keep our records accurately (0.892), the overall quality of services provided by our Firm is excellent. (0.888) and The Firm`s competitiveness is enhanced innovation and profitability has been realized (.738) have large positive loadings on factor2, so this factor describes Competitiveness is enhanced by innovation.

Together, all two factors explain 0.770 or 77.08% of the variation in the data as shown in Table 4.16.

Factor 1: Use online system and accurate information

Factor 2: Competitiveness is enhanced by innovation

Tomoya, Shinya & Huy (2016) studied the degree of impacts obtained from the survey mostly falls between large impact and moderate level of each variable on the impact of the use of ICT. The three biggest impacts of ICT use on logistics are improvement of effectiveness in control and planning, Improvement of overall quality of customer service.

4.4.4.3 Supply chain performance from responsiveness perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Table 4. 8: Factor analysis and descriptive statistics of Responsiveness

Rotated Component Matrix[a]				
	Component			
Timely delivery	**Factor 1**		**Mean**	**Std.D**
We provide reliable delivery	0.943		3.50	1.10
We show sincere interest to solve customers' problem	0.917		3.40	1.04
Our employees provide services at the promised time	0.884		3.38	0.92
We deliver services to customers satisfactorily through internet system	0.868		3.30	1.11
We deliver cargo to customers on time	0.867		3.52	0.91
Customers are satisfied with the products and services provided by our firm	0.862		3.39	1.27
Our response to customer orders is quicker	0.801		3.22	0.90
Grand Mean			**3.39**	**1.04**
Use electronic transaction for payment		**Factor 2**		
We promptly invoice and receive cash by electronic transfer system which eases transaction		0.976	3.21	0.92
Eigenvalue	5.692	1.081		
% of Variance	71.152	13.508		
Cumulative %	71.152	84.659		
Total Mean			**3.30**	**0.98**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Source: own survey (2019)

We provide reliable delivery (0.902), we show sincere interest to solve customers' problem (0.917) and our employees provide services at the promised time (.884) have large positive loadings on factor1, so this factor describes timely delivery of cargo in ESLSE.

We promptly invoice and receive cash by electronic transfer system which eases transaction (.976) has large positive loadings on factor2, so this factor describes electronic payment system.

Together, two factors explain 0.846 or 84.65% of the variation in the data as shown in Table 4.8.

Factor 1: Timely delivery

Factor 2: Competitiveness is enhanced by innovation

Kirk , Curtis & Thomas (2003) suggested, information technologies allow firms to more quickly and accurately share demand data, sales projections and production schedules which provides adopting organizations greater flexibility and responsiveness in the face of a constantly changing environment.

4.4.4.4 Supply chain performance from flexibility perspective

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Table 4. 9: Factor analysis and descriptive statistics of Flexibility

Component Matrix[a]			
	Component		
Flexibility to understand customers need	**Factor 1**	**Mean**	**Std.D**
Our employees understand customer specific needs	0.896	3.74	0.84
The complaints on the products and services delivered have reduced	0.886	3.58	0.85
Our employees are polite and friendly staff to customers	0.885	3.69	0.87
We employ professional trained personnel to handle customer's requests	0.879	3.57	0.85
Customers feel safe when transacting with us	0.833	3.41	1.04

We often investigate and correct irregularities in operating activities	0.82	3.60	0.92
Eigenvalue	4.52		
% of Variance	75.27		
Cumulative %	75.27		
Total Mean		**3.60**	**0.89**

Extraction Method: Principal Component Analysis.
Source: own survey (2019)

Our employees understand customer specific needs (0.896), the complaints on the products and services delivered have reduced (0.886) and our employees are polite and friendly staffs to customers (.885) have large positive loadings on factor, so this factor describes flexibility in ESLSE.

This factor explains 0.752 or 75.27% of the variation in the data as shown in Table 4.9.

Factor: Flexibility to understand customers need

Somuyiwa, Adebayo & Akanbi (2011) findings reveal the mechanisms of how IS integration can facilitate greater agility in the supply chain, leading to improved operational performance, such as responsiveness, flexibility, dependability and organizational learning. A key to the success of an organization is to align agile supply chain strategy to the differentiation strategy in order to meet the overall objective for having a competitive advantage since customer expectations are never static.

The overall supply chain performance mean value of ESLSE with efficiency, effectiveness, responsibility and flexibility perspective were 3.22, 3.33, 3.30 and 3.60 respectively. Therefore the ICT adoption role in supply chain performance of with respect to flexibility had rated moderate effect, but the other performance measuring perspectives rated little extent.

Ruth &Ana (2010) Studied and identified regarding the supply chain, the digital transformation and the use of intelligent and cooperative systems will make the supply chain smarter, more

transparent and more efficient in every stage. There will be a particular focus in new models which will be more closely to individual customer needs, promoting a significantly increase of the decision making quality and become more and more flexible and efficient in the near future.

4.4.5 Major ICT adoption challenges in ESLSE

In the process of examining of the data, standard deviation was used. Small standard deviations relative to the value of the mean itself indicate that data are close to the mean whereas a large standard deviation relative to the mean indicates that the data points are distant from the mean. The mean is a poor fit of the data. Standard deviation is a measure of how well the mean represents the data (Field, 2009).

Mesfin (2016) used a kind of rule of thumb to create equal intervals for a range of five points Likert scale that ranges from strongly No Extent to Very large Extent in the survey questionnaire. A calculated mean value that ranges from 1 to 1.80 implies No Extent , a mean range from 1.81 to 2.6, from 2.61 to 3.4, from 3.41 to 4.2 and from 4.21 to 5.00 represented respondents' perceptions of somewhat Little extent, Moderate, Large extent and Very Large Extent respectively.

Table 4. 10: Factor analysis and descriptive statistics of ICT adoption challenges

Component Matrix[a]	**Component**		
Human resource capability	**Factor 1**	**Mean**	**Std.D**
Lack of expertise	0.898	2.88	1.01
Organizational Resistance	0.886	2.88	1.16
Lack of Education and training	0.886	3.37	6.20
Eigenvalue	1.949		
% of Variance	64.981		
Cumulative %	64.981		
Grand Mean		**3.04**	**2.79**
Technical related problem	**Factor 1**		
Lack Information sharing accessibility and accuracy	0.901	3.24	0.95
Inflexible information systems	0.872	2.92	1.36

Inappropriate/inaccurate performance and cost measures	0.758		3.10	0.81
Lack data accuracy	0.734		2.83	1.07
Grand Mean			**3.02**	**1.05**
Lack of suitable software and hardware with support		**Factor 2**		
Lack of support from software vendor		0.935	2.99	0.82
Lack of suitable hardware and software		0.932	2.83	0.78
Eigenvalue	3.767	1.072		
% of Variance	62.787	17.875		
Cumulative %	62.787	80.662		
Grand Mean			**2.91**	**0.80**
Management related problems	**Factor 4**			
Improper change management	0.912		3.07	1.09
Lack of customer sophistication	0.901		3.04	1.18
Lack of awareness of benefits	0.897		3.09	1.17
Lack of cultural (organizational) readiness	0.894		3.11	1.07
Conflicting priorities for resources	0.874		3.26	1.00
Lack of standard formats and methods	0.863		3.19	1.13
Lack of effective project management	0.803		3.14	0.98
Autocratic mandatory implementation by top management	0.783		2.80	0.95
High cost	0.894		2.89	1.90
Lack of top management support	0.754		3.25	1.15
Grand Mean			**3.08**	**1.16**
Eigenvalue	6.582			
% of Variance	73.134			
Cumulative %	73.134			
Total Mean			**3.01**	**1.45**

Extraction Method: Principal Component Analysis.
a. 4 components extracted.

Source: own survey (2019)

4.4.5.1 Factor analysis and descriptive statistics of human resource related challenges for ICT adoption in ESLSE

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Lack of expertise (0.898), organizational resistance (0.886) and lack of education and training (.885) has large positive loadings on a factor, so this factor describes human resource capability in ESLSE.

The one factor explains 0.649 or 64.98% of the variation in the data as shown in Table 4.10.

Factor 1: Human resource capability

From Table 4.10 above indicated the challenge of ICT adoption factors in ESLSE were related to human resource problems was lack of education and training, organizational resistance and lack of expertise identified as a little extent problem with a total mean of 3.04.

4.4.5.2 Factor analysis and descriptive statistics of technical related challenges for ICT adoption in ESLSE

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Lack Information sharing and accessibility (0.901) and inappropriate/inaccurate performance and cost measures (0.758) have large positive loadings on factor1, so this factor describes Lack of information sharing accessibility and accuracy in ESLSE.

Together, all two factors explain 0.806 or 80.66% of the variation in the data as shown in Table 4.10.

Factor 1: Lack of information sharing accessibility and accuracy.

Factor 2: Lack of suitable software and hardware with support.

The highest mean value of technical related problem were Lack Information sharing and accessibility 3.24 , inappropriate or inaccurate performance and cost measures 3.10, lack of support from software vendor 2.99 and inflexible information systems 2.92 identified as little extent with total mean 2.96 .

4.4.5.3 Factor analysis and descriptive statistics of management related challenges for ICT adoption in ESLSE

In these results, a varimax rotation was performed on the data. Using the rotated factor loadings, you can interpret the factors as follows:

Improper change management (0.912), lack of customer sophistication (0.901) and lack of awareness of benefits (.897) have large positive loadings on factor1, so this factor describes management related problems in ESLSE.

The one factor explains 0.731 or 73.13% of the variation in the data as shown in Table 4.10.

Factor 1: Management related problem

From Table 4.10 above indicates the challenge of ICT adoption factors in ESLSE were related to management problem which were conflicting priorities for resources, lack of top management support, lack of awareness of benefits, improper change in management tend to be perceived as a problem to a little extent with total mean value of 3.26, 3.25, 3.09 and 3.07. The overall grand mean management related challenge scored 3.08.

Therefore the results of all problems had very close mean value; the problems related to management had more identified problems observed in ESLSE with Grand mean value of 3.08.

Similar to this study with respect to inadequate employee training Pietro E., Heli K. (2007) identified lack of compatibility with the current system, inadequate employee training, and system not being flexible enough was considered the most important barriers for ICT investment

in the Northern Europe (Norway). In Italy, the ICT investment, implementation and the running costs were reported important barriers for ICT adoption. However, the responses reveal some interesting differences in experienced barriers in Northern and Southern Europe. In Norway, lack of adequate employee training was considered a very important barrier, while in Italy it was not the greatest barrier.

Identical with this research, Tomoya , Shinya & Huy (2016).The major barriers and constraint of ICT adoption considered by the logistics service providers are update of personal skills, lack of technological skills, data security and lack of technological standards. Among four groups of companies, small firms face a number of constraints in adopting ICT.

Atieno (2012) A major technological barrier is the complexity of the ICT solutions. In their daily use, these system are too complex and not user friendly. Another barrier lies in constant updating of the data that these solutions require. Other major barriers are the lack of classification schemes and standard formats to represent the data to be inserted into the ICT system.

In contrast with this research on financial problem Pietro (2009) studied and found out that the factors inhibiting ICT adoption do not significantly vary between provider types but the most important inhibitors are primarily financial, Human resource implications and ICT supply have also an important role in inhibiting ICT investment.

4.5 Correlation Analysis

To facilitate an inferential analysis of the relationship between independent variables ICT adoption and ICT capability and dependent variable supply chain performance of ESLSE.

In this section the researcher tried to accomplish the goal of the study through applying Pearson correlation analysis as it is the most widely used methods of measuring the strength and direction of relationship between and among variables.

4.5.1 The relationship among ICT adoption, ICT capability and supply chain performance

Pearson Correlation analysis was used to determine the relationship between independent variables (ICT adoption, ICT capability) and dependent variable supply chain performance with respect to efficiency, effectiveness, responsiveness and flexibility.

Accordingly, the Pearson Correlation results range between 1 (perfectly linear positive correlation) to -1 (perfectly linear negative correlation). When the correlation value is 0, no relationship exist between the variables under study and when the correlation value lies in the middle between 1 & -1 (excluding 0) the below interpretation developed by (Field, 2005).

Table 4. 11: Correlation analysis of variables

	Correlations					
		Mean	Std. Deviation	1	2	3
1	Performance	3.60	0.78	1		
2	ICT Adoption	4.09	0.73	.474**	1	
3	ICT Capability	3.16	0.51	.736**	.542**	.1

As can be witnessed on table 4.11 above, which depicts the relationship between independent variables(ICT adoption and ICT capability) and supply chain performance, both ICT adoption and ICT capability are found to have significant correlation with supply chain performance since two-tailed significance test values are less than 0.01. Pearson correlation value illustrates that ICT adoption (r=.474**) and ICT capability (r=.736**) have strong positive correlation with supply chain performance.

Arthur (2016) studied Information Technology Capability, Adoption, Logistics Service Quality and the Performance of Third Party Logistics Providers in Uganda shows that all the four components of logistics service quality (i.e., tangible, reliability, empathy and responsiveness, assurance) are positively and significantly related to the performance of third party logistics. These results imply that if there is logistics service quality (i.e., tangible, reliability, empathy and

responsiveness, assurance) in clearing and forwarding firms , it is likely to influence and lead to improved performance of the third-party logistics providers.

Stephen (2016) studied that there exists a significant positive relationship between IT capability and the performance of third party logistic providers. The results reveal that the components of IT Capability like IT Architecture, IT Relationship Resource, IT Infrastructure and IT Human Resource are positively and significantly related to the performance of third party logistics providers. These results imply that if there is IT Capability (i.e., IT architecture, IT relationship resource, IT Infrastructure and IT Human Resource) in clearing and forwarding firms, it is likely to influence and lead to improved performance of third party logistics providers.

These results imply that if there is ICT Capability in ESLSE, it is very likely to influence and lead to improved supply chain performance. The result suggests that ICT adoption factor which is perceived usefulness and perceived ease of use are positively and significantly related to ICT capability of ESLSE.

4.6 Regression Analysis

Supply chain performance of ESLSE is explained by four dimension of measure which was efficiency, effectiveness, responsiveness and flexibility.

When running a Multiple Regression, there are assumptions that need to check the data meet, in order to analysis reliability and validity. It aims to investigate how the independent variable or predictor variables may predict the dependent variable or outcome variable.

4.6.1 The role of ICT adoption and ICT capability on supply chain Performance

To examine the role of ICT adoption and ICT capability on supply chain performance of ESLSE with respect to dependent variable performance by the independent variables ICT adoption and ICT capability, the first assumption we can test is that the predictors ICT adoption and ICT capability are not too highly correlated. We can do this in two ways. First, we need to look at the correlations Table 4.12. Correlations of more than 0.8 may be problematic. If this happens,

consider removing one of your independent variables. This is not an issue in this research, as the highest correlation is r=.736.

Table 4. 12: Variables correlation analysis

Correlations				
		Performance	ICT Adoption	ICT Capability
Pearson Correlation	Performance	1.000		.
	ICT Adoption	.474**	1	
	ICT Capability	.736**	.542**	1.000
Sig. (1-tailed)	Performance		.000	.000
	ICT Adoption	.000		.000
	ICT Capability	.000	.000	
N				183

Source: own survey (2019)

To check the next assumption, It need to look at is the Model Summary box. Here, we can use the Durbin-Watson statistic to test the assumption that our residuals are independent (or uncorrelated). This statistic can vary from 0 to 4. For assumption to be met, we want this value to be close to 2. Values below 1 and above 3 are cause for concern and may render your analysis invalid.

Chieh (2007) identified in this study on technological innovation for China's logistics industry the correlations among these factors and the innovation in logistics technologies. The correlation matrix gives us initial evidences of the hypotheses: technological, organizational and environmental are associated positively with the adoption of technological innovations, and the

supply chain performance is positively associated with the adoption of technological innovations. Moreover, the technological, organizational and environmental factors are not highly correlated.

Table 4. 13: Performance model Summery

Model Summary[b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.815[a]	0.665	0.660	0.41578	1.365

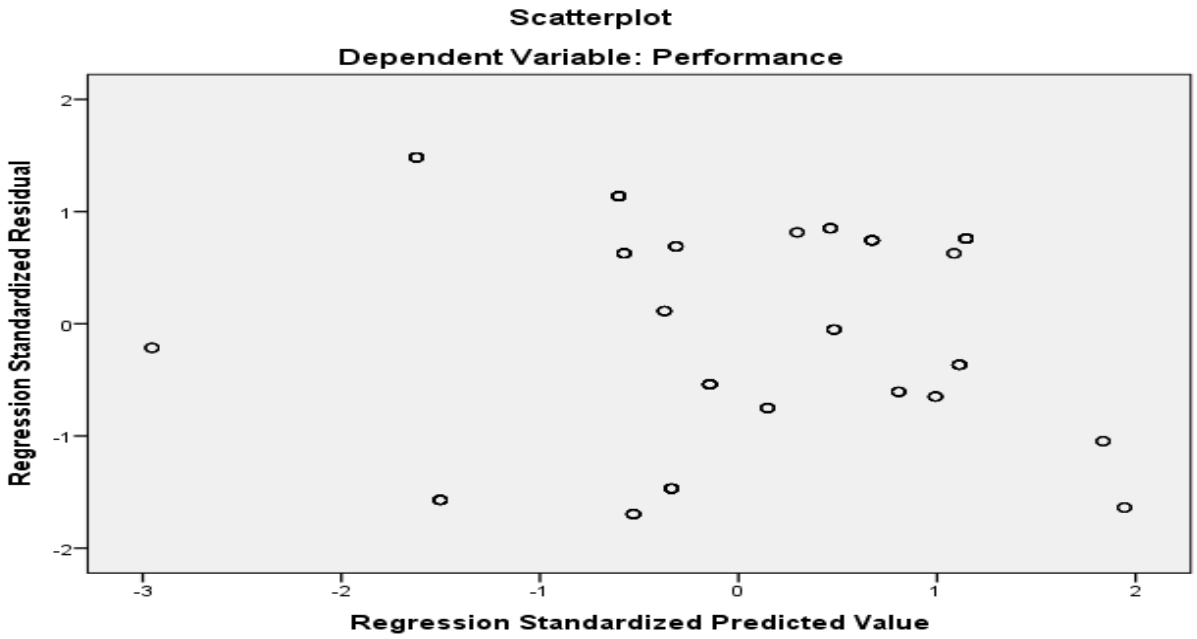
a. Predictors: (Constant), ICT Capability, ICT Adoption, b. Dependent Variable: Performance

Source: own survey (2019)

To test the third assumption, it needs to look at the final graph of the output. This tests the assumption of homoscedasticity, which is the assumption that the variation in the residuals (or amount of error in the model) is similar at each point of the model.

This graph plots the standardized values our model would predict, against the standardized residuals obtained. As the predicted values performance flexibility increase (along the X-axis), the variation in the residuals should be roughly similar. If everything is ok, this should look like a random array of dots. If the graph looks like a funnel shape, then it is likely that this assumption has been violated.

Figure 4. 1: Scatter Plot of performance



Source: own survey (2019)

Reading and looking at scatter plot as only have a small number of data points, the graph can be difficult to read ,but as it generally appears more random than funneled, therefore this assumption is probably valid .

Table 4. 14: Coefficients of performance

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-0.295	.211		-1.397	0.164		
	ICT Adoption	0.045	.050	0.064	.885	0.378	.706	1.417
	ICT Capability	1.106	.072	0.789	15.330	0.000	.706	1.417

a. Dependent Variable: Performance

Source: own survey (2019)

The discussion of findings has been structured around each research objective and findings made from the analysis. Ideally, it was expected that the relationship between (ICT adoption and ICT capability) and supply chain performance would be positive and significant. The study used a simple linear regression model of the form SCP= $\beta 0 + \beta 1X1 + \beta 2X2 + \varepsilon$ where LP= supply chain performance, X1= ICT adoption, X2= ICT capability and ε = error term.

SCP= -0.295 + .045X1+1.106X2+ε

Constant = -0.295, shows that if ICT adoption and ICT capability are rated as zero or held constant; supply chain performance would be a factor of -0.295 and constantly decreased .
X1 = 0.064, shows that one unit increase in ICT adoption results in an increase in supply chain performance by a factor of 0.064.
X2 = 0.789, shows that one unit increase in ICT capability results in an increase in supply chain performance by a factor of 0.789.

These findings concur with Eric, Elegwa & Mike (2017) who found out that that information communication technology capabilities contributed positively towards the performance of organizations.

In contrary to Arthur (2016) research findings also indicate that IT adoption and logistic service quality influence the performance of the third party logistic providers because according to the findings they are significant predictors. However, IT capability was found not to be a significant predictor of performance of third party logistics providers.

Results in the Table 4.13 reveal that ICT capability and ICT adoption factor can predict up to 66% of the total variance in the supply chain performance of ESLSE (Adjusted R Square =.660). This means that the regression model can only explain 66% of the changes in the dependent variable while the remaining percentage can be attributed to other factors other than ICT

capability and ICT adoption factor. This regression model was significant (sig. <.05) with its results worth using it as a basis to make decisions related to flexible supply chain performance of ESLSE.

Among the independent variables, ICT capability (β=0.789, p<.000) was significant predictor of the supply chain performance of ESLSE, but ICT adoption factor was a not found to be a significant predictor of supply chain performance of ESLSE. This implies that in order improve supply chain performance of ESLSE; there is a need to more increase ICT capability instead ICT adoption.

Adebayo(2007) found an organization supply chain agility through its information system capabilities has no positive influence on its supply chain performance is rejected while the alternate hypothesis that an organization's supply chain agility through its information system capabilities has a positive influence on its supply chain performance is accepted.

Chieh (2007) found that for China's logistics service providers, higher explicitness of technology can help the transfer of technological knowledge within the organization and, therefore, raise the willingness to adopt technological innovations. Logistics companies with rich experiences in the application or adoption of related logistics technologies will have higher willingness to adopt technological innovations. Organizational encouragement can give employees motivation and support to adopt technological innovation. High quality of human resources means that employees are capable of innovation in technologies.

Chieh (2007) found that the adoption of technological innovations exhibits significantly positive influences on both financial and non-financial supply chain performances. Therefore China's logistics service providers with a more favorable attitude toward adopting innovative logistics technologies will attain better supply chain performance.

Zafer & Pınar (2018) study also explores the relationship between technologic acceptance, information technology capabilities and logistics service performance. Information technology capabilities and technology acceptance have a positive effect on logistics service performance.

However the research found out ICT adoption is not significant predictor for the supply chain performance ESLSE. Zhongzhi, Daniel, and Adegoke (2017) studied why do supply chain technology adoptions sometimes fail to improve a firm's performance? And found out in spite of the potential benefits of supply chain technology , these technologies are not always used effectively and found that the extent of supply chain technology utilization is positively and significantly driven by the efficiency motivation, but not by the legitimacy motivation. Previous studies have shown that both legitimacy and efficiency motivations can be linked to adoption. But their findings indicate that the more firms are driven to adopt supply chain technology by their efficiency needs, the more they will actually use the technology. If firms simply mimic institutional actors that they perceive as successful in adopting supply chain technology, they are less likely to utilize the technology to a large extent.

CHAPTER FIVE

SUMMERY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

In this chapter, an attempt is made to give a summary of the research findings, conclusions, recommendation and suggestion for further research. The main purpose of this study was to examine the role of ICT adoption in the supply chain performance of ESLSE.

5.2 Summary of major findings

The study investigated the triggering factors of ICT adoption, examined the role of ICT capability and ICT adoption on supply chain performance and identified major challenges of ICT adoption on supply chain performance of ESLSE.

Factor analysis results for ICT adoption factors which were perceived usefulness and perceived ease of use. The extraction of principal component analysis of perceived usefulness had three positive eigenvalues to determine the number of dimension needed to represent a variable which were use resource efficiently had highest mean value with score of 4.36 , accomplish task quickly mean score was 4.17 and give knowledge and information 4.13.The total mean value was 4.21 and standard deviation 0.95 .

Perceived ease of use was one of triggering factor to adopt ICT in ESLSE and easy to use and make skillful had highest mean value with score of 4.40 and user friendly and easy to learn mean score was 3.99, using IT have satisfaction and enjoyable 3.83 and not require lot of training 2.85.The total mean value was 3.89 and standard deviation 1.46 .The finding interpreted as respondent assumed using ICT make skillful and ease of use would help the adoption of ICT in ESLSE but the respondent agree that learning how to use IT is not easy. Finding showed perceived usefulness more triggering factor to adopt ICT than perceived ease of use in ESLSE.

The second objective examined the role of ICT capability and ICT adoption on supply chain performance in ESLSE. The study revealed that relationships between IT capability, IT adoption, logistics and supply chain performance of ESLSE. The results show that there exists a significant positive relationship between ICT capability and ICT adoption. IT capability influences better service to customers. Customers are able to get good services in time limit expected. It enhances the concept of Just In Time (JIT). This helps firms to deliver services to customers in the service expected. Services will be available to customers at any time they need. Firms with IT capability provide wide scope of services than those that lack IT capability. Firms create competitive advantages over others due to efficient and reliable services provided to customer. As the scope of work increases sales increase and the turnover is high. In the long run the firm's reliability increase and responsiveness is realized. The results are in line with Bowersox (2002) who argued that IT capability can contribute to a firm's competitive advantage by providing cost leadership and product differentiation. Supply chain performance can potentially improve by building ICT capability. ICT capability significantly affects important dimensions of the logistics service

quality of these firms; namely reliability, responsiveness, assurance, empathy and tangibility of services.

The findings show that there exists a significant positive relationship between ICT capability and supply chain performance of ESLSE. This means that ESLSE to do better they require having capability in the ICT. Firms which possess ICT capability perform well and are more reliable. The services provided are efficient and the response to customer's inquiry and order processing is quicker. The finding is consistent with Zaryab (2012) who indicated that IT increases operational competitiveness, flexibility and productivity of third party logistics. Consistently, Piplani, Pokhararel, and Tan (2004) maintain that IT automates the basic operational process of a logistics service provider thus improving of the efficiency of the firm. According to Zaryab (2012), using advanced IT in the supply chain enables clearing firms to timely and effectively responds to customer's needs and requirements thus meeting customer expectations. It also reduces the lead time of orders and improves service level of enterprises. Among the independent variables, ICT capability (β=1.106, $p<.000$) was the most significant predictor of supply chain performance of ESLSE. But, ICT adoption was not found to be a significant predictor of supply chain performance of ESLSE. This implies that in order for the performance of ESLSE to improve, there is a need to increase ICT capability.

The result indicated the challenge of ICT adoption factors in ESLSE were related to management problem which was lack of top management support, lack information sharing and accessibility, lack of standard formats and methods tend to be perceived as a problem to a little extent. The challenge in the category of human resource problems was lack of education and training, organizational resistance and lack of expertise identified as a little extent and the last problem which was categorized as a technical problem were inappropriate or inaccurate performance and cost measures, lack of support from software vendor and inflexible information systems identified as little extent. However the results of all problems had very close mean value, the problems related to management had more identified problems observed in ESLSE.The finding was consistent with Kilpala (2005) survey in relation to barriers to ICT adoption; inadequate employee training and lack of awareness of the ICT benefits were considered the most important

barriers to ICT adoption in the logistics service providers. The findings of the present study suggest different inhibiting factors as in the Pokharel (2005) study, the case study analysis indicated that the lack of appropriate ICT products and services in the market as one of the main constraints on ICT adoption and implementation in full haulage firms.

5.3 Conclusion

Finding the study conclude that perceived usefulness more triggering factor to adopt ICT than perceived ease of use in ESLSE. The study focused on the role ICT capability and ICT adoption, on supply chain performance of ESLSE. The results indicate significant positive relationships between ICT capability and supply chain performance and research findings also indicate that ICT capability influence the supply chain performance of ESLSE .Therefore according to the findings ICT capability is significant predictor. However, ICT adoption was found not to be a significant predictor of performance of ESLSE. The research concluded that ICT capability was a better significant predictor of supply chain performance of ESLSE than ICT adoption as used in the conceptual frame work. Therefore ESLSE need improve ICT adoption and ICT capability in order to improve on the supply chain performances operations especially in the areas of documentation, cargo tracking, warehousing, transportation, freight forwarding, port and terminal handling and shipment operations .Finding shows that lack of compatible education and training were the major ICT adoption challenges and to alleviate the challenge a careful assessment of education and training needs should minimize this problem.

5.4 Recommendation

There should be increased awareness on the perceived usefulness and educational training to increase perceived ease of use on the need to accept adoption of ICT on shipping and logistics operations because of its multidimensional benefits in enhancing supply chain performance. The researchers recommend that the accumulation ICT can help the transfer of technological knowledge within ESLSE and can raise the capability to adopt innovative technologies. ESLSE can increase their technology innovation abilities by encouraging or supporting their employees to adopt new technologies as well as by training and educating their employees to become experts. ESLSE should provide efficient and reliable shipping and logistics services quality to

their customers, by avoiding delays in documentation, cargo delivery and short led time. This will increase their competitive advantage in the field of shipping and logistics sector and hence providing customer satisfaction. To alleviate the challenge of ICT adoption, ESLSE apply careful assessment of education and training needs should minimize this problem. In order to do well in the industry of shipping and logistics, ESLSE needs to build IT capability, by developing IT Architecture, IT Infrastructure, IT Human Resource and IT Relationship ship. This improves the performance of ESLSE and hence profitability.

5.5 Future Research Recommendation

A number of topics may be identified that would merit further investigation. First, this study is focused on the current status of ICT adoption and it does not provide any advice on how ICT should be implemented in the in ESLSE. Second by using longitudinal data, future research could investigate the process of ICT adoption and trace its impact on company operations over time. In addition, longitudinal data would permit the formulation of more appropriate policy recommendations for governmental bodies in order to accelerate the rate of ICT diffusion. Third, it will be important to include a customer perspective in future studies matching service user and provider perspectives. This will improve understanding of the mechanisms that allow the use of ICT to bring mutual benefits to service provider and customer. Finally, future work can use other variables of IT, which can influence SCM implementation of a firm. For example, IT alignment, IT advancement, internal IT integration, IT utilization, IT competence, IT flexibility and management commitment to IT.

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APPENDIX

Questionnaire

This research is in thesis proposal submitted to the Addis Ababa University School of Commerce in Partial fulfillment of the requirements for the degree of masters of art in logistics and supply chain management and I will be most grateful if you could kindly complete this questionnaire and answer all the questions by ticking in the appropriate box or filling in the spaces provided. The information given here will only be used for purposes of this study and will be treated with utmost confidentiality. Your cooperation will be highly appreciated.

SECTION A: BIO-DATA

1. Kindly indicate your age bracket (Tick as appropriate)

Less than 30 Years	☐	31 - 40 years	☐
41 – 50 years	☐	Above 50 years	☐

2. How long have you been working in ESLSE?

0-5 years	☐	6-10 years	☐
11-15 years	☐	Over 15 years	☐

3. What is your highest academic qualification?

Certificate	☐	Diploma	☐
Bachelor's degree	☐	Masters Degree	☐

Others (Specify.....)

4. In which sector do you work in?

Shipping Sector	☐	ICT departments	☐
Port & Terminal Sector	☐	Freight Forwarding Sector	☐

Corporate Services Sector ☐

Other (Specify……)

5. What is your designation?

Executive ☐ Manager/head of department ☐

Other (Specify……..)

6. Have attended any ICT course

Yes ☐

No ☐

7. Period of computer usage a week

0 Hour ☐

1-9 Hours ☐

>= 10 Hours ☐

8. Period of internet usage a week

0 hours ☐

1-3 hours ☐

4-7 hours ☐

>8 hours ☐

PART B: HOW IS ICT PERCIVED USEFULNESS AND PERCEIVED EASE OF USE IN ESLSE

1. How would you rate the use of ICT perceived usefulness and perceived ease of use in ESLSE. Use a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

Triggering factor for ICT Adoption and Measure of ICT Adoption	1	2	3	4	5
Perceived Usefulness					
Using IT enables us to utilize services more quickly					
Using IT simplify entry processing by our company					
Using the IT is better than processing the documents manually					
We recommend everybody to use IT due to its usefulness					
We use IT for making inquiries					
IT provides reliable security controls we need					
We save time in entry processing when using IT					
IT enhances our interaction with branch offices					
We find IT use to be flexible to interact with					
Saving data in a large capacity					
Enhance ICT knowledge and information					
Speed up the communication process					
Save Money					
Perceived Ease Of Use					
IT offers freedom, flexibility and convenience in the time of document processing					
Using the IT is satisfying and enjoyable					
Learning how to use IT is easy					
We need continuous learning in order to use IT effectively					
We rarely forget our pass words					

It is easy to use IT software					
Using IT does not require a lot of training					
Learning to use IT is easy for us					
Simplicity involved in using IT encourages us to use the system					
IT is user friendly					
We have a positive attitude towards using IT					
We find it easy to do what we want to do with IT					
We find it easy to become skillful at using IT					
Overall we find IT system easy to use					

PART C: THE ASSESSMENT OF ICT CAPABILITIES ON SUPPLY CHAIN PERFORMANCE IN ESLSE

2. How would you rate ICT capability in ESLSE. Use a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

What is ICT capability in ESLSE	1	2	3	4	5
Human capital					
Our staff frequently undergo IT refresher training					
Our company has provided sufficient training when implementing new ICT systems and applications.					
Our employees have been able to adopt new ICT applications for their work					
Our employees have been able to innovate new ideas and approaches to work effectively by adopting new ICT applications					
Our employees have shown little resistance to adopt new ICT systems and applications					
ICT Infrastructure					
We often uses IT facilities such as Computers, fax, Printers, and phones to transact with customers					
We have a computer laboratory; Direct trade input (DTIs) for employees instructions and data capture					

Our computer systems are linked with servers to network to all ESLSE branch offices.					
ICT Capacity					
Portfolios which are a set of different types of IT application with business processes					
We restructure IT work processes to leverage opportunities					
We provide our services to customers 24 hours a day					
Knowledge Source & IT Relationship					
There is clarity of vision regarding how IT contributes to business value					
Management has the ability to understand value of IT investment					
There is a climate that encouraging risk taking and experimentation with IT					
We have technology based links with customers					
We have technology based links with suppliers					
We use IT based entrepreneurial collaborations with external partners					

PART D: THE ROLE OF ICT ADAPTION ON SUPPLY CHAIN PERFORMANCE

3. To what extent do the following ICT adoption role the supply chain performance of the ESLSE ? Use a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

ICT Adoption Performance	1	2	3	4	5
Efficiency					
We have a quicker computerized information processing system and optimum decision					
We provide convenient service charges to customers					
We provide financial and technical advice to clients					
We use computerized systems to shorten transaction time					
We use IT facilities to provide quick information to customers					

We provide an automatic billing system and updates customers on time					
We use on line operation system to reduce costs and maximize profits					
We promptly invoice and receive cash by electronic transfer system which eases transaction					
The resources have been optimally utilized					
Value creation for stakeholders has been promoted					
Effectiveness					
We keep our records accurately					
Our firm promptly responds to customer's inquiries and orders on time					
Our Employees are willing to help customers					
We use on line system to handle customer request on time					
We ensure accuracy and completeness of information					
We monitor service performance satisfactorily					
We often carry out consistent staff performance review					
Our Firm has modern equipment to process customer's orders					
The Firm`s competitiveness is enhanced innovation and profitability has been realized					
The overall quality of services provided by our Firm is excellent.					
Responsiveness					
Our employees provide services at the promised time					
We deliver services to customers satisfactorily through internet system					
We deliver cargo to customers on time					
We show sincere interest to solve customers' problem					
We provide reliable delivery					
Customers are satisfied with the products and services provided by our firm					
Our response to customer orders is quicker					
We promptly invoice and receive cash by electronic transfer system which eases transaction					

Flexibility					
Customers feel safe when transacting with us					
Our employees are polite and friendly staff to customers					
Our employees understand customer specific needs					
The complaints on the products and services delivered have reduced					
We employ professional trained personnel to handle customer's requests					
We often investigate and correct irregularities in operating activities					

PART E: CHALLENGES OF ICT ADOPTION IN ESLSE

4. To what extent do you face challenges in ICT adoption

With regard to ESLSE, to what extent do you experience the following challenges in ICT adoption? Use a scale of 1 to 5 where 1= no extent, 2= little extent, 3= moderate, 4= large extent and 5 is to a very large extent

Challenges of ICT adoption inESLSE	1	2	3	4	5
Human Resource					
Lack of Education and training					
Lack of expertise					
Organizational Resistance					
Technical					
Lack of support from software vendor					
Lack of suitable hardware and software					
Inflexible information systems					
Lack Information sharing and accessibility					
Inappropriate/inaccurate performance and cost measures					
Lack data accuracy					
Management					
Lack of top management support					

Lack of effective project management					
Lack of cultural (organizational) readiness					
Improper change management					
Autocratic mandatory implementation by top management					
Lack of standard formats and methods					
Lack of customer sophistication					
Lack of awareness of benefits					
Conflicting priorities for resources High cost					

5. What other information would you like to share about the role of ICT and supply chain performance in ESLSE?

……

……

6. . What do you think should be done in ICT adoption to enhance supply chain performance in ESLSE?

……

THANK YOU