The Role of Information Communication Technology in Supply Chain Integration and in supply chain performance the case of Ethio-Telecom

BY

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Declaration

I, Berhane Tikabo Gebregiorgis, announce this research paper entitled “the role of ICT (Information Communication Technology) in supply chain integration and supply chain performance in the case of Ethio telecom” is my own and I dare to say original research work that has not been produced by others in any other universities for any other requirements in any form. To this end, I acknowledged all sources of information that I used to produce the study appropriately and I would say perfectly.

Student Researcher	Signature	Date
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Letter of Certification

This to certify that Berhane Tikabo has carried out his thesis work on the topic entitled “The role of ICT in supply chain integration in Ethio-telecom” under my guidance and supervision. Accordingly, I here assure that his work is appropriate and standard enough to be submitted for the award of Master of Arts in Logistics and Supply Chain Management.

Research Advisor	Signature	Date
Shiferaw Mitiku (PhD)	_____	_____

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THE ROLE OF INFORMATION COMMUNICATION TECHNOLOGY(ICT) IN SUPPLY CHAIN INTEGRATION IN THE CASE OF ETHIO-TELECOM

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LIST OF ABBREVIATION

ICT	Information Communication Technology
IT	Information Technology
SCM	Supply Chain Management
ET	Ethio Telecom
VC	Voucher Card
SIM	Subscriber Interface Module
CWH	Central Warehouse
ERP	Enterprise Resource Planning &
CRM	Customer Relationship Management
SCI	Supply Chain Integration
EDI	Electronic Data Interchange
WWW	World Wide Web
EC	E-commerce
PU	PERCEIVED USEFULNESS
PEOU	PERCEIVED EASE OF USE
SPSS	Statistical Package for Social Sciences

ABSTRACT

Information communication technology is a vital tool to integrate supply chain and enhance the operational performance. This research aims to investigate the role of Information communication technology in supply chain integration, which includes supplier integration, customer integration, internal integration, and information integration and its effect on supply chain performance by using the four dimensions' measurement such as flexibility, cost, time, and quality. In order to undertake the study, there are problems such as; problems related to lack of alignment among departments, problem related to skill of the employees, lack of focus from top management, network interruption, inspection delay, fear of technology, scrap items in all company premise, warehouse space problem and disposal of obsolete items. Such problems happened due to poor supply chain management in general and supply chain integration problems in particular. This study has five objectives; these are to examine the role of Information communication technology on supply chain integration of the ethio-telecom, to determine the role of Information communication technology adoption in supply chain management performance, to determine the relationship between supply chain integration and supply chain performance, to identify factors influencing the adoption of Information communication technology for supply chain integration and to analyze the impact of supply chain integration elements on supply chain performance. The casual research design was employed with a sample of 125 employees through nonprobability sampling particularly deliberate or purposive sampling. The questionnaires were sent to 125 respondents to fill it. From the total 125 questioners distributed all were returned from which 17 were not correctly filled and rejected. Therefore 108 were effectively used for analysis that shows response rate of 86.4 percent. This is a good response rate based on Fowler (2002) a 75 percent response rate is considered adequate. The collected data was analyzed using both descriptive statistics (mean & standard deviation) and inferential statistics (correlation and linear regression). Main findings of the study depicts that, there is strong integration role of Information communication technology on the supply chain integration as the mean values of the four supply chain dimension (internal integration, customer integration, information integration and supplier integration)were above the minimum requirement(i.e. greater than the mean value of 2.5).Moreover, internal integration, customer integration, information integration and supplier integration dimensions of supply chain integration had a significant effect on supply chain performance of the enterprise by the role of Information communication technology. The other finding for the role of Information communication technology on supply chain performance dimensions (cost, flexibility, quality and time(responsiveness) were above the minimum requirement (i.e. greater than the mean value of 2.5). Means the role of Information communication technology had significant effect on supply chain performance dimensions. The final finding is the factors affect the adoption of Information communication technology such as external and internal factors. Both factors had an adversely effect on adoption of Information communication technology.

Keyword: *supply chain Integration, supply chain Integration elements, supply chain performance, supply chain performance dimensions, Information communication technology*

CHAPTER ONE: INTRODUCTION

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

1.1 Background of the study

The activity of the supply chain initiative goes back to early beginnings in the industry of textile based on quick response and for efficient consumer response in the industry. More recently different organizations across many industries started to look at the entire supply chain process. In 1985, Kurt Salmon Associates undertaken a supply chain analysis and the results of the study signifies the time of delivery for the textile supply chain, from raw material to consumer, was 66 weeks long, out of which 40 weeks were spent in warehouses or in transit. The result of long supply chain is a major blow to the industry due to financing the inventory and lack of the right product in the right place at the right time (Kurt Salmon Associates, Inc., 1993).

Supply chain management (SCM), an integrated approach to the planning and control of materials, services, and information flows from suppliers through factories to the end-customer, represents one of the most significant paradigm shifts of modern business management; it recognizes that individual businesses no longer compete as solely autonomous units, but rather as supply chains (Chen and Paulraj, 2004a).

Information and communications technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications (*Murray, James (2011-12-18)* and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, middleware, storage, and audiovisual systems, that enable users to access, store, transmit, and manipulate information (*FOLDOC. 2008-09-19.)*

In today's business world the central concept of supply chain management is taken by the idea of integration, because the practice of SCM requires a systematic integration processes starting from sourcing, to manufacturing, and to distribution along the supply chain (Cooper, *et al* 1997). And ICT helps to integrate the scattered company entities throughout the world, as well as the integration between independent companies that operate within one supply chain (Shoghari and Abdallah, 2016). This integration contributes to collaborate among supply chain partners and to stay in the competition. The horizon of supply chain integration is wide enough ranging from supplier integration to customer integration including central concept of internal integration (Flynn, B.B., Huo, B., & Zhao, X., 2010).

Supply chain management emphasizes the overall and long-term benefit of all parties on the chain through co-operation and information sharing. This signifies the importance of communication and the application of IT in SCM. This is largely caused by variability of ordering (Yu et al., 2001). Information sharing between members of a supply chain using EDI technology should be increased to reduce uncertainty and enhance shipment performance of suppliers and greatly improve the performance of the supply chain system (Srinivasan *et al*., 1994).

Nowadays, Ethiopia companies use ICT to integrate different supply chain process. However, considering the newness of using ICT to integrate and improve supply chain management in Ethio-telecom in particular and in many other local companies in general, studies conducted to identify the role of ICT in supply chain integration are negligent. Hence, the main purpose of this study is to identify the role of ICT in supply chain integration in ethio-telecom.

1.2. Background of the organization

Ethio-telecom was established on December 2010 by the decision of the government of Federal Democratic Republic of Ethiopia to transform the previous traditionally operating corporation (ETC) with a vision to be a world class telecom operator. Ethio telecom provides different kinds of products and services all over the country and act as a sole service provider (Fanuel, 2013).

Ethio-telecom is the only telecom service provider in Ethiopia. Due to its monopolization the consumption of all telecom products like voucher cards (VCs), SIM cards and network materials are imported through the company and distributed by the company itself and other distributers. But the major portions of those items are distributed mainly through the company owned distribution channels. That means the company needs to manage its supply chain effectively and efficiently to be successful. Like other companies in Ethiopia, ethio-telecom didn‘t has supply chain management section until 2011 i.e. until the transformation process began (Fanuel, 2013).

Then it was started to increase the effectively and efficiency of supply chain management by integrated supply chain thought information communication technology (ERP). However, it faced different challenges in implementing and managing the supply chain integration with information communication technology (ICT) of the company as based on the feedback from employees and from my experience and observation. The following challenges are some of the many concerns of the supply chain management: - Skill problem, lack of focus from top management, Inspection delay, fear of technology, scrap items in all company premise, warehouse space problem and disposal of obsolete items, vehicle assignment and etc. (Fanuel, 2013)

1.3. Statement of problem

Research has shown information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. Effective coordination of supply chain activities, by means of excellent information technology processes, has recently been identified as essential to organizational performance (Lewis & Talalayevsky, 1997). If information sharing between members of a supply chain using EDI technology should be increased to reduce uncertainty, enhance shipment performance of suppliers, and greatly improve the performance of the supply chain system (Srinivasan *et al*., 1994).

Supply chain integration is the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organizational processes, in order

to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer (Flynn*et.al,* 2010).

Westbrook and Frohlich (2001); and Vickery, *et al.* (2003) found a positive and direct relationship between information technology and supply chain integration. Chen and Paulraj, (2004) said that: internal integration of different departments within a firm should act as integrated process. Kulp, *et al.* (2004) and Gimenez and Ventura, (2005) showed the importance of downstream integration. Bagchi, *et al.* (2005) stated that supply chain integration affects operational performance, and the degree of integration influences cost and efficiency. Swink, *et al*. (2007) and Flynn, *et al.* (2010) pointed out that external integration emphasizes the importance of cooperation and collaboration with suppliers and customers.

Supply chain management in Ethiopia is at its infancy stage. As per the World Bank logistics performance, Ethiopia is standing at 126^{th} place from the world manifesting the lowest performance in supply chain management. Many companies in Ethiopia do not even have supply chain management department in their organizational structure (World Bank report, 2016).

Being the only telecom service provider in Ethiopia, ethio-telecom (ET) has monopolized the importation and distribution of all telecom products like voucher (VCs), SIM cards and network materials. In addition to the challenge that comes from being the only distributer in the country, the supply chain system of ethio-telecom has also been suffering due to skill problem of the employees, lack of focus from top management, network interruption, inspection delay, fear of technology, scrap items in all company premise, warehouse space problem and disposal of obsolete items. There is also different departments focus to achieve own objective separately. Such problems happened due to poor supply chain management in general and supply chain integration problems in particular. This company has been using both SCM and ICT for the past eight years to integrate the functions of different departments internally and with customers and suppliers externally through ERP and CRM systems by assuming a positive and direct relationship between information technology and supply chain integration (Westbrook and Frohlich (2001); and Vickery, *et al.* (2003)). And according to Li *et.al,* 2006, any organization initiative including supply chain integration practices should ultimately lead to enhanced organizational performance, these and

other existing challenges have placed a significant pressure on the company. Therefore, this study was help to identify improvement areas that can solve the role of ICT to supply chain integration problems and supply chain performance problems.

Westbrook and Frohlich (2001); and Vickery, *et al.* (2003) found a positive and direct relationship between information technology and supply chain integration. Many studies have found that integration across the supply chain has a positive impact on organizational performance (e.g. Flynn *et al.*, 2010, BaofengHou, 2012, La Hatani, 2013; Sohail, S.M., 2009).

Despite the importance of ICT to supply chain integration and supply chain performance there is a lack of studies in Ethiopia that link ICT in supply chain integration and supply chain performance. In addition, previous researches are limited in manufacturing industry and organizational performance, but this research had extended the study of ICT in supply chain integration and supply chain performance to service providing company. In addition, the previous research studied on supply chain integration includes internal and external integration variables but this study adds one more variables such as information integration. Therefore, this study could contribute in filling these gaps by examining the role of ICT in supply chain integration and its impact on supply chain performance of Ethio-telecom.

1.4. Research Questions

This research identified major roles of ICT in supply chain integration in ethio-telecom. The research paper answered the following research questions.

1. What are the major roles of ICT in supply chain integration at the ethio-telecom?
2. How ICT adoption has impacted on the performance of supply chain management system at the ethio-telecom?
3. What is the relationship between supply chain integration and supply chain performance by the role of ICT at ethio-telecom?

4. What are the major factors influencing the adoption of ICT at ethio-telecom?

5. How can supply chain integration elements impact on supply chain performance in ethio-telecom?

By identifying the answer for the above questions, the study will try to identify the major roles of ICT in supply chain integration and identify challenges in using ICT that will alert decision makers of the company.

1.5. Objective of the study

- To examine the role of ICT in the Supply Chain Integration of ethio-telecom operation.

1.5.1 Specific objective

1. To identify the role of ICT on supply chain integrations.
2. To determine the role of ICT adoption in SCM performance in the ethio-telecom.
3. To determine the relationship between supply chain integration and supply chain performance at ethio-telecom.
4. To identify factors influencing the adoption of ICT in ethio-telecom.
5. To analyze the impact of supply chain integration elements (supplier, information, internal, and customer integration) on supply chain performance.

1.6. Significance of the Study

The result of the study was given an insight for the company's management as well as other concerned bodies such as researchers and academicians about the existing role of ICT in supply chain integration. It gave also suggestion new possible ways in using ICT to improve and integrate different supply chain process and enable the company to improve its supply chain management system.

1.7. Scope of the Study

This study was only focus on the company's different departments or functions such as; suppliers, sourcing, warehouses, inventory, and logistics. There is also of mega sellers out of the company, which are the customers of head office. The geographical scope of the study covered the head office in Addis Ababa city because the departments covered under the study has found in ethio-telecom head office. The time scope of the study covered from January 2019 to July 2019.

The subject scope focused on the role of information communication technology (ERP and CRM) on supply chain integration i.e. information, customer, supplier and internal integration.

1.8. Limitation of the study

This study encountered certain limitation during the course of conducting the study. One of the difficulties encounters was the respondents were reluctant to fill out and return the questionnaire on time and the other difficulties due to time constraint it didn't possible to collect data in all company departments in head office of ethio telecom. In addition, this study did not include other than head office because of cost and time constraints.

1.9. Organization of the study

This research paper was organized into five chapters: Chapter one contains the introduction part dealing with background of the study, the research problem, objectives of the study, scope, significance and limitation of the study. The second chapter discusses the review of related literature about the subject matter. In chapter three the methodologies that would be used for the study are presented.

CHAPTER TWO: RELATED LITERATURE REVIEW

Information communication technology (ICT) enhances the supply chain integration of the organization. Supply chain integration is about collaboration, cooperation and coordination among different players of supply chain. Different authors defined supply chain, supply chain management supply chain integration and Information communication technology in different ways, each definition is tailored according to the nature of the study, industry, and research objective. The following section will explore the relationship of Information communication technology and supply chain integration, as well as, the effects on operational performance. This chapter presents a review of studies that have been done in the past. The specific areas covered include the theoretical literature review, Empirical Literature Review and conceptual framework.

2.1. Theoretical Literature Review

2.1.1. Supply Chain

Traditionally, marketing, distribution, planning, manufacturing, and the purchasing organizations along the supply chain operated independently. These organizations have their own objectives, and these are often conflicting. In present-day, however, there is the assumption that SC's should compete instead of companies (Christopher, and Towill, 2000). Supply chain is composed of great number of products, customers, delivery points, suppliers, costs, etc, in a complex network (Gupta & Sahay, 2007). When we come to the definition it is a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer (Mentzer, *et.al.* 2001).

It is also a network of different groups of interconnected participating companies that add value to a stream of transformed inputs from their sources of origin to the end products or services that are demanded by designated end-consumer (Dawe Lu, 2011). Those different companies or an independent business unit that starts from original supplier to end-customers (Lambert *et al*, 2005).

In addition, supply chain is a linkage of various organizations and the chain comprises vendors that supply raw materials, producers who convert the raw material into finished product, warehouses that store products, distributor's that deliver products to retailers and retailers who deliver products to the ultimate consumer through upstream and downstream linkages in different kinds of activities and processes (Christopher, 1998).

According to (Ganeshan and Harrison, 1995) defined as supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers". In summery all ideas try to show supply chain is the alignment of firms that bring products or services to market (Lambert *et al*., 1998) and it consists of all stages involved, directly or indirectly, in fulfilling a customer request. A supply chain not only includes the manufacturers and suppliers, but also includes transporters, warehouses, retailers, and customers themselves (Chopra and Meindl, 2001).

2.1.2. Supply chain management

The Origin of Supply Chain Management goes back to the 1950s and 1960s, when US manufacturers were employing mass production techniques to reduce costs and improve productivity while relatively little attention was typically paid to creating supplier partnerships, improving process design and flexibility, or improving product quality (Wisner *et al*., 2005). But as competition in the U.S. intensified further in the 1990s accompanied by increasing logistics and inventory costs and the trend toward market globalization, the challenges associated with improving quality, manufacturing efficiency, customer service, and new product design and development also increased. To deal with these challenges, manufacturers began purchasing from a selected number of certified, high- quality suppliers with excellent service reputations and involved these suppliers in their new product design and development activities as well as in cost, quality, and service improvement initiatives. This is done so by reducing the supply base as much as to a single supplier and enters into a long-term agreement as strategic alliance in doing their business. As companies began implementing supply chain management initiatives, they began to understand the necessity of integrating all key business processes among the supply

chain participants enabling the supply chain to act and react as one entity. SCM particularly focuses on integration with a few competent suppliers in both product development and inventory control. The integration spreads and spans the entire chain from suppliers, manufacturer, distributer, and retailer (Jaya, 2004).

According to Mentzer (2000) SCM has been conceptualized with two different components- an integrative business philosophy and implementation actions- to manage the flow of a distribution channel from the supplier to the ultimate user when we come to the definition of supply chain management, it is a set of activities undertaken by organization to promote effective management of its supply chain (Li, Ragu-Nathan, Ragu-Nathan, & Subba Rao, 2006). Supply chain management (SCM) according to (Handfeild & Nichols, 1999) is the integration in the flow and transformation of goods from raw materials stage (extraction), through to the end user, as well as the associated information flows. Material and information flow both up and down the supply chain. The supply chain includes the management of information systems, sourcing and procurement, production scheduling, order processing, inventory management, warehousing, customer service and aftermarket disposition of packaging and materials. In addition, it includes logistics flows, the customer order management, the production processes, and the information flows necessary to monitor all the activities at the supply chain nodes, as quoted in (Sevensson, 2003) by Lummus *et al*. (2001).

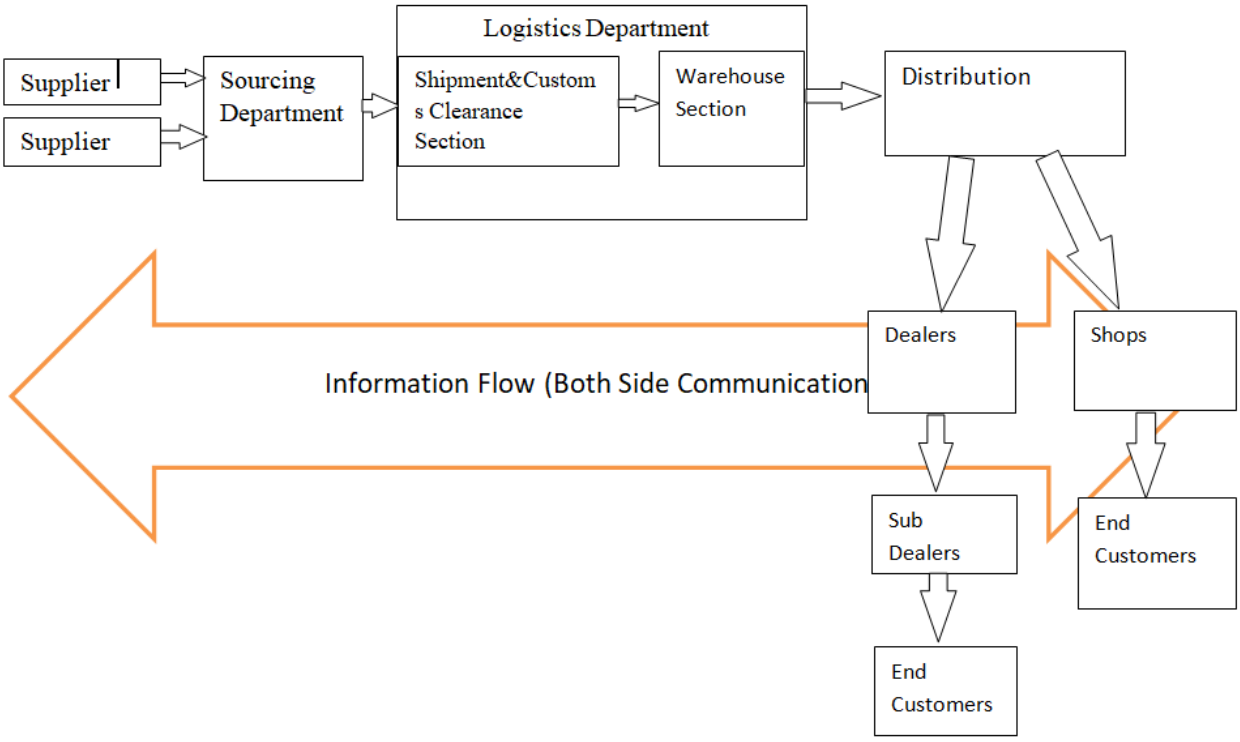
The Supply Chain Council's definition of Supply chain management is: "Managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer". Lambert defined SCM is as the integration of key business processes from end users through original suppliers that provides products, services, and information and hence add value for customers and other stakeholders (Lambert *et al*., 1998).

In SCM there are dependencies between levels in channels from the point of origin to the point of consumption (Lamber *et al*., 1998; Hakansoon and Snehota, 1995; Stern, 1969; Alderson, 1957, 1965; Mc Cammon and Little, 1965; Weld, 1916) as quoted in the work of (Svensson, 2007). SCM might be seen as a business philosophy that strives to integrate the dependent

activities, actors, and resources between the different levels of the points of origin and consumption in channels. This means that SCM comprises different kinds of dependencies in, between and across companies in channels from manufacturers/suppliers to customers/consumers. Meanwhile, in 2004, Stadler summarized various definitions of SCM given by different authors as, an activity of linking different units of organizations along a SC and coordinating materials, financial and information flows in order to fulfill customer demands with the objective of boosting competitiveness of the supply chain of an organization as a whole.

IT seems to be particularly important in fast clock speed industries or when flexibility and agility are needed. Many theoretical papers have addressed the value of IT in SCM. For example, Levary, R. (2000) suggests that IT in SCM provides a reduction in cycle time, a reduction of inventories, a minimization of the bullwhip effect, and improvement in the effectiveness of distribution channels.

Figure.2.1: Ethio telecom supply chain map



Source: Self developed

2.1.3. Supply chain integration

According to Sweeny *et al* (2011), most businesses certainly manufacturing based business can be described in terms of the five functions: buy, make, store, move and sell. This is what is referred to as the internal (or micro or intra-firm) supply chain. Traditionally these functions have often been measured, and therefore managed, in isolation, often working at cross purposes. This traditional approach is analogous to a relay race with responsibility being passed from one function to another. But now a day there is an intensive global competition among companies. Then they need organizations to create cooperative and mutually beneficial relationship among supply chain partners (Wisner and Tan, 2000) because the "whole is greater than the sum of the parts".

Supply chain integration is the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organizational processes, in order to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer (Flynn*et.al*, 2010).

Bowersox *et al*. 1999, Westbrook and Frohlish (2001), pointed out that organizations or companies need to implement supply chain integration to meet the new challenges of the global competitive environment. Coordination in the supply chain has many different forms, but, as whole, the purpose of all kinds of coordination is that entities in a chain of end customer information or the final consumer of goods and services, particularly be aware of the amount of actual demand to have the knowledge to produce programs, schedule, control the level of Inventory, design their products in the way that be able to deliver them at the right time, right place to consumer in order to attract customer satisfaction and be successful in competitive market ahead of their competitors (Li & woo, 2004).For example, The Institute for supply Management describes supply chain management as: "the design and management of seamless, value-added processes across organizational boundaries to meet the real needs of the end customer. The development and integration of people and technological resources are critical to successful supply chain integration." In other word A tight relationship among the members of supply chain create a conducive environment for the free flow of information and better

performance, proper functioning with employees, having better infrastructure and systems can have a climate of innovation and free flow of ideas. Thus, having such type of organization creates capability for delivering high quality of goods and services, which in turn have best satisfied customers and, a desire to be part of a win-win relationship. Consequently, a variety of opportunities will be created in order to sustain long lasting supply chain profitability and market share but needs to be managed effectively (Andrew & Linda, 2013).

In maintaining competitive advantage, the contribution of collaboration among supply chain partners and organized management system across organizational practice is quite substantial to stay in the competition. In today's business world the central concept of supply chain management is taken by the idea of integration, because the practice of SCM requires a systematic integration processes starting from sourcing, to manufacturing, and to distribution along the supply chain (Cooper, M., Lisa, M., Ellram, J., Gardner, T., & Albert, M. H, 1997).The horizon of supply chain integration is wide enough ranging from supplier integration to customer integration including central concept of internal integration (Flynn, B.B., Huo, B., & Zhao, X., 2010).

poor information technology infrastructure, whether caused by lack of funds or lack of awareness and commitment of top management, has also been identified as a major barrier to successful supply chain integration (Bender, 2000).

2.1.3.1. Supplier Integration

Supplier integration refers to acquiring operational, technical and financial information with the suppliers. Manufacturers and suppliers may share information including production plans, demand forecasts and levels of inventory. This information sharing results in enhancing the product and production requirements and better utilizing the supplier's and the firm's capability and structure of cost (Zahra Lotfi *et al.*2013). Stank, *et al.* (2001), defined supplier integration as "the degree to which a firm can partner with its key supplier members". Some authors use the term downstream integration to express supplier integration. Scannell, *et al.* (2000) has focused on upstream integration, analyzing the integration with suppliers. Flynn, *et al.* (2010), also

comment on supplier integration as it involves core competencies related to coordination with critical suppliers.

The integration of information system between organisations allows for an increase in the free flow of relevant information that results in better decision making from both the buyer and the supplier (Vickery et al., 2003). Research that has been done in this area recognizes that information technology integration improves customer service and decreases operational cost between buyer and supplier. The research further stipulates that EDI is a driving force for a competitive supply chain management strategy (Vickery et al., 2003).

Research has shown information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. Moreover, information technology is touted as having a profound effect on collaborative relationships by facilitating cross-functional interactions between the supply chain partners (Grover and Malhotra, 1997). It eliminates the barriers between functional areas and among firms for a smooth information flow. It also facilitates the integration of suppliers into new product development and joint planning (McIvor et al., 2000). Thus,

H1: ICT has significant negative effect on SCI of ethio telecom with respect to supplier integration.

2.1.3.2. Internal Integration

Internal integration is integration within all internal departments from incoming material to distribution. It involves integration across departments and functions under the control of the manufacture in order to fulfill customers' requirements. This suggests that more consideration should be given to interplay in the middle of functional departments, for instance production, procurement, logistics, inventory, marketing, sales and distribution (Zahra Lotfi *et al.*2013).

Internal integration mainly involves data and information system integration through the use of enterprise resources planning (ERP), real-time searching of inventory and operating data, and integration of activities in different functional areas. Internal integration also involves cross-

functional cooperation or working together across different functions in process improvement or new product development. Internal integration recognizes that different functions within affirm should not act as functional silos, but instead as part of an integrated process (Zhao, *et al.*2011). Flynn, *et al.* (2010) defined internal integration as "the degree to which a manufacturer structures its own strategies, practices and processes into synchronized, collaborative processes to fulfill its customers' requirements and efficiently interact with suppliers".

Internal Integration defined as the process of connecting different function in a firm such as manufacturing, purchasing and materials management (Ward & Zhou, 2006). For example, ERP systems are a form of internal integration of processes (Davenport, 1998). Furthermore, these information systems aid in generating information and facilitating information sharing within the firm, which can enhance a firm's production capabilities (e.g., Schlie & Goldhar, 1995; Small, 1999).

H2: ICT has significant negative effect on SCI of ethio telecom with respect to internal integration.

2.1.3.3. Customer Integration

Customer integration is supply chain integration downstream. It is the outgoing set of products and services and the incoming set of data from customers to suppliers. Customer integration leads to creating a relationship with customers and hence gaining a better and clearer understanding of customers' references (Zahra Lotfi *et al.*2013). Customer integration discussed and defined by different researchers' perspectives. Flynn, *et al.* (2010) defined that customer integration involves core competencies derived from coordination with critical customers. Kulp, *et al.* (2004) studied the integration with buyers. Van der Vaart and Van Donk (2008) analyzed supply chain integration from different perspectives: attitudes, pattern, and practices. While other authors have studied integration with customers and suppliers such as Flynn, *et al.* (2010) and Zhao, *et al.* (2011) considered a broader perspective for supply chain integration as internal

integration and external integration. Huo, B. (2012) said that both supplier integration and customer integration could be classified as external integration.

Integration of IT has been classified based on whether the process is done internally or externally. External integration refers to information systems that connect a firm with its suppliers and customers (Ward & Zhou, 2006). IT integration with suppliers and customer has been found to impact firm performance positively Frohlich (2002) and Subramani (2004).

H3: ICT has significant negative effect on SCI of ethio telecom with respect to customer integration.

2.1.3.4. Information integration

Information integration refers to the sharing of key information along the supply chain network which is enabled by information technology (IT). One of the main purposes of information integration is to achieve real-time transmission and processing of information required for supply chain decision making. According to Lisa Harrington (1999), Supply chain management emphasizes on the flow of information and products along the members of supply chain in an organization and also encompasses; suppliers, customers, producers, and service providers that integrates together the acquisition, purchase, manufacture, assemble and distribute products from suppliers to the ultimate users. Proper information utilization will lead to greater coordination in the chain and a better coordination in the flow of information between partner's results to growing impacts on the timely delivery (speed), accuracy, quality of products. A critical emphasis on information technology without the interest of sharing information will not contribute to associate organizations together. Effective utilization of information technology has the potential to develop supply chain partners in order to perform together for better delivery of products to consumers. It also Information integration refers to the sharing of key information along the supply chain network which is enabled by information technology (IT). One of the main purposes of information integration is to achieve real-time transmission and processing of

information required for supply chain decision making. Lee et al (2000) show that information sharing can lead to lower cost through reductions in inventories and shortages.

One of the main aspects of technology was to integrate the supply chain by using industry standards Electronic Data Interchange (EDI) to properly communicate key business documents such as: purchase orders, invoices, advanced shipment notification, and financial payment. The critical emphasis is that EDI could not be used to automate poor business practices rather we streamline the business "handoffs" then use automation to drive the process.

According to the study of Koçoglu ipek , Salih Zeki imamoglu, Hüseyin ince, Halit Keskin (2011),sharing of information across the chain is a key and critical component in achieving an integrated supply chain because it is believed that SCI increases collaboration, minimizes uncertainty, increases the speed of material flow, accelerate order fulfillment, reduction of inventory costs, increases the satisfaction of customer through reliable and fast delivery of products, improve performance and increase operational effectiveness. While the technological aspect of information integration is significant, it is the frequency, the quantity and the quality of information that is shared that really matters.

If information flow managed properly, it is the key factor for both efficiency and effectiveness in the supply chain with the key characteristic of sharing information up and down the supply chain related to the flow and demand requirements. In addition, if information shared, it can be potentially available on a real-time basis. When discussing the use of IT in SCM, we refer to the use of inter organizational systems that are used for information sharing and/or processing across organizational boundaries by using Enterprise Resource Planning system. Enterprise Resource Planning (ERP) is a term used to refer to a system that links individual applications (for example, accounting and manufacturing applications) into a single application that integrates the data and business processes of the entire business.

H4: ICT has significant negative effect on SCI of ethio telecom with respect to information integration.

The integration of information system between organizations allows for an increase in the free flow of relevant information that results in better decision making from both the buyer and the supplier (Vickery et al., 2003). Research that has been done in this area recognizes that information technology integration improves customer service and decreases operational cost between buyer and supplier. The research further stipulates that EDI is a driving force for a competitive supply chain management strategy (Vickery et al., 2003).

2.1.4. Information Communication Technology (ICT)

ICT (Information and Communication Technologies) refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT) but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums (Bluton, 1999). ICT is today being applied in many organizations in a wide range and operations areas. It has provided new ways to store, process, distribute and exchange information both within companies and with customers and suppliers in the supply chain (Internet).

(World Bank, 2003) defined information & communication technology consists of hardware, software, networks and media for collection, storage, processing, transmission, and presentation of information (voice, data, text, images). The advancement in technology, specifically in information technology, together with globalization, the complexity of business processes and shrinking of time horizons are oscillating order-of-magnitude changes in the competitive demands on strategic business management and on the management of supply chains. The competitive pressures have a strong direct effect on supply chain strategy and integration of the organization which forces companies to look for effective ways to manage their supply chain. In the past decade, the main focus in the supply chain management (SCM) research was the contribution of integration as a key variable to achieve improvements in their business practice (Tan, K.C., Lyman, S.B., & Wisner, J.D, 2002; Romano, P, 2003).

"Information technology is a term that encompasses all forms of technology utilized to create, capture, manipulate, communicate, exchange, present, and use information in its various forms (business data, voice conversations, still images, motion pictures, including those not yet conceived)" Jari S., Heikki K., (2006)

Information (and communication) technology plays a central role in supply chain management in the following aspects. First, IT allows firms to increase the volume and complexity of information which needs to be communicated with their trading partners. Second, IT allows firms to provide real-time supply chain information, including inventory level, delivery status, and production planning and scheduling which enables firms to manage and control its supply chain activities. Third, IT also facilitates the alignment of forecasting and scheduling of operations between firms and suppliers, allowing better inter-firms coordination. As such, the problems in coordinating supply chain activities that often hindered by time and spatial distance can be reduced (Paulraj and Chen, 2007).

If information flow managed properly, it is the key factor for both efficiency and effectiveness in the supply chain with the key characteristic of sharing information up and down the supply chain related to the flow and demand requirements. Inter-organizational information systems may be simple electronic data interchange (EDI) systems for exchanging data such as purchase orders, advice of delivery notices, and invoices, or may involve more complex transactions such as integrated cash management systems, shared technical databases, internet, intranet, and extranet (Min and Galle 1999). Electronic data interchange (EDI) is not just an electronic ordering system; it helps to integrate stocking, logistics, materials acquisition, shipping and other functions to create a more proactive and effective style of business management and customer responsiveness (Mische, 1992) and thereby improve competitive advantage (Calza and Passaro, 1997). It helps in sharing information about markets, materials requirements forecasts, inventory levels, production and delivery schedules (Webster, 1995).

Given that the web is a flexible, interactive, and relatively efficient medium through which various business partners and consumers can communicate, the potential that it offers for improvement of efficiency in the channel functions is enormous (Griffith and Palmer, 1999). As innovations in technologies such as intranets and extranets are critical in integrating and

coordinating cross-functional teams across organizational boundaries (Grover and Malhotra, 1997). Extranets connect enterprises to their partners and the internet links the enterprises to their customers and other agencies (Shaw, 2000). Intranets merge the advantages of internet with those of local area networks (Chellappa *et al*., 1996) to provide support for electronic connections between intra-organizational partners and electronic access to operational data. Intranets use web-based and internet technology to easily and inexpensively share data across a private network and they are capable of providing information in a way that is immediate, cost-effective, easy to use, rich in format, and versatile. In addition, ERP systems can be considered as an information technology infrastructure that is able to facilitate the flow of information between all supply chain processes in an organization (Martin, 1998). The ERP systems represent an optimum technology infrastructure that, when integrated properly with a process-oriented business design, can effectively support supply chain management systems (Chen, 2001).

Recently the concepts of supply chain design and management have become a popular operations paradigm. This has intensified with the development of information and communication technologies (ICT) that include electronic data interchange (EDI), the Internet and World Wide Web (WWW) to overcome the ever-increasing complexity of the systems driving buyer–supplier relationships. The complexity of SCM has also forced companies to go for online communication systems. For example, the Internet increases the richness of communications through greater interactivity between the firm and the customer (Watson et al., 1998). If information sharing between members of a supply chain using EDI technology should be increased to reduce uncertainty, enhance shipment performance of suppliers, and greatly improve the performance of the supply chain system (Srinivasan *et al*., 1994).

The sharing of information among supply chain networks allows the supply chain drivers to work together with the goal of integrated and coordinated supply chains for effective supply chain management. Information also enhances the performance and reduces the risks of supply chains because it provides processes executed transactions and it creates opportunity for decision makers when they need it and, in the format, they need it. This is where IT comes into role and it

consists of hardware and software applications. IT also plays an important role in integrating suppliers, manufactures, distributors and customers to satisfy the quantity and quality of products. Organizations can gather vital information along the entire supply chain and react quickly to any predictable market changes, thereby gaining competitive advantage by effectively utilizing SCM (Tummala & Schoenherr, 2008). Providing information availability and visibility, enabling a single point of contact for data, allowing decisions based on total supply chain information and enabling collaboration with partners are the objectives of IT in SCM (Simchi-Levi *et al.*, 2003). The functional roles of IT in SCM have been outlined as Transaction Execution, Collaboration, Coordination, and Decision Support (Auramo *et al*., 2005). IT systems such as data integrity, real time availability, visibility and processing capability of information and standardization of business process are expected to facilitate better matching of supply and demand between supply chain members and create an excellent backdrop for embarking on integration with external partners in the supply chain (Tarn *et al*., 2002).

If information flow managed properly, it is the key factor for both efficiency and effectiveness in the supply chain with the key characteristic of sharing information up and down the supply chain related to the flow and demand requirements. In addition, if information shared, it can be potentially available on a real-time basis. When discussing the use of IT in SCM, we refer to the use of inter organizational systems that are used for information sharing and/or processing across organizational boundaries by using Enterprise Resource Planning system. Enterprise Resource Planning (ERP) is a term used to refer to a system that links individual applications (for example, accounting and manufacturing applications) into a single application that integrates the data and business processes of the entire business.

Basic Enterprise Resource Planning (ERP) is one of various software systems that used to make the integration between the three processes (stages). ERP is a system that effectively integrates all information required by the operating process functions including finance, accounting, human resources, production, material management, quality management, allocation and distribution, and sales by organization or process reengineering and information technology (Stephen, 2000, cited in Adaileh, J.M. and Abu-alganam, M.K., 2010). Internal integration and external

integration play different roles in the context of SCI. while internal integration recognizes that the departments and functions within a manufacturer should function as part of an integrated process, external integration recognizes the importance of establishing close, interactive relationships with customers and suppliers (Flynn *et al*., 2010).

Internal integration is integration within all internal departments from incoming material to distribution. It involves integration across departments and functions under the control of the manufacture in order to fulfill customers' requirements. This suggests that more consideration should be given to interplay in the middle of functional departments, for instance production, procurement, logistics, inventory, marketing, sales and distribution (Zahra, *et al.* 2013).

Internal integration mainly involves data and information system integration using enterprise resources planning (ERP), real-time searching of inventory and operating data, and integration of activities in different functional areas. Internal integration also involves cross-functional cooperation or working together across different functions in process improvement or new product development. Internal integration recognizes that different functions within a firm should not act as functional silos, but instead as part of an integrated process (Zhao, *et al.* 2011).

The phrase internal supply chain‟ is to describe work aimed at breaking down the barriers between functions within organizations. Asif (2010) also discusses to support customer requirements at the lowest total system cost, internal integration represents the integration of all internal functions, from material management to production, sale and distribution. At this stage, the firm focuses on the internal flow of goods into the organization and on the way out to the customer. Moreover, internal integration is characterized by full system visibility from distribution to purchasing and required integration across functions under the control of the firm to achieve customer satisfaction. In practice, it means that special attention must be given to the interface between functional areas such as procurement, production, logistics, marketing, sales and distribution.

Flynn, *et al.* (2010) defined internal integration as "the degree to which a manufacturer structures its own strategies, practices and processes into synchronized, collaborative processes to fulfill its

customers' requirements and efficiently interact with suppliers". Projogo also believed that improvement in logistics integration contribute to the increasing of operational benefit (Prajogo, 2012).

When we use ICT in an efficient way with all the knowledge and idea about ICT to improve their SCM operations since nowadays, ICT plays as a prerequisite which means that ICT has become a central construct around which entire SC is built (Nedelko, Z., 2008). On the other words, ICT is assigned as a requirement for SC network. Therefore, these give a boost to their organizations into more optimized and maximize profits and benefits for their organization's performance in terms of their SCM.

Telecommunications and computer technology allow all the actors in the supply chain to communicate among each other. The use of information technology allows suppliers, manufacturers, distributors, retailers, and customers to reduce lead-time, paperwork, and other unnecessary activities. It is also mentioned that managers will experience considerable advantages with its use such as the flow of information in a coordinated manner, access to information and data interchange, improved customer and supplier relationships, and inventory management not only at the national level but also at also internationally (Handfield and Nichols, 1999). Also, the advantages will include supply contracts via internet, distribution of strategies, outsourcing and procurement (Simchi-Levi et al., 2003). All companies are looking for cost and lead time reductions with the purpose of improving the level of service but also to enhance inter-organizational relationships (Humphreys et al. 2001).

2.1.5. The effect of SCI on operational performance

Different organizations use financial performance as a key output measure of firm performance, but many studies conducted on supply chain described that, relying only on financial performance measures results for various limitations (Eccles & Pyburn, 1998). This study focusses on operational performance to measure the benefits of Supply Chain Integration. Internal integration can help functions to leverage each other's resources and capabilities to jointly design products, ensure product quality and reduce duplicated tasks which allow speeding up product delivery processes, improving distribution process and reducing the obsolescence of

inventory through accurate information about the demands and preferences of the customer (Schoenherr & Swink, 2012).

Many studies conducted on the relationship between SCI and operational performance reflects that an effective integration along the supply chain have an impact on the financial performance of an organization. For example, according to Frohlich and Westbrook (2001), manufacturers that have higher degrees of supplier and customer integration obtain the highest performance improvements in terms of market share and profitability. We can indicate that operational performance plays a vital role in the relationship between Supply Chain Integration and financial performance.

Other academicians and researchers have investigated supply chain performance different perspectives. Wang, *et al.* (2009) developed supply chain performance measures based on efficiency. Gimenez, *et al.* (2011) studied profits, delivery speed and transportation costs as a performance measure. Vanichchinchai, 2014 investigated firm's supply performance that composed of flexibility, cost, relationship and responsiveness.

Bowersox, *et al.* (2000) and Croxton, *et al.* (2001) said that the use of external linkage performance metrics leads to the creation of end customer value through integrating activities and communication with other member firms along the supply chain. Harrison and New (2002) pointed out the importance of operational performance metrics as a standard framework to assess operational performance, which includes internal and external firm links. Vaidya and Hudnurkar (2012) presented the criteria of performance evaluation through cost, customer service, productivity, asset measurement, quality, time, innovativeness, price, flexibility / adaptability, ability to collaborate, supplier profile, and marketing measures.

A broader conceptualization and more effective business performance should include indicators of operational performance. This is mainly because non-financial measures can overcome the limitations of just using financial performance measures (Eccles & Pyburn, 1992, Medori, 1995, Neely, 1998, Beamon, 1999, Medori & Steeple, 2000). There are many advantages of using non-financial measures, including the facts that non-financial measures are more timely than financial

ones (Chen and Lee,1995), they are more measurable and precise, they are consistent with company goals and strategies, and non-financial measures change and vary over time as market needs change and thus tend to be flexible (Medori & Steeple,2000).

Research has shown information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. Effective coordination of supply chain activities, by means of excellent information technology processes, has recently been identified as essential to organizational performance (Lewis & Talalayevsky, 1997)

Recent advances in communication and information technology (IT) have provided firms with an opportunity for significant savings in costs by coordinating the planning of various stages of supply chain management (Peters 1992). The results of these advanced technologies have made today's supply chains more dynamic and flexible. More than ever before, information technology (IT) is permeating the supply chain at every point, transforming the way exchange-related activities are performed (Palmer and Griffith, 1998). Ideally, the goal of these systems is to replace inventory with perfect information, which equates to zero transaction cost as indicated in neoclassical economics (North, 1990).

The reported benefits of information sharing include improved ordering function, increases in sales, and lower inventory and/or shortage costs through better inventory allocation, because information sharing mitigates the information distortions along the vertical supply chain linkages (Bender, 2000).

Information and communications technology (ICT) are used by many private enterprises to improve the performance, productivity and competitiveness in the marketplace (UNCTAD, 2011).

The emergence of new network technologies and expansion of the Internet can improve organizations internal and external communication capabilities. Lower information processing costs make co-ordination and mutual adjustment processes more efficient, and therefore improves organizational performance (Andersen, 2001).

The market is the driving force for any changes in an organization. Market factors such as customer requirements, competitors and price force organizations the way they manage their

operations. For example, companies select to for IT enabled SCM in order for companies to compete in a networked economy wherein you have to compete in a global market by multiple competitive performance objectives such as price, quality, flexibility, responsiveness and dependability. The economic reason here is the cost reason. However, flexibility and responsiveness are important in order to compete in a global and networked market, the cost still plays an important role in being competitive. Obviously, flexibility and responsiveness are interconnected with cost. Many companies choose cost reduction as a competitive performance objective. In order to reduce the cost of production, companies have implemented the concept of SCM with a view to eliminate non value- adding activities. IT helps to improve the accurate information flow and in turn accurate decisions to support the business process in an effort to meet the changing market requirements.

Availability of resources locally make some companies to opt for global outsourcing and this again demands an IT-enabled SCM with a view to overcome lack of resources.

This study considered the supply chain performance as a group of standards and benchmarks that are adopted and used by the organizations to achieve customer satisfaction and maximum level of profitability. Therefore, the following dimensions are measure supply chain operational performance: Cost, Flexibility, Quality, and Time (Speed), because they are considered the most common dimensions that are investigated in the previous studies

2.1.5.1 Cost

There are many indexes for improving operational performance of an organization one of the basic is reduction of its cost. The basic reason behind is to minimize the cost for the purpose of efficiency and effectiveness of strategies and policies. Proper cost management implies the optimal use of resources for the efficiency of organization in order to create value for customers. Due to this rationale the satisfaction of customer's and loyalty and long-lasting wealth for the organization will be created. Effective way of managing cost is the result of managing decisions (Patterson & Anders, 2013).

Recent advances in communication and information technology (IT) have provided firms with an opportunity for significant savings in costs by coordinating the planning of various stages of supply chain management (Peters 1992). According to Cachon and Fisher, (2000) ICT help to share information with supply chain partners and lower cost.

2.1.5.2. Flexibility

Flexibility expressed through the capability of a system to undertake proactive and reactive adaptation of settings to deal with uncertainties, which occur both internally, and externally uncertainty. In the supply chain, the main reason for flexibility is to increase the complexity of processes that adds value and to shorten the time of response to the demand of the customer. In todays' business world the complexity of business process is rising, so businesses must be customer oriented. Companies can take different measures to improve their products and increase their flexibility and one of the measures is to outsource some of their products to other companies (Singh & Sharma, 2014). Rosenzweig, et al. (2002) defined flexibility as" the ability of the firm to develop flexible operations in hypercompetitive environment to meet the frequent changes in volume, product mix and schedules occur". Flexibility described as the ability of a system of an organization in responding quickly to changes occurred both inside and outside the system. The final achievement in the performance of an organization is to gain competitive advantage and creating customer's satisfaction.

Given that the web is a flexible, interactive, and relatively efficient medium through which various business partners and consumers can communicate, the potential that it offers for improvement of efficiency in the channel functions is enormous (Griffith and Palmer, 1999).
The results of these advanced technologies have made today's supply chains more dynamic and flexible. More than ever before, information technology (IT) is permeating the supply chain at every point, transforming the way exchange-related activities are performed (Palmer and Griffith, 1998).

2.1.5.3. Quality

Quality is highly related with the extent of communication among members of the supply chain. At this point quality of communication expressed based on the degree accuracy, adequacy, level of update, and completeness in the process of communication among partners of supply chain. Quality of communication inferred based on the system of information; outsourcing and other related organizational relationships are considered as key variables in the relationship along partners of supply chain. In order to establish and maintain effective cooperation, the company should strive to create a meaningful and high-level communication with supply chain partners to enhance the quality and involvement along the supply chain. Quality of communications plays a pivotal role in integrating activities related to organizational system in which quality of effective communications aids to integrate sustainable supply chain. The ultimate point is that, there is an acceptable relationship between quality of communication and supply chain integration in which the effect may be direct and indirect (Lin, 2013).

2.1.5.4. Time (responsiveness)

The traditional dimensions to measures performance are expressed by delivery time and lead-time. Different studies defined time, lead-time, and cycle time. Cycle time is the time between one completion jobs or tasks to another, i.e. from starting one process or task to start the same process or task again. Lead time is the time that is required from setting the order by customer to deliver the product or service (company and supplier) including manufacture, transportation, processing, warehousing, and delivering the product or service to the final customer (Gimenez, *et al.* 2011).

According to Dejonckheere, Disney, Lambrecht, and Towill, (2004) ICT help to share information with supply chain partners and shorter lead times of order processing.

2.1.6. The major Factors influencing the adoption of ICT.

The major factors that affect the adoption ICT arise from the national level (external) factors: the political, socio-economic, technological and legal factors and the internal factors are the worker

and the managerial. The internal adoption factor is mainly influenced by the characteristics of the manager and the technical knowledge or influencing the workers.

External level factors are outside the control of individuals and organizations at the national level, such as, the Political, Economic, Social, Technological, and Legal factors.

Kapurubandara and Lawson (2006) have categorized internal and external barriers that impede adoption of ICT by SMEs in a developing country. The internal barriers include owner/manager characteristics, firm characteristics, cost and return on investment, and external barriers include, infrastructure, social, cultural, political, legal and regulatory. Lal (2007) investigated the adoption of ICT in SMEs in Nigeria and found that one of the major factors inhibiting ICT diffusion and intensive utilization is poor physical infrastructure. In developing countries, some of the ICT challenges include legal and regulatory issues, weak ICT strategies, lack of research and development, excessive reliance on foreign technology and ongoing weaknesses in ICT implementation. Adebayo, Balogun and Kareem, (2013);Adenikinju, (2005);Sajuyigbe and Alabi (2012); Lal(2007); Apulu and Emmanuel, (2011) and Apulu and Latham (2011) amongst others, identified more factors that affect the adoption of ICT by SMEs in Nigeria. These factors include lack of infrastructural facilities, lack of funds, cost of implementation, lack of awareness, lack of appropriate government policies, lack of skills and training, cultural factors, electricity constraints, corruption, low levels of education, illiteracy, lack of proper information, and so on. Adenikinju (2005) advocates that problems relating to the SMEs sector in Nigeria and its development have been handled inappropriately by the government and highlight problems such as infrastructural and cultural factors, as acting against the effective development and exploitation of ICT in Nigeria. Lal (2007) also pointed out that the major factors that affect the adoption of ICT are infrastructure, cost of purchasing computer equipment, government support and management support respectively. Sajuyigbe and Alabi (2012) asserted that lack of finance, lack of electricity, lack of computer skill personnel and lack of government support are the major factors that hinder adoption of ICT by SMEs. Apulu and Emmanuel, (2011) also found that characteristics of the firm and industry sector are contributory factors to the adoption and exploitation of ICTs in SMEs.

2.1.6.1. The external factors affecting the adoption of ICT

2.1.6.1.1. Political Factors

The telecommunications policy of a nation determines how the sector functions, including its ownership and competitiveness. This condition determines the affordability and availability of ICT and plays a critical role in the adoption and diffusion process. The ability of national political conditions to reform the telecommunication policy depends on how the political system is organized. Li *et al*. (2005) argue that the political structure – and especially the decision-making apparatus and the ideology of the legislature plays a critical role in opening up the market. Furthermore, reform in the sector is less likely in countries where the incumbent operators have already made a large investment. In addition, Galal and Nauriyal (1995) and Levy and Spiller (1996) argue that the political structure and the configuration of interest groups determine the likelihood of telecommunication reform. There is a high level of investment in Ethiopian telecommunication. China's Zhanxing Telecom Corporation (ZTE) invested $1.3 billion dollars. Whether this will be a hindrance for the liberalization of Ethiopian telecommunications will become clear in the future (Davison 2012).

The political context of a country determines how the telecommunication sector is organized and functions.

Gasmi *et al*. (2009) point out that the quality of the political institutions, that is the political accountability, is a key factor in creating a strong regulatory body for the telecommunication sector. Countries that have accountability in their political system create a strong and effective regulatory body. By contrast, Maiorano and Stern (2007) argue that the choice of a regulatory framework based on a country's institutions leads to no convincing conclusion. However, Henisz and Zelner (2001) argue that a country's political institutions play a critical role in how telecommunication services operate.

The adoption of ICT can have unanticipated effects. According to Soper and Demirkan (2012): ICT adoption can have unanticipated effects that reach far beyond the scope of individuals, groups, or organizations. Mobile phones, for example, were not designed to foster democracy in emerging societies, and yet they do. The Internet was not designed to constrain corruption in

emerging societies, and yet it does. What we find most fascinating is that the effects do not seem to result from any international or concerted action on the part of the users of these technologies. Rather, they seem in general to be emergent properties that arise naturally when citizens in emerging societies adopt ICTs and integrate them into their lives. (Soper and Demirkan 2012, 22) The Ethiopian government is wary of what ICTs can do, or how they can be used in society in the light of the Arab spring. The repeated response given by various Ethiopian ministers is that "we are not ready to liberalise the telecommunication sector." Although there are elections every five years, in the current parliament there is only one opposition member. The policies are formed according to the governing party's own interests. Therefore, the interests of the incumbent government that is running the country guide the policy. Other researchers (Galal and Nauriyal 1995; Levy and Spiller 1996) also found that the telecommunications sector policy is significantly affected by the political structure and influence of interest groups.

"Technopolitics" is about how different competing individuals or groups try to impose and act on their political goals using artifacts (Winner 1980). In his research on the adoption of two large Ethiopian ICT projects, Gagliardone (2014) conducted 92 interviews with politicians and technocrats and with other stakeholders. He argues that these projects are an extension and a means of cementing the political ideology of the government.

2.1.6.1.2. Socio-economic Factors

The economic policies practiced by governments and their results, such as the general economic condition, inflation management, corruption and the exchange rate, affect how organizations and individuals adopt ICT. These economic factors affect the diffusion of innovations differently: some innovations diffuse easily while others fail completely. In addition, the economic effects also vary for different social groups. A nation's economic policies affect diffusion of innovation. For example, tax policies affecting innovations that have to be imported can discourage organizations and individuals from adopting them. General economic conditions determine the trend in pricing and affordability of the innovation, which affects an organization's ability to adopt it (Gurbaxani and Mendelson 1990). Krieg (1995) argues that widespread low-level economic conditions result in a deficiency of material wealth, which in turn inhibits the adoption of technology in poor communities.

The telecommunication sector is growing continuously; according to ITU (2013b), the revenue from services in this sector contributes 4% of GDP in Sub-Saharan countries. In many cases, there is a positive relationship between GDP per capita and adoption of an innovation by organizations and individuals. The higher the GDP per capita of a nation, the more likely that innovation adoption increases by organizations and individuals (Billon *et al*. 2009). Its influence is further enhanced by the development of the Internet. This provides access to information and has the ability to organize individuals and social groups to empower them to influence political and social issues.

ICT can improve people's lives. However, the government has imposed a 40% tax on all ICT equipment imported into the country. This makes ICT unaffordable. Price has a significant role in the adoption of ICT, with high price acting as a resistance factor. Mokaya (2012) confirms that perception of high price by owner/managers restricts adoption. Furthermore, the general economic conditions, low GNI per capita, high level of inflation (44% in 2008, 24% in 2012) and the devaluation of the currency by 50% makes ICT very expensive in Ethiopia. Back in 2009, the cost of 128 Kb/s broadband was 5,000 Birr (250 pounds sterling) per month. At the same time, according to the World Bank, the average yearly income of an individual was US$1,050. The figures indicate that broadband is very expensive for small and micro enterprises, and this acts as an adoption resistance factor. This finding concurs with another study indicating that the price of ICT products and services play a significant role in the adoption or rejection of ICT (Davis and Kanago 1998).

Adoption of ICT, in many cases, is switching old technology for new. Switching requires skills and knowledge to use the new technology effectively. Switching costs should be affordable for the adopter if switching is to occur. However, in the case of in Addis Ababa, the cost is very expensive. Hence, ICT is failing to be adopted by the small and micro enterprises. Other studies indicate similar results; for example, Shapiro and Varian (1999) showed that if switching costs are too expensive, then adoption will not take place.

Financial constraints are a key barrier to Information sharing in supply chain. Cost considerations are the prime challenges to support the infrastructure and manpower requirements of information system. Information and technological systems require more funds because

without this efficient information sharing cannot take place in supply chain. Large amount of financial resources are needed for redesigning internal organizational and technical processes, changing traditional and fundamental product distribution channels, customer service procedures and training of staff to achieve efficient information sharing in supply chain (Motwani *et al*., 2000). Cragg *et al*. (2002) has reported that lack of resources inhibits organizations to adopt information sharing using information technology**.** It is because of difficulties in raising finance to invest in information sharing systems (Damaskopoulos and Evgeniou, 2003).

2.1.6.1.3. Legal Factors

Laws and regulations often impede ICT, especially in the developing world. The legal and regulatory framework governing ICT in these countries is often not proactive. It essentially hinders individuals in using ICTs and deters potential ICT service providers. Regulators in developing countries are generally weak, dependent and often part of a system in which the legacy operator captures the regulatory and political process (Proenza 2006).

The lack of legislation dealing with emerging technologies has been noted in both developed and developing countries and is more pronounced in the latter (Ng'ang'a 2009). According to Ng'ang'a, Kenya had no legislation to deal with threats arising from identity theft, computer crime, money laundering and fraud. On the other hand, government intervention through regulations can be a positive force for research into the development of new products, for example in the case of dangerous substances. Taylor *et al*. (2003) instance the research and development of environmental control technology for hazardous substances such as sulphur dioxide (SO2) and the results of the diffusion of innovations of such technology. The law forces organizations to adopt the new technology.

Edie *et al* (2007) also stated that Information and Communications Technology (ICT) is improving communication in the construction sector. On the negative side, it also showed that

Only 26% of respondents agreed that e-procurement was acceptable as admissible written proof during construction. Only 17% thought that it was acceptable as a written notice. This questions the legal validity of electronic information exchange and must be considered as a barrier to the implementation of an e-procurement system.

2.1.6.1.4. Telecommunication Factors

Between 1985 and 1999 many developed countries reformed their telecommunication policies, resulting in the improvement of their telecommunication networks. As a result, both tele density and labour productivity more than tripled (Fink et al. 2003). The rapid growth of technological innovations in the past three decades transformed how individuals and organizations communicate, work and interact. Traditional telecommunication services have been transformed beyond recognition, changing the generation, transformation and communication of information, and creating instant communication between individuals and organizations. One of the barriers to the adoption of technology in the Least Developed Countries (LDC) is the unreliable telecommunication infrastructure. Karanasios and Burgess (2008) show how SME owners use innovative methods to overcome the inadequate and unreliable infrastructure by using a satellite link to connect to their customers.

The adoption of ICTs can have unanticipated effects for individuals, groups and organizations. As Soper and Demirkan (2012) argue, the effects of the mobile phone on fostering democracy and empowerment in the emerging countries were not anticipated – and yet it does just that. The Internet provides transparency, thus curbing corruption. For example, in Kenya and elsewhere in Africa, the use of the mobile phone for finance was not part of the design for mobile phones, and yet it fulfils this purpose (Ngugi et al. 2010). Furthermore, the unanticipated effects of ICT adoption encompass many areas, including the social, economic and political sphere of a company.

The advancement of information technology has increased the ease of information sharing and has provided better methods to share and integrate information. Technological linkages across organizational units as well as up and down the supply chain are particularly critical to sharing information. Study has shown that complexity of a technology is a major factor that affects the adoption of information sharing (Newcomer and Caudle, 1991). Different organizations may use various types of hardware, software, data standards and definitions, as well as programming languages and the task of integrating them could be very challenging. Hoffman and Mehra (2000) stated that the technological factors can cause the failure of any information system in supply chain so that technological barriers need to be tackled at the earliest. Premkumar and

Ramamurthy (1995) concluded that if the technology is simple to use, it is easier to adopt and other characteristics such as functionality, reliability and accessibility influence the users to use the technology for information sharing.

Although the technology is much cheaper than before, it still represents a considerable investment for SMEs, that traditionally lack such funds Levy M., Powell P., Yetton, P. (2002)

2.1.6.2 The internal factors affect the adoption if ICT

Issues affecting the adoption of ICT in developing countries are enormous. They range from skills deficiency, economic constraints, lack of infrastructure, lack of funds, confidentiality and security concerns, low level of internet penetration and bandwidth, to inappropriate ICT policies amongst others (e.g., Kapurubandara and Lawson, 2006; Lawrence and Tar, 2010; Omary et al., 2010). Weiner and Rumiany (2007) note that the implementation of ICT in the developing world is often inhibited because the infrastructure, human capital development and financial resources that are necessary to implement ICT effectively, are either absent or of a poor quality. They argue that ICT policies adopted in developing countries have the ability to increase (rather than decrease) the digital divide within countries, and in so doing make it even more difficult for businesses in rural areas to compete. Weiner and Rumiany (2007) further justify this point by arguing that when new technology is introduced in developing countries, it is usually made available in urban areas that have the required infrastructure and market, thereby making those areas become more competitive. With the rapid advances in technology, there is a growing fear that rural areas, which are already hampered by large distances from markets and plagued with poorer quality infrastructure, will be further disadvantaged by their lack of ICT (Kew and Herrington, 2009).

According to Kari (2007) the developing world still lacks the most basic forms of information and communication infrastructure unlike developed countries, where ICT has been used to change the manner in which businesses are conducted, in order to attain some forms of strategic advantage. Prasad (2009) also asserts that lack of scholarly focus tends to hinder the development and use of ICT in developing countries since businesses lack the vital information that could provide directions for the successful use of it.

Monczka and Morgan (1997) termed poor IT infrastructure as a barrier in the supply chain integration. However, poor IT infrastructure may be attributed to lack of funds and lack of awareness and commitment of top management about the use of IT tools in a supply chain (Bender, 2000; Kilpatrick and Factor, 2000). The deployment of IT tools in a supply chain is also not free from barriers. Some of these barriers are due to lack of trust in information technology tools, fear of information system breakdown etc. (Kwan, 1999; Ayers, 2000; Zhao and Xie, 2002; Li, 2000; Agarwal and Shankar, 2003). Dawes (1996) found that differences in level of the technological capabilities of chain members may be an important barrier in participation in inter-organizational information systems. Lack of ability of professionals to maintain adequate levels of knowledge and expertise due to fast pace of rapidly and radically changing technology used in information sharing system is one of the major barrier of information sharing (Dawes, 1997; Holden *et al*., 2003).

2.1.6.2.1. Lack of skills and knowledge.

With regards to the skills issue, MacGregor et al. (1996) advocate that SMEs tend to avoid the use of ICT in their businesses, if it is seen as complex. Alam and Noor (2009) also identify the lack of suitable technical and managerial staff with sufficient ICT expertise as a major barrier for SMEs in terms of adopting ICT and conclude that SMEs usually lack skills amongst their workforce. Similarly, Apulu *et al*. (2011) in their research involving 25 SMEs, identified that skills deficiencies are a contributing factor affecting a number of SMEs that have successfully adopted ICT from further adopting more sophisticated ICT solutions. Therefore, the skills of employees in SMEs are crucial to the successful adoption of ICT. Lack of skills can affect the effective utilisation of ICT even amongst SMEs that have successfully adopted ICT. In addition, Reynolds *et al*. (1994) states that SMEs owner-managers are unlikely to adopt technologies if they lack the requisite skills.

Lack of knowledge was considered to be another issue. Although most of the non-adopters had a positive view concerning the use of ICT, they indicated that their lack of knowledge on how to use computers remains the major issue for non-adoption. A number of respondents expressed their desires to learn how to use computers and the internet, if given the opportunity to do so. According to Costello et al. (2007), lack of knowledge on how to use technology and low

computer literacy are factors that can affect the adoption of ICT. Similarly, Lee and Kim (2004) advocate that lack of technological knowledge amongst employees and their management capability can be a barrier to the adoption and extension of information systems. The authors highlighted in their research, that some SME managers are concerned about the introduction of ICT because of the fear that their employees might be not familiar with it.

2.1.6.2.2. Focus of top management

The number of studies stated that the individual characteristic crucial role in implementation of new technology (Bayo-Moriones & Lera-López, 2007; Gangwar, Date, & Ramaswamy, 2015). Some study found the positive impact knowledge CEO and experience that influence of ICT in SMEs (Ghobakhloo *et al.*, 2011a). Additionally, the attitude of CEO (top manager) or owners influenced the use of ICT (Golding, Donaldson, Tennant & Black, 2008; Maryeni, Go-vindaraju, Prihartono, & Sudirman, 2014).

Managerial characteristic in this study explain about people to make decision in SMEs just like an owner, Chief Executive Officer (CEO) or top manager (Golding *et al.*, 2008; Ghobakhloo *et al.*, 2011a). The previous study explained link between the attitude of the CEO toward IT and successful application of IT (Huy *et al.*, 2012). Manager has knowledge of IT to adopt of e-commerce (Thong & Yap, 1995).

The non-adoption of ICT has also been attributed to lack of awareness. A number of SME owner-managers in Nigeria are not familiar with the conceptual basis and potential benefits of adopting ICT (Apulu and Latham, 2009). Chibelushi and Costello (2009) also state that lack of awareness could hinder SMEs from understanding the potential benefits that are associated with new technologies, which could enhance their efficiency and increase productivity. Awareness has a positive influence on organisation inclination to consider new ICT (Tarafdar and Vaidya, 2006). Moreover, owner-managers' personal characteristics are very important in technology adoption (Costello et al., 2007). This implies that an owner's enthusiasm for technology is a major motivator in the adoption of ICT. According to Levy et al. (2002), the major factor in increasing investment in IS/IT is the owner's enthusiasm. Also, Apulu and Latham (2009) suggest the need for owner-managers to conduct training sessions for staff as this will assist in creating awareness on the benefits associated with adopting ICT in organisations.

2.1.6.2.3. Fear of Technology

Technology is seen as a necessary measure for adoption when to adopt and use ICT. The decision to adopt the technology does not only depend on what is available in the market but how the technology according to the technology of the company (Rogers, 1995). Technologies are defined and presented in a variety of dimensions consisting of perceived relative advantage, compatibility, complexity, trainability, observability, cost investment and security (Ghobakhloo, Hong, Sabouri & Zulkifli, 2011; Alam & Noor, 2009).

Attitude toward using technology is referred as "An individual's positive or negative feelings about performing and using technology" (Davis et al. 1989; Fishbein and Ajzen 1975).

Resistance to change, lack of a widely accepted solution and lack of leadership, which are cultural issues, are highlighted as barriers by Edie et al (2007) in the USA. These produce a slowdown in adoption of e-procurement and result in a failure to reach many of the perceived benefits. Therefore, a cultural change needs to take place prior to adoption of an eprocurement system. However, with the pressures on companies, other competing initiatives have taken priority in many occasions.

Technology changes can also impact the nature and culture of an organization. Changes have the possibility of impacting an employee's job responsibilities, which can create feelings of uncertainty. The uncertainty of what new technology means for employees' can trigger more resistance to their acceptance of it. Resistance can also come in the form of attachment to old processes and legacy tools that employees are comfortable with. Employees can become accustomed to a situation that are not the most beneficial and will strongly resist any suggestions to change it (Caruth, Middlebrook and Rachel, 1985). Technology change is more than just brining in a new tool or piece of software, it is also changing the behavior of employees' that can be content with a given way of doing things and resistant to changing what they are used to. Human discomfort with change is really based on the fear of loss. The fear of the unknown sometimes is worse than the actual change itself and employees can let these fears cloud their judgment about the benefits that a change may bring for them and an organization.

Causes of these fears can come from feelings of uncertainty, lack of tolerance, differences in opinion and threatened self-importance. According to Carr “resistance to change is mainly an effort to maintain the status quo and resistance is a behavior put up to protect an individual from the perceived effects of a real or imagined threat” (Agboola, 2011).

2.2. Empirical Literature Review

2.2.1. The role of ICT to supply chain integration.

Certain previous researchers have devoted deal of attention to the relationship of information communication technology and supply chain integration from different perspective/dimensions of overall supply chain. Some of these researches' findings are discussed as follow. The first dimension SCM is based on the integration of all activities that add value to customers starting from product design to delivery. According to Simchi- Levi *et al*. (2000), the second SCM dimension is a set of approaches utilized to effectively integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide cost while satisfying service level requirements.

There are a very few literature survey articles that deals with IT in SCM. However, it is impossible to achieve an effective supply chain without IT. Since suppliers are located all over the world, it is essential to integrate the activities both inside and outside of an organization. This requires an integrated information system (IS) for sharing information on various value-adding activities along the supply chain. IT is like a nerve system for SCM. There are many articles on IT in supply chain. Most of the literature discusses only the implications of one or two aspects of supply chain, for example, strategies, tools and techniques, but not in an entirety. However, a comprehensive survey of IT in SCM will be useful to identify the critical success factors of IT for an integrated supply chain (tag, 2001).

Many researchers explained the close links between information systems and the management of logistics (Christopher, 1997; Cooper, 1994; Feraud, 1998). Chiu (1995) presented an integrated framework for distribution firms to establish and so improve their distribution systems. Also highlighted the role of IT in improving the efficiency of logistics value chain. E-logistics has been gaining ground after companies selected to go for third party logistics. The experiences reported indicate the IT is an indispensable tool for logistic operations.

Research has shown information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. Moreover, information technology is touted as having a profound effect on collaborative relationships by facilitating cross-functional interactions between the supply chain partners (Grover and Malhotra, 1997). It eliminates the barriers between functional areas and among firms for a smooth information flow. It also facilitates the integration of suppliers into new product development and joint planning (McIvor *et al*., 2000).

According to the study of Koçoglu ipek , Salih Zeki imamoglu, Hüseyin ince, Halit Keskin (2011),sharing of information across the chain is a key and critical component in achieving an integrated supply chain because it is believed that SCI increases collaboration, minimizes uncertainty, increases the speed of material flow, accelerate order fulfillment, reduction of inventory costs, increases the satisfaction of customer through reliable and fast delivery of products, improve performance and increase operational effectiveness. While the technological aspect of information integration is significant, it is the frequency, the quantity and the quality of information that is shared that really matters.

The reduction of organizational slack, of which inventory is a typical example, requires a close coordination as well as intensive information exchange between the supply chain partners (Caputo, 1996). Information technology is vital in supporting strategic and operational logistics decisions. It enhances supply chain logistics efficiency by providing real-time information regarding product availability, inventory level, shipment status, and production requirements (Radstaak and Ketelaar, 1998). In particular, it has a vast potential to facilitate collaborative planning among supply chain partners by sharing information on demand forecasts and production schedules that dictate supply chain activities (Karoway, 1997). Furthermore, information technology can effectively link downstream customer demand information to upstream supply chain functions (e.g., purchasing and manufacturing) and subsequently facilitate “pull” (demand-driven) supply chain operations (Min and Galle, 1999). In addition, all non-value adding activities can be eliminated by avoiding congestion in different supply chain partner firms.

2.2.2. The role of ICT in supply chain performance.

The emergence of new network technologies and expansion of the Internet can improve an organizations internal and external communication capabilities. Lower information processing costs make co-ordination and mutual adjustment processes more efficient, and therefore improve organizational performance (Andersen, 2001). It also supports decentralized and less hierarchical organizational structure. Electronic communication is less formal, reduces organizational barriers. Electronic communication enhances innovation particularly in large dispersed groups (Gallupe *et al*., 1992). However, there is a need to standardize the information flow and access control to information along the supply chain. Teo and Ang (1999) found that management commitment to the strategic, use of IT/IS management knowledge about business, and top management confidence in the IS department are the top three critical success factors.

The developed countries have use ICT in an efficient way with all the knowledge and idea about ICT to improve their SCM operations since nowadays, ICT plays as a prerequisite which means that ICT has become a central construct around which entire SC is built (Nedelko, Z., 2008). On the other words, ICT is assigned as a requirement for SC network. Therefore, these give a boost to their organizations into more optimized and maximize profits and benefits for their organization's performance in terms of their SCM.

2.2.3. The role of ICT in supply chain integration and performance.

The use of IT in supply chain has received considerable attention with various technologies have been introduced for Business-To-Business (B2B) communication, including web internet, B2B private (Ethernet), and EPOS (Electronic Point of Sale). Studies have shown that effective IT connection improves the integration between supply chain partners in terms of material flows (Soliman and Youssef, 2001). In this regard, IT supports key processes in supply chain, including sourcing, procurement, order fulfilment (Kehoe and Boughton, 2001; Swaminathan and Tayur, 2003). This improved logistics integration between supply chain partners yields a number of operational benefits, including reduction in costs (Nooteboom, 1992), lead time (Liu,

Zhang, and Hu, 2005), and risks (Clemons, Reddi, and Row, 1993) as well as improvement in sales, distribution, and customer services, and service levels (Seidmann and Sundararajan, 1997). There are also a number of studies have demonstrated various benefits of having information sharing with supply chain partners, including inventory reductions (Lee, So, and Tang, 2000; Yu, Yan, and Cheng, 2001), lower costs (Cachon and Fisher, 2000), and shorter lead times of order processing (Dejonckheere, Disney, Lambrecht, and Towill, 2004).

Most surveys report a positive relationship between supply chain integration and performance (Van der Vaart and van Donk, 2008). DeToni and Nassimbeni (1999) found that better performing plants exhibit a higher level of logistic interactions, Frohlich and Westbrook (2001) that the widest arcs of integration had the strongest association with performance improvement, Sheu et al. (2006) that higher levels of collaboration result in operational efficiency in the supply chain system, and finally Li et al. (2009) that supply chain integration is significantly related to supply chain performance.

Research has shown information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. Effective coordination of supply chain activities, by means of excellent information technology processes, has recently been identified as essential to organizational performance (Lewis & Talalayevsky, 1997). One of the primary goals of these systems is to replace inventory with perfect information. For example, Xerox provides master production schedules (MPS) online to suppliers to facilitate just-in-time delivery, leading to reduced inventory costs and improved buyer-supplier relationships (Powell and Dent-Micallef, 1997).

Integration of IT has been classified based on whether the process is done internally or externally. Internal Integration defined as the process of connecting different function in a firm such as manufacturing, purchasing and materials management (Ward & Zhou, 2006). For example, ERP systems are a form of internal integration of processes (Davenport, 1998). Furthermore, these information systems aid in generating information and facilitating information sharing within the firm which can enhance a firm's production capabilities (e.g.,

Schlie & Goldhar, 1995; Small, 1999). External integration refers to information systems that connect a firm with its suppliers and customers (Ward & Zhou, 2006). IT integration with suppliers and customer has been found to impact firm performance positively Frohlich (2002) and Subramani (2004). There are other studies too, which suggest that IT integration contributes to reduction of Lead times. Lead-time in a supply chain classified as material movement Lead-time and information movement Lead-time (Jones & Towill, 1999). The supply chain thus developed is called Information enriched supply chain. In an information-enriched supply chain, firms are more closely connected both internally and externally because of information sharing resulting in reduced information lead-time and reduced total lead-time in a supply chain. Another impact of External IT integration has been found to be the decision-making process time. Data integration serves to make the data available in a standard format, which is understandable to all the stakeholders (Galbraith, 1973). At the same time insufficient data integration leads to delays, decreases in communication and greater distortion of meaning (Huber, 1982). Between-firm integration aids supply chain partners in reaching joint decisions by facilitating information exchange, recollection, and standardization (Dennis, 1996). Analytical studies provide evidence that between-firm IT integration reduces lead time. Cachon and Fisher (2000) find that sharing demand and inventory data can shorten the order processing lead-time.

Westbrook and Frohlich (2001); and Vickery, *et al.* (2003) found a positive and direct relationship between information technology and supply chain integration. Chen and Paulraj, (2004) said that: internal integration of different departments within a firm should act as integrated process. Kulp, *et al.* (2004) and Gimenez and Ventura, (2005) showed the importance of downstream integration. Bagchi, *et al.* (2005) stated that supply chain integration affects operational performance, and the degree of integration influences cost and efficiency. Swink, *et al*. (2007) and Flynn, *et al.* (2010) pointed out that external integration emphasizes the importance of cooperation and collaboration with suppliers and customers. Adaileh, J.M. and Abu-alganam, M.K. 2010 studied the role of ERP on supply chain integration (internal and external). The results showed that both internal and external integration are positively related with ERP.

Researchers have found that a key enabler for effective supply chain management is information sharing among linked partners, which has been greatly facilitated by recent advances in information technology (e.g., Lee and Whang, 2000; Jharkharia and Shankar, 2005). The reported benefits of information sharing include improved ordering function, increases in sales, and lower inventory and/or shortage costs through better inventory allocation, because information sharing mitigates the information distortions along the vertical supply chain linkages. In addition, poor information technology infrastructure, whether caused by lack of funds or lack of awareness and commitment of top management, has also been identified as a major barrier to successful supply chain integration (Bender, 2000).

In the research focusing on specific technologies or application areas, there exists a distinct body of research on the adoption factors and impact of Electronic Data Interchange (EDI) (see e.g. Iacovou et al., 1995; Mukhopadhyay *et al*., 1995; Tuunainen, 1998). Here, for example cost reduction objectives (Mukhopadhyay *et al*., 1995) and volume of transactions between supply chain partners (Tuunainen, 1998) have been associated with the adoption of EDI links. Further, for example, the use of Extended Markup Language (XML) for supply chain integration has been studied (Nurmilaakso et al., 2002). As for research focusing on specific application areas, for example, the tracking systems and their importance for the efficient coordination of logistics flows have been widely studied (Harris, 1999; Stefansson and Tilanus, 2001; Ala-Risku et al., 2003; Kärkkäinen *et al.*, 2003). According to this body of literature, tracking is needed especially in situations with in-transit consolidation, and in project-oriented businesses.

In general, the results support the notion that information technology serves to coordinate activities in the supply chains. They further illustrate that the increased level of IT usage facilitates closer working relationships with partners, better integration of supply chain and improve the performances for supply chain.

2.2.4. The major Factors influencing the adoption of ICT.

The major factors that affect the adoption ICT arise from the national level (external) factors: the political, socio-economic, technological and legal factors and the internal factors are the worker

and the managerial. The internal adoption factor is mainly influenced by the characteristics of the manager and the technical knowledge or influencing the workers.
External level factors are outside the control of individuals and organizations at the national level, such as, the Political, Economic, Social, Technological, and Legal factors.

Kapurubandara and Lawson (2006) have categorized internal and external barriers that impede adoption of ICT by SMEs in a developing country. The internal barriers include owner/manager characteristics, firm characteristics, cost and return on investment, and external barriers include, infrastructure, social, cultural, political, legal and regulatory. Lal (2007) investigated the adoption of ICT in SMEs in Nigeria and found that one of the major factors inhibiting ICT diffusion and intensive utilization is poor physical infrastructure. In developing countries some of the ICT challenges include legal and regulatory issues, weak ICT strategies, lack of research and development, excessive reliance on foreign technology and ongoing weaknesses in ICT implementation. Adebayo, Balogun and Kareem, (2013);Adenikinju, (2005);Sajuyigbe and Alabi (2012); Lal(2007); Apulu and Emmanuel, (2011) and Apulu and Latham (2011) amongst others, identified more factors that affect the adoption of ICT by SMEs in Nigeria. These factors include lack of infrastructural facilities, lack of funds, cost of implementation, lack of awareness, lack of appropriate government policies, lack of skills and training, cultural factors, electricity constraints, corruption, low levels of education, illiteracy, lack of proper information, and so on. Adenikinju (2005) advocates that problems relating to the SMEs sector in Nigeria and its development have been handled inappropriately by the government and highlight problems such as infrastructural and cultural factors, as acting against the effective development and exploitation of ICT in Nigeria. Lal (2007) also pointed out that the major factors that affect the adoption of ICT are infrastructure, cost of purchasing computer equipment, government support and management support respectively. Sajuyigbe and Alabi (2012) asserted that lack of finance, lack of electricity, lack of computer skill personnel and lack of government support are the major factors that hinder adoption of ICT by SMEs. Apulu and Emmanuel, (2011) also found that characteristics of the firm and industry sector are contributory factors to the adoption and exploitation of ICTs in SMEs.

With regards to the skills issue, MacGregor et al. (1996) advocate that SMEs tend to avoid the use of ICT in their businesses, if it is seen as complex. Alam and Noor (2009) also identify the lack of suitable technical and managerial staff with sufficient ICT expertise as a major barrier for SMEs in terms of adopting ICT and conclude that SMEs usually lack skills amongst their workforce. Similarly, Apulu *et al*. (2011) in their research involving 25 SMEs, identified that skills deficiencies are a contributing factor affecting a number of SMEs that have successfully adopted ICT from further adopting more sophisticated ICT solutions.

2.3. Conceptual framework of the study

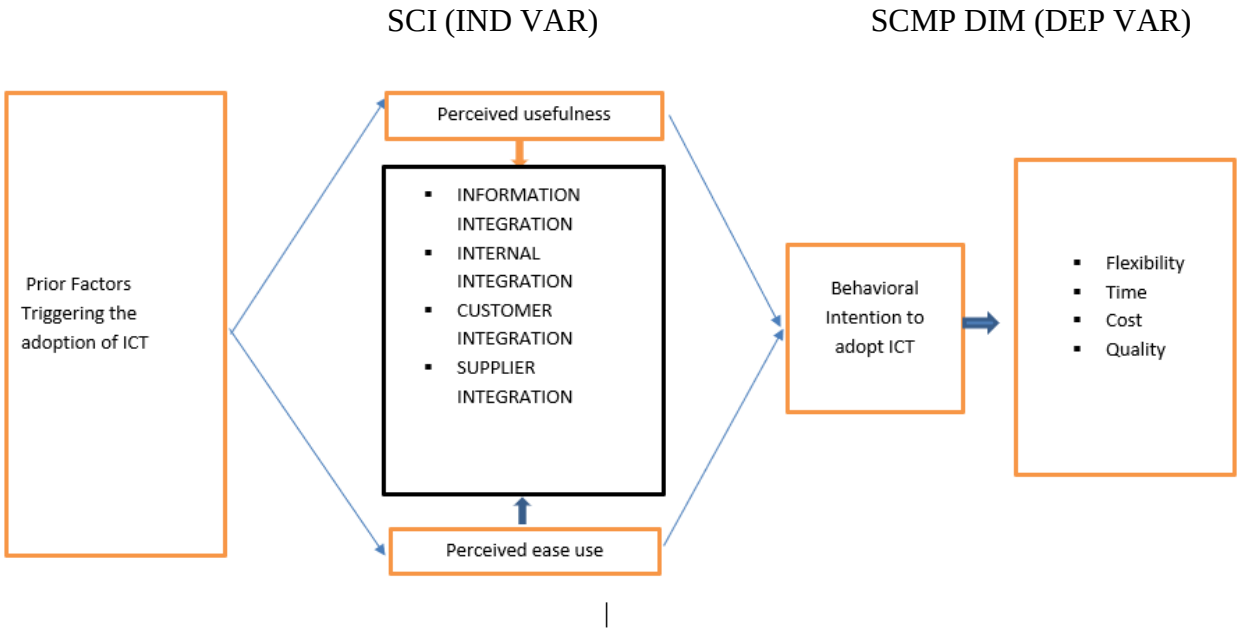


Figure 2.2. Conceptual Framework

Source: adapted from Hussein *et al*, 2014 and adjusted by the researcher.

Table 2.1: Challenges of external and internal factors adoption of ICT.

CHALLENGES	
Internal Factors that Affect adoption of ICT	**External Factors that Affect adoption of ICT**
• Skill problem of the employees	• POLETICAL
• Lack of focus from top management	• ECONOMICAL
• Fear of technology	• LEGAL
	• TECHNOLOGICAL

2.3.1. Perceived Usefulness (PU)

Access to information offers the possibility for improved human competence. Lombardi (2007:2) observed that the acquisition of capacity to access authentic information is prevented by users' reluctance to accept and use available strategies and techniques to access the information. Perceived usefulness, according to Davis (1989: 320), is the extent to which a person believes that utilising a particular method or technique would enhance his or her job performance or routine responsibility. This perception, he explains, is anchored on the consideration that the capacity acquired will strengthen performance

2.3.2. Perceived Ease of Use (PEOU)

Davis (1989: 320) argued that perceived ease of use is the extent to which an individual considers that making use of a specific system would be effortless and hassle free; in other words, ease of use means freedom from complexity and trouble. Thus, an application that is perceived to be easier to use is generally accepted and utilized by more people. Zhu, Linb and Hsu (2012: 968) add that Perceived Ease of Use signifies the degree to which an individual accepts that using certain technology would be effortless and hassle free. The system

characteristics can help the ease of use of technology and system usage can equally lead to the acquisition of Information Literacy skill.

This study tries to show the role of ICT to integrate the supply chain management by measuring the four performance measurement dimensions. There are also internal and external challenges when ICT adopt in this company. Supply chain integration and dimensions are dependent variables whereas information communication technology is independent variables.

CHAPTER THREE: METHODOLOGY OF THE STUDY

In this chapter the methodology used including the research design, the study area, the population understudy, sample size and sampling techniques, sources of data collection, methods of analysis, validity and reliability tests results were be discussed.

3.1. Description of the study area

Ethio-Telecom is one of the biggest governmental infrastructures in Ethiopia. It is an integrated telecommunications solutions provider offering internet, data, Value Added Service (VAS), International and voice services. Ethio-telecom use Enterprise Resource Planning (ERP) & Customer Relationship Management (CRM) to integrate the supply chain of the organization. This study tried to show the role of ICT in supply chain integration and its effect on supply chain performance and it covered in the area of suppliers, sourcing department, logistic department, warehouse department, inventor department y, and customers.

3.2. Research Approach

The main objective of this research is to examine the role of ICT in Supply Chain Integration in ethio-telecom operation. Considering the purpose of the research and the nature of the phenomenon mixed research approach implemented. Which were used both quantitative and qualitative research approach.

3.3. Research design

A research design is the arrangement of condition for collection and analysis of data in the manner that combine relevance to the research purpose with economy in procedure (Saunders *et al,* 2009). There are three types of business research, namely exploratory, descriptive and causal (zikmund *et al*, 2010). This study was adopting the causal and descriptive research design. Causal research also called explanatory research is the investigation of cause and effect relationships in order to determine causality; to observe variation in the variable that is assumed to cause the change in the other variable and then measure the changes in the other variable using

statistical methods. It enables us to understand the very nature of what we are actually looking at it. Whereas the descriptive research design was used to minimize bias in the collection of data and finding out the what, where and how of a phenomenon (Kothari, 2008).

3.4. Population and Sample Design

According to Saunders *et al,* (2009), a population is an entire group of individuals, events or objects with some common observable characteristics. In this research, the target population for this study was consisted majorly of the managements and employs of suppliers, sourcing, logistics, warehouse, inventory and customers in head office of ethio-telecom. These considered relevant because they are familiar with the information needed on the topic under discussion.

The target population of the study was the ethio telecoms sourcing and facility division having the 2613 employees. From all the five departments of the division, only Sourcing, facility & fleet departments, and Logistics & Supply department works are taken as the target population, excluding Personal Assistances and Clerks because their dutys aren't related to the study. Based on the company profile December 2018, the total number of employees in this study was 2613. The population selected based on its reliability for the sources of data required and its convenience for data collection.

The selection of the respondents carried out by using non-probability sampling particularly deliberate or purposive sampling. From the target population the sample are selected by using Carvalho's (1984) sample size determination.

Table 3.1: Carvalho's sample size determination. Source: Carvalho (1984)

Population Size	Small	Medium	Large
51-90	5	13	20
91-150	8	20	32
151-280	13	32	50
281-500	20	50	80
501-1200	32	80	125
1201-3200	50	125	200
3201-10000	80	200	315
10001-35000	125	315	500
32001-150000	200	500	800

By referring the above table for this study, the target population was 2631 employees out of these 125 samples taken from Sourcing and facility division.

3.5. Data Source and Type

Primary and secondary sources of data collection methods used for analysis of the study. The primary data were gathered using survey questionnaire from the selected sample respondents/employees of ethio telecom and secondary data were collected from the company oracle data base, from the different online and off-line literatures mainly on Journals, Books, and Report and Proceedings

3.6. Data collection Procedure

The method of data collection from primary sources were distributed the questionnaires to the employees and managers of the case company. The close-ended Likert type questionnaires are used. This questionnaire type selected because it is easy to administer to groups of people simultaneously; it is less costly and less time consuming than other measuring instruments. Likert scale is a widely used rating scale which requires the respondents to indicate a degree of agreement or disagreement with each of a series of statements or questions i.e. from (1) strongly disagree to (5) strongly agree. The questionnaire was also including some questions about educational background of respondents, employee level of the respondents, experience of the respondents at their current position. On the other hand, secondary data collected from different sources such as journals, working papers, researches, thesis, articles and worldwide web and the case company ethio-telecom.

3.7. Method of data analysis and presentation

The collected data analyzed and interpreted by using both qualitative and quantitative techniques. The data collected by open-ended questions were analyzed qualitatively whereas Closed ended questionnaires were analyzed quantitatively data. This study was used descriptive statistics analysis to analyze quantitative data such as frequency distribution, mean and standard deviation.

Inferential statistics particularly the Pearson's correlation also used to show the relationship and the strength/degree as well as direction of associations between variables. The other inferential statistics used is regression analysis so that to show interdependence of independent variables and dependent variable. Thus, both the strength of the relationship between variables and the influence of independent on dependent variable and statistical significance assessed.

3.8. Ethical Considerations

According to Leedy & Ormarod (2010), there are four ethical issues that need to be addressed in the process of undertaking a research: That are protection from harm, informed consent, right to privacy, and honesty with professional colleagues. Therefore, the participants in this study selected with full

consent and informed to respond for questionnaires with confidence and understanding the purpose of the thesis; and the researcher was assuring that as he will keep the information confidential and the data have used only for intended purpose.

3.9. Validity and Reliability test

Validity refers to the extent to which an instrument measures what it is supposed to measure (Bryman and Bell, 2007). A measure's validity relies on the definitions of the variable, which is used to design the measure. There are different types of validity such as content, face, internal and external validity. Content validity was ensured by formulating the questions in simple language for clarity and ease of understanding. Questionnaires included a variety of questions on the knowledge of the top management officials and their staff about the role of ICT in supply chain integration in ethio telecom. Supply chain professionals, manager and employees also initially evaluated the questionnaire and they responded that the contents included in the questionnaire were good and easy to understand implying that the instrument fulfills content validity. The above people to see how it looks such as its visibility and size also checked the questionnaire and they recommended that it is okay which implies it fulfills face validity. The questionnaire has adequate sample size to make inference about the population as a result it fulfils external validity or the study can generalize about the population based on the sample.

The study gave questionnaires to ten respondents, which are one manager and nine employees, after fill full the above validity measurements .Then the reliability of the questionnaire has been checked during the pretest session with a above sample of respondents and their responses were almost the same. After the necessary modification made, the tools administered to the respondents. Hence, the study believes that the instrument is valid. In addition to that, the reliability or internal consistence of the data measured using the Cronbach's Alpha method. An alpha coefficient of 0.75 or higher indicated that the gathered data are reliable as they have a relatively high internal consistency and can be generalized to reflect opinions of all respondents in the target population (Zinbarg 2005). Based on this technique, the data collected checked for consistency before analysis made. As shown in table 3.2, the overall Cronbach's alpha coefficient for the score is 0.95. Therefore, the data collected in this study shows high reliability

or high internal consistency. The below table shows the SPSS result of the reliability statistics using Cronbach's Alpha.

Table 3-2 Reliability test:

Number	Variables	Numbers of Items	Cronbach's Alpha
1	Supplier Integration	3	.883
2	Information Integration	3	.881
3	internal integration	3	.881
4	customer integration	3	.881
5	company supply chain integration	4	.873
6	cost	5	.874
7	flexibility	5	.878
8	quality	5	.876
9	responsiveness	5	.874
10	supply chain performance	4	.888
11	political system	3	.880
12	economic factors	3	.884
13	LEGAL FACTORS	4	.880
14	technological factors	5	.880
15	external factors	4	.874
16	skill of employees	3	.881
17	focus of top management	4	.883
18	fear of technology of employees	3	.883
19	internal factors	3	.885
		57	0.952

CHAPTER FOUR

4.1. Results, Discussion and Interpretation.

Under this chapter, the analysis and interpretation carried out based on the data collected through questionnaire from five departments (i.e. sourcing, warehouse, inventory, logistics and goods shipment) which work along the line of supply chain. The data analyzed using Statistical Package for Social Science (SPSS v.25). Based on the methodologies, research design and tools of the proposal the data collected from 125 respondents. From the total 125 questionnaire distributed, all returned from which 17 were not correctly filled and rejected. Therefore 108 effectively used for analysis that shows response rate of 86.4 percent. This is a good response rate based on Fowler (2002) a 75 percent response rate considered adequate.

Data analysis, discussion and interpretation of the results presented in the following subheadings: first, the study variables analyzed and described from statistical point of view by using means, standard deviations. Second, the researcher used correlation analysis, specifically Pearson correlation to measure the degree of association between different variables under consideration. Third, Regression Analysis also used to test the effect of independent variables on dependent variable.

4.2. Demographic data presentation and analysis

Observing the demographic trend or characteristics of our sample population before starting the data analysis is useful to make the analysis more meaningful for the reader. This part of the questionnaire requested limited amount of information related to personal and demographic status of respondents. Table (4.1) shows the general characteristics of the respondents in terms of gender, educational qualification, and years of experience.

Gender: The gender distribution of respondents in ethio telecom covers 74(68.5%) of male and 34(31.5%) of female respectively. This implies that male employees dominate the gender distribution of Ethio telecom.

Educational qualification: Most of the respondents hold bachelor's degree with 108 (79.6%) respondents, while 20(18.5%) respondents hold Second Degree and above. The least academic qualification is diploma with 2 respondents (1.9%). This shows most of the respondents have a good academic qualification to understand the concept of the variables and answer the research questionnaires.

Years of experience: Experiences of most respondents is more than 10 years with 64 respondents (59.3%), while 25 respondents (23.1%) have stayed at the organization for between 6 years and 10 years. This indicates that most of the respondents selected have good experience regarding the company and their response can be considered genuine.

Table 4-1 Demographic analysis

Dimension		Frequency	Percentage
Gender of the respondents	Female	34	31.5%
	Male	74	68.5%
Educational Qualification	Certificate	0	0.0%
	Diploma	2	1.9%
	First Degree	86	79.6%
	mastere Digree	20	18.5%
Experience	less than 1 year	1	0.9%
	1-5 years	18	16.7%
	6-10 years	25	23.1%
	more 10 years	64	59.3%

Source: Survey result, 2019

4.3. DESCRIPTIVE ANALYSIS

The mean or average is a measure of central tendency that offers a general picture of the data without unnecessarily covering one with each of the observations in the data set. The mean of respondents in each dimensions of supply chain integration suggest that the average amount that each dimension has positive or negative response of respondents. In this case, the mean of each item together with their respective dimension overall mean/average mean was calculated in order to conclude the role of ICT in the overall supply chain integration of ethio telecom. The mean statistical values of the items were based on the 5 point Likert scale and will be illustrated through the following assumptions: if the mean (M) score is below 2.5 it implies that the respondents‟ disagree with the statement, if the mean score is equal to 2.5 it indicates that the respondents‟ prefer to stay Neutral, and finally if the mean score is above 2.5 it implies that the respondents‟ agree with the statement.

Accordingly, the mean scores have been computed for all the role of ICT on four supply chain integration dimensions that includes supplier integration, information integration, customer integration, internal integration and also the operational performance and factors effect on supply chain integration by equally weighting the mean scores of all the items under each dimension and factors. The average mean results of each supply chain integration dimension together with their respective variables separately presented, analyzed and interpreted as follows.

Objective 1, To identify the major roles of ICT on supply chain integration at the ethio-telecom.

To examine this objective, the researcher used descriptive statistics like Mean and Standard Deviation.

Table 4.2. The role of ICT on supply chain integration (SCI)

Supply Chain Integration	ITEM N=108	SD	D	N	A	SA	M	SD	MM	MSD
supplier integration	ICT adoption improve information exchange with major supplie	1	0	12	56	39	4.22	0.715	4.17	0.782
	ICT adoption improve quick ordering system with major supplie	1	2	17	48	40	4.15	0.818		
	ICT help to stable procurement through network with major sup	3	0	20	44	41	4.14	0.814		
Information Integration	ICT adoption help to high level of free sharing of accurate information across members of supply chain	0	2	13	53	40	4.21	0.724	4.22	0.803
	ICT improves the timely sharing of information across the members of supply chain.	0	4	13	39	52	4.29	0.821		
	ICT help to strong coordination in the flow of information among partners.	0	5	18	41	44	4.15	0.863		
Internal Integration	ICT improves data integration among internal functions.	2	0	10	43	53	4.34	0.799	4.16	0.834
	There is enterprise application integration among internal function	0	6	20	55	27	3.95	0.813		
	ICT adoption helps to have strong and integrated inventory management	1	6	10	45	46	4.19	0.891		
Customer Integration	Adoption of ICT helps to link the company with customer	0	4	25	40	39	4.06	0.863	4.08	0.835
	Adoption of ICT helps to have effective communication between the company's major customers.	0	5	20	48	35	4.05	0.836		
	Adoption of ICT help to establish quick ordering system with major customers.	0	4	17	49	38	4.12	0.806		
									4.16	0.814

Source: Survey result, 2019

Table 4.2 shows that the mean value of dependent variables is between 4.08 and 4.22 with standard deviations between 0.782 and 0.835. The overall mean of the four variables is 4.16 with standard deviation 0.814, which mean there is an agreement among ethio-telecom employees on the role of ICT in supply chain integration positively. Based on the Means of dependent variables, information integration relatively highly implemented with mean value of 4.22. It is due to the fact that the company has been implementing different ICT instruments like phone,

internet, intranet, extranet, fax, and software's like ERP (Enterprise Resource Planning) and CRM (Customer Relationship Management) system as an effort to integrate information functions. Customer integration shows the relatively least implemented integration dimension with mean value of 4.08. This shows that the company customer integration by use of ICT relatively low, but it doesn't mean low performance in integration with customers because its mean value is above 2.5. Supplier integration and internal integration are integrated by ICT and their mean values 4.17 and 4.16 respectively.

According to McIvor *et al*., (2000) information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. Moreover, information technology is touted as having a profound effect on collaborative relationships by facilitating cross-functional interactions between the supply chain partners (Grover and Malhotra, 1997). It eliminates the barriers between functional areas and among firms for a smooth information flow.

It also facilitates the integration of suppliers into new product development and joint planning (McIvor et al., 2000).

Based on the comments from the survey of using ICT for the supply chain department of this company, it plays a great role to integrate the supply chain department. Because the mean value of external, information, and internal integration result show more than 2.5 means the respondents are agreeing the use of ICT in this company. In addition, our survey result shows the same to McIvor *et al*., (2000) for the role of ICT in integration on supply chain partners. Therefore, this company has good implementation experiences of ICT to integrate the company supply chain. In addition, the interview answers the same result with the questioners.

4.1.1. Supplier Integration

The respondents gave statements that denote the role of ICT to integration with major suppliers. They asked to show the extent to which they agreed with such ICT help to integrate suppliers of the company. They responded as given in table 4.2.

The Table (4.2) shows the role of ICT in supplier integration mean value between 4.14 and 4.22 with the standard deviation between 0.715 and 0.818. The overall mean value of ICT in supplier

integration is 4.17 with standard deviation 0.782, which means there is an agreement among employees' high role of ICT in supplier integration in this company.

The highly impact of ICT adoption in supplier integration is improve information exchange with major suppliers with mean of 4.22. The ICT adoption improves quick ordering system with major supplier. has also a relatively higher with mean value of 4.15. Then the average mean value shows 4.17 means adoption of ICT help to integrate the major suppliers of this company.
According to Ward & Zhou, (2006) information systems can connect a firm with its suppliers and customers. and IT integration with suppliers and customer has been found to impact firm performance positively Frohlich (2002) and Subramani (2004).
Based on the comments from the survey of using ICT for suppliers' integration of the company, it plays a great role to integrate the company with its suppliers by using internet, extranet and phone. Because the average mean value result show more than 2.5 means the respondents are agree the use of ICT to integrate the company with its suppliers and the result is the same with Ward & Zhou, (2006). Therefore, this company has used ICT efficiently to integrate with suppliers.

4.1.2. Information Integration

Adoption of ICT help to integrate Information and another core dimension of supply chain integration. The preceding table 4.2 pinpoints the mean value of each item related to the adoption of ICT in information integration with its aggregate average.
The respondents show their agreement on the adoption ICT help to get accurate information across members of supply chain with the mean 4.12 and standard deviation score of 0. 724.Respondents also show their agreement on ICT improves timely sharing information and strong coordination across the members of supply chain with mean value of (M=4.29, SD=0.821) and (M=4.15, SD=0.863) respectively. The overall mean value of information integration items is 4.22 with standard deviation 0.803, which mean there is an agreement among employees on the relatively higher use of ICT in information integration. The effect of adoption of ICT in information integration is reflected in various ways in ethio telecom: the high level of

accurate and timely sharing of information along the supply chain and strong utilization ICT to integrate information among Supply Chain partners.

According to Lisa Harrington (1999) effective utilization of information technology has the potential to develop supply chain partners in order to perform together for better delivery of products to consumers. It also Information integration refers to the sharing of key information along the supply chain network which is enabled by information technology (IT). One of the main purposes of information integration is to achieve real-time transmission and processing of information required for supply chain decision making. Lee et al (2000) show that information sharing can lead to lower cost through reductions in inventories and shortages.

Based on the comments from the survey of using ICT for information' integration of the company, it plays a great role to integrate information for the company. Because the average mean value result show more than 2.5 means the respondents are agree the use of ICT to integrate information for the company. Therefore, this company has used ICT to integrate information, to get accurate information across members of supply chain and to greater coordination in the supply chain.

4.1.3. Internal Integration

The respondents gave statements that denote the adoption of ICT in internal integration among different functions of the company. They asked to show the extent to which they agreed with such adoption of ICT taking place in company. They responded as given in table 4.2. It shows the mean of adoption of ICT in internal integration is between 3.95 and 4.34 with the standard deviation between 0.799 and 0.891. The overall mean of ICT use in internal integration items is 4.16 with standard deviation 0.834, which mean there is an agreement among employees on the relatively higher use of ICT in internal integration variables. The highly mean value among internal functions is the use of ICT for improves the data integration and its mean value is 4.3. Integrative inventory management within the company has also a relatively higher by the adoption of ICT like ERP system with mean value of 4.19. Whereas enterprise application integration among internal function like ERP and CRM systems is relatively low and its mean value is 3.95 but it doesn't mean the integration among the internal functions are poor. This is

may be the integration application between ERP and CRM do not synchronize in sales with other departments.

Internal integration mainly involves data and information system integration using enterprise resources planning (ERP), real-time searching of inventory and operating data, and integration of activities in different functional areas. Internal integration also involves cross-functional cooperation or working together across different functions in process improvement or new product development. Internal integration recognizes that different functions within a firm should not act as functional silos, but instead as part of an integrated process (Zhao, *et al.*2011).

Adaileh, J.M. and Abu-alganam, M.K. 2010 studied the role of ERP on supply chain integration (internal and external). The results showed that both internal and external integration are positively related with ERP. And according to Davenport, (1998) ERP systems are a form of internal integration of processes

Based on the comments from the survey of using ICT for internal integration of the company, it plays a great role to integrate internally for the ethio-telecom company. Because the average mean value result show more than 2.5 means the respondents are agree the use of ICT to integrate the company internally. Therefore, this company has used ICT to integrate internal to improve data integration and to integrate internal functions.

4.1.4. Customer integration

The other critical dimension of supply chain integration is the integration of customer by the use ICT. The table (4.2) above depicts that the mean value of customer integration by using ICT is between 4.05 and 4.12 with the standard deviation between 0.806 and 0.863. The overall mean of the customer integration items is 4.08 with standard deviation 0.835, which mean there is an agreement among employees on the existence linkage of the company with major customer by using of ICT services like phone and email.

According to Ward & Zhou, (2006) information systems can connect a firm with its suppliers and customers. and IT integration with suppliers and customer has been found to impact firm performance positively Frohlich (2002) and Subramani (2004).

Based on the comments from the survey for adoption of ICT to integrate major customers of ethio-telecom, it plays a great role to integrate customers for this company. Because the average mean value result show more than 2.5 means the respondents are agree the use of ICT to integrate the company with major customers. Therefore, this company has used ICT to integrate with major customers and to establish quick order system that helps to impact positively on performance of ethio-telecom.

4.2. Supply Chain Performance Analysis by the impact of ICT.

This section presents information on the impact of ICT on organization supply chain performance measurement at the ethio-telecom. The results presented as follows and the researcher used descriptive statistics like Mean and Standard Deviation.

Objective 2, To determine the role of ICT adoption in SCM performance in ethio telecom.

Table: 4.3. Supply Chain Performance Analysis by the impact of ICT.

Supply chain Performance	**ITEM N=108**	**SD**	**D**	**N**	**A**	**SA**	**M**	**SD**	**MM**	**MSD**
Cost	Adoption of ICT reduces operational cost	1	6	14	40	47	4.17	.922		
	Adoption of ICT helps the company to provides cost effective service to its customer	1	8	14	51	34	4.01	.912		
	ICT helps to lower inventory holding cost of ethio telecom	2	3	24	47	32	3.96	.896		
	Adoption of ICT helps to reduce warehouse cost of ethio telecom	2	5	24	41	36	3.96	.956	3.992	0.9276

	Adoption of ICT helps to reduce transport management cost of ethio telecom	3	6	21	51	27	3.86	.952		
Flexibility	Adoption of ICT helps to accommodate the different test and preference of customers.	1	7	20	59	21	3.85	.841		
	Adoption of ICT helps to have diversity of product usage.	1	7	29	44	27	3.82	.915		
	ICT helps to know the demand and supply products and services	1	2	15	56	34	4.11	.777		
	ICT help to facilitate sourcing process	0	2	13	46	47	4.28	.747		
	ICT helps to control and follow up the logistic activity	0	6	10	47	45	4.21	.832	4.054	0.8224
Quality	Adoption of ICT helps ethio telecom to give quality customer service.	0	5	10	55	38	4.17	.779		
	Adoption of ICT helps ethio telecom to increase the efficiency of its operational activity	0	5	14	45	44	4.19	.833		
	Adoption of ICT helps to increase the effectiveness of operational activity	0	4	14	46	44	4.20	.806		
	Adoption of ICT increases accuracy of the ethio telecom service	0	4	18	50	36	4.09	.803		
	Adoption of ICT maximizes neatness of the ethio telecom service	2	3	16	55	32	4.04	.853	4.138	0.8148
Responsiveness	Adoption of ICT helps to reduce time wastage in ethio telecom operation	0	8	9	47	44	4.18	.874		
	Use of ICT shortens lead time (the time which elapses between the receipt of customer's order and the delivery of goods)	0	5	14	53	36	4.11	.801	3.984	0.873

	ICT helps to quick response by the company to changes in market demand	0	3	21	52	32	4.05	.778		
	Major suppliers provide quick inbound logistics to ethio telecom by using ICT.	4	11	24	40	29	3.73	1.082		
	ICT helps to responds rapidly to changes in product volume demanded by customers	1	5	25	55	22	3.85	.830		
									4.04	0.86

Source: Survey Result 2019

As shown on table 4.3 the average mean value for the impact of ICT on operational performance variables is between 3.984 and 4.138 with standard deviation between 0.81 and 0.92. The overall mean value of the four dimensions is 4.04 with standard deviation 0.86, which indicate that there is an agreement among ethio_telecom employees that there is a high (positive) impact of ICT on supply chain performance. As shown on the table above there is a relatively higher impact of ICT on supply chain performance regarding quality with mean value of 4.138. With a mean value of 3.984, the company has the lowest impact of ICT on supply chain performance regarding to responsiveness variable.

Research has shown information technology to be an effective means of promoting collaboration between collections of firms, such as groups of suppliers and customers organized into networks. Effective coordination of supply chain activities, by means of excellent information technology processes, has recently been identified as essential to organizational performance (Lewis & Talalayevsky, 1997).

Recent advances in communication and information technology (IT) have provided firms with an opportunity for significant savings in costs by coordinating the planning of various stages of supply chain management (Peters 1992). The results of these advanced technologies have made today's supply chains more dynamic and flexible. More than ever before, information technology (IT) is permeating the supply chain at every point, transforming the way exchange-related activities are performed (Palmer and Griffith, 1998). Ideally, the goal of these systems is to

replace inventory with perfect information, which equates to zero transaction cost as indicated in neoclassical economics (North, 1990).

The majority of surveys report a positive relationship between supply chain integration and performance (Van der Vaart and van Donk, 2008). Frohlich and Westbrook (2001) that the widest arcs of integration had the strongest association with performance improvement, Sheu *et al*. (2006) that higher levels of collaboration result in operational efficiency in the supply chain system, and finally Li *et al*. (2009) that supply chain integration is significantly related to supply chain performance.

A number of studies have demonstrated various benefits of having information sharing with supply chain partners with the help of ICT, including inventory reductions (Lee, So, and Tang, 2000; Yu, Yan, and Cheng, 2001), lower costs (Cachon and Fisher, 2000), and shorter lead times of order processing (Dejonckheere, Disney, Lambrecht, and Towill, 2004).

Based on the comments from the survey of adoption of ICT for the supply chain department of this company, it plays a great role to the performance of the supply chain department. Because the mean value of the aggregate supply chain performance dimensions such as cost, flexibility, quality and responsiveness result show, more than 2.5 means the respondents are agree the use of ICT for ethio-telecom Company. In addition, our survey result shows the same result with Peters *et al*., (1992), Palmer and Griffith *et al*., (1998) on cost and flexible. There is also the same result on role of ICT on shorter lead-time with the study result of Dejonckheere, Disney, Lambrecht, and Towill, (2004). Therefore, this company has good implementation experiences of ICT to improve the performance of supply chain management. And the interview result the same with likerts result for the positive role of ICT on supply chain performance.

4.2.1. Cost

The study identified some measures of cost in which the respondents were required to state their level of agreement. The responses were presented in the above table 4.3. As shown on the above table the mean value of the cost variable is between 3.86 and 4.17 with the standard deviation between 0.896 and 0.922. The overall mean value of cost variable items is 3.992 with standard deviation 0.93, which means there is an agreement among employees of ethio_telecom that the company has reduced cost by the adoption of ICT. The company has the highest reduction

operational cost by adoption of ICT with mean value of 4.17 and the lowest reductions of transportation management cost by adopting ICT with mean value 3.86.

Given that the web is a flexible, interactive, and relatively efficient medium through which various business partners and consumers can communicate, the potential that it offers for improvement of efficiency in the channel functions is enormous (Griffith and Palmer, 1999)
Recent advances in communication and information technology (IT) have provided firms with an opportunity for significant savings in costs by coordinating the planning of various stages of supply chain management (Peters 1992). According to Cachon and Fisher, (2000) ICT help to share information with supply chain partners and lower cost.

Based on the comments from the survey of adoption of ICT for the supply chain department of this company, it plays a great role to reduce the cost of the supply chain department. Because the mean value of the cost result shows, more than 2.5 means the respondents are agree the use of ICT for ethio-telecom Company. In addition, our survey result shows the same result with Peters *et al*., (1992), and Cachon and Fisher, (2000) on cost saving and lower cost. Therefore, this company has good implementation experiences of ICT to reduce or save the cost of supply chain management.

4.2.2. Flexibility

The study identified some measures of flexibility in which the respondents were required to state their level of agreement. The response presented in table 4.3. As shown on the above table the mean value of adoption of ICT on flexibility items is between 3.82 and 4.28 with the standard deviation between 0.75 and 0.84. The overall mean of the flexibility items is 4.05 with standard deviation 0.82, which means there is an agreement among employees on the impact of ICT on supply chain performance regarding to flexibility. With respect to flexibility dimension the company has the highest ICT impact on facilitate sourcing process with mean value of 4.28. On the other hand, the company has the lowest ICT impact on diverse usage of product with mean value of 3.82. But it doesn't mean there is not impact the use of ICT on flexibility of this company.

The results of these advanced technologies have made today's supply chains more dynamic and flexible. More than ever before, information technology (IT) is permeating the supply chain at every point, transforming the way exchange-related activities are performed (Palmer and Griffith, 1998).

Based on the comments from the survey of adoption of ICT for the supply chain department of this company, it has made supply chains more dynamic and flexible. Because the mean value of the flexibility result show more than 2.5 means the respondents are agree the use of ICT on flexibility for ethio-telecom company. In addition, our survey result shows the same result with Palmer and Griffith, (1998), on dynamic and flexible. Therefore, this company has good implementation experiences of ICT on flexibility of supply chain management. In addition, the interviews answers the same result with the questioners.

4.2.3. Quality

The study identified some measures of quality in which the respondents were required to state their level of agreement. The response was presented in table 4.3. As shown on the below table the mean value of quality variable items is between 4.09 and 4.20 with the standard deviation between 0.779 and 0.833. The overall mean value of quality variable is 4.14 with standard deviation 0.81, which means there is an agreement among employees that the company has high performance regarding to quality by adoption ICT.

The company has a high performance on effectiveness of operational activity by adoption of ICT with mean value 4.20., whereas adoption of ICT on maximizes service neatness is lowest with mean value of 4.0. but it doesn't mean that low performance by adoption of ICT on maximize neatness for this company.

The use of Information and Communication Technology (ICT) in the SCM has proven to have a positive impact in companies that have implemented it, particularly in relation to procurement, since this enhances collaboration, improving the quality of information shared between suppliers and buyers (Lee, H. y Whang, C., 1997).

Based on the comments from the survey of adoption of ICT for the supply chain department of this company, it plays a great role to improve the quality of the supply chain department.

Because the mean value of the quality result shows, more than 2.5 means the respondents are agree the use of ICT for ethio-telecom Company. In addition, our survey result shows the same result with Lee, H. y Whang, C., (1997) on improve the quality information shared between suppliers and buyers. Therefore, this company has good implementation experiences of ICT to improve the quality of information shared between suppliers and buyers of supply chain management, this helps to increase the effectiveness of the operational activity.

4.2.4. Time/ responsiveness

The study identified some measures of time or responsiveness in which the respondents were required to state their level of agreement. The responses presented in table 4.3. As shown on the above table the mean value of time/ responsiveness variable items is between 3.73 and 4.18 with the standard deviation between 0.778 and 1.08. The overall mean of the responsiveness items is 3.98 with standard deviation 0.87, which means there is an agreement among employees that the company has a medium performance regarding to time or responsiveness variable by the help of ICT. The company has the highest performance regarding to reduce time wastage on operation by adoption of ICT with the mean value 4.18, whereas its performance on provide quick inbound logistics by using ICT is lowest with mean value 3.73.

According to Dejonckheere, Disney, Lambrecht, and Towill, (2004) ICT help to share information with supply chain partners and shorter lead times of order processing.

Based on the comments from the survey of adoption of ICT for the supply chain department of this company, it plays a great role to shorter lead times of order processing. Because the mean value of the responsiveness result show more than 2.5 means the respondents are agree the use of ICT on shorter lead times for ethio-telecom company. In addition, our survey result shows the same result with Dejonckheere, Disney, Lambrecht, and Towill, (2004), on responsiveness. Therefore, this company has good implementation experiences of ICT on shorter lead times of order processing of supply chain management.

4.3: The major factor influencing the adoption of ICT.

This section presents information on the major factors influencing the adoption of ICT at the ethio-telecom. The results presented as follows and the researcher used descriptive statistics like Mean and Standard Deviation. The major factors influencing the adoption of ICT are external factors such as political, economic, legal and technological factors, whereas the internal factors are skill of the employees, lack of focus from top management and fear of technology.

Objective 4, To identify the factors influencing the adoption of ICT in ethio-telecom.

Table: 4.4. The major factor influencing the adoption of ICT.

Factors that Affect adoption of ICT		**ITEM N=108**	**SD**	**D**	**N**	**A**	**SA**	**M**	**SD**	**MM**	**MSD**
External Factors	**Political**	Adoption of ICT affected by political relationship with other nation	7	14	38	34	15	3.57	1.03		
		Adoption of ICT affected by political affiliated decisions	49	32	37	26					
		Adoption of ICT affected by the political instability of the country	3	7	31	44	23				
	Economical	Adoption of ICT in SCM is too costly to implement	1	6	25	53	23	3.8	0.91		
		Adoption of ICT is affected by lack of budget	2	6	24	42	34				
		Adoption of ICT is affected by unaffordable cost of international experts	1	10	37	40	20				
	Legal	Adoption of ICT is challenged by unavailability of legal framework towards security	2	7	35	49	15	3.61	0.86		
		Adoption of ICT is affected by unfavorable legal system of nations towards technology adoption	2	9	32	51	14				
		ICT adoption is affected by the capability of legal expertise in understanding ICTs role.	2	9	35	49	13				
		ICT adoption is affected by unstable law and regulation of the sector	2	5	35	54	12				
	Technol	Unstable infrastructure poses challenge in use of ICT systems in SCM	2	5	19	51	31	3.81	0.92		
		Continuous system failures are challenges in use of ICT adoption in SCM for ethio telecom	5	6	13	50	34				
		Adoption of ICT is affected by unsuitable,	4	8	21	64	11			3.70	0.93

	ogical	incompatible programs and/or information offered by supplier									
		Adoption of ICT is affected by the complexity to implement in SC system	2	10	27	54	15				
		Poor implementation and deployment of the ICT systems have created problems on SCM	2	5	21	60	20				
								3.70	0.93		
Internal Factors	**Skill of Employees**	Lack of skills by users has posed a challenge in adopting ICT in SCM	2	4	24	48	30				
		Lack of technical and IT knowledge of experts of the ethio telecom affected the adoption of ICT.	3	10	23	43	29				
		The less interest of employees to upgrade their ICT skill affected the adoption of ICT in ethio telecom	5	11	21	48	23	3.8	1.00		
	Focus from Top Management	The top managements failer to facilitate ICT adoption related training to the employees affected the adoption of ICT	3	7	25	46	27				
		Top managements of ethio telecom underestimates the effect of ICT expert's contribution towards the success of the company.	7	11	32	45	13				
		The less attention of the top management towards value of ICT affected the adoption of ICT	5	14	28	39	22				
		The under estimation of managers on the economic benefit of ICT affected the adoption of ICT at ethio telecom	7	11	25	45	20	3.59	1.06	3.56	1.08
	Fear Technological of Employees	Adoption of ICT is affected by the negative attitude of employees towards technology	14	21	14	43	16				
		Adoption of ICT is affected by the complex nature of technology for employees	9	23	23	42	11				
		Adoption of ICT is affected by lack of background experience towards technology	8	17	20	47	16	3.29	1.19		
								3.56	1.08		

Source: Survey result 2019

4.3.1. External factors that affect adoption of ICT

This section presents information on the external factors, such as political, economic, legal and technological factors, on influencing the adoption of ICT at the ethio-telecom. The results were presented as follows and the researcher used descriptive statistics like Mean and Standard Deviation

As shown on table 4.3 the average mean value for the external factors that affect adoption of ICT variables is between 3.57 and 3.81 with standard deviation between 0.86 and 1.03. The overall mean value of the four factors that affects the adoption of ICT is 3.7 with standard deviation 0.93, which indicate that there is an agreement among ethio_telecom employees that there is an adversely impact by external factors on adoption of ICT. As shown on the table above there is a relatively highly affected by technological factors on adoption of ICT with mean value of 3.81. With a mean value of 3.57 the company has the lowest ICT affected by political system variables.

Kapurubandara and Lawson (2006) have mentioned external barriers that impede adoption of ICT by SMEs in a developing country such as infrastructure, social, cultural, political, legal and regulatory. Lal (2007) investigated the adoption of ICT in SMEs in Nigeria and found that one of the major factors inhibit ICT diffusion and intensive utilization is poor physical infrastructure.

Based on the comments from the survey of the external factors affects the adoption of ICT for the supply chain department of this company, it has adversely impacted by external factors such as political, economical, legal and technological. Because the aggregate mean value of the four external factors result show more than 2.5 means the respondents are agree on the negative impact of external factors on the adoption of ICT for ethio-telecom company. In addition our survey result shows the same result with Kapurubandara and Lawson (2006) , on the barriers that impede adoption of ICT. Therefore, this company has affected by external factors to adopt ICT on supply chain management.

4.3.1.1 Political System

The researcher identified some factors affect the adoption of ICT by political system of the country and the respondents were required to state their level of agreement. The responses presented in table 4.3.

As shown on the above table the mean value of Political System variable items is between 3.33 and 3.71 with the standard deviation between 0.967 and 1.08. The overall mean of the Political System variable items is 3.57 with standard deviation 1.03, which means there is an agreement among employees that the company has an adversely impact on ICT adoption by political system. The company has the highest adverse impact by political instability on adoption of ICT with mean value 3.71, whereas the lowest impact on adoption of ICT by political relationship with other nation with mean value 3. 33..

According to Galal and Nauriyal (1995), Levy and Spiller (1996) found that the telecommunications sector policy significantly affected by the political structure and influence of interest groups. In addition, Kapurubandara and Lawson (2006) have mentioned external barriers that impede adoption of ICT by SMEs in a developing country such as political.

Based on the comments from the survey of the political factors affects the adoption of ICT for the supply chain department of this company, it has adversely influenced by political factors. Because the mean value of this factor result show more than 2.5 means the respondents are agree on the negative impact of political factors on the adoption of ICT for ethio-telecom company. In addition, our survey result shows the same result with Kapurubandara and Lawson (2006) and Galal and Nauriyal (1995); Levy and Spiller (1996) on the barriers that impede adoption of ICT. Therefore, this company has affected by political factor to adopt ICT on supply chain management.

4.3.1.2. Economic Factors

The researcher identified some factors affect the adoption of ICT by economic factors and the respondents were required to state their level of agreement. The responses presented in table 4.3.

As shown on the above table the mean value of economic variable items is between 3.63 and 3.93 with the standard deviation between 0.856 and 0.964. The overall mean of the economic variable items is 3.8 with standard deviation 0.914, which means there is an agreement among employees that the company has an adversely impact on ICT adoption by economic factors. The company has the highest adverse impact on adoption of ICT by lack of budget with mean value 3.93, whereas the lowest influence adoption of ICT by unaffordable cost of international experts with mean value 3.63.

General economic conditions determine the trend in pricing and affordability of the innovation, which affects an organization's ability to adopt it (Gurbaxani and Mendelson 1990). Shapiro and Varian (1999) showed that if switching costs are too expensive, then adoption ICT will not take place.

Based on the comments from the survey of the economic factors affects the adoption of ICT for the supply chain department of this company, it has adversely influenced by economic factors. Because the mean value of this factor result show more than 2.5 means the respondents are agree on the negative impact of economic factors on the adoption of ICT for ethio-telecom company. In addition, our survey result shows the same result with Kapurubandara and Lawson (2006) and Galal and Nauriyal (1995); Levy and Spiller (1996) on the barriers that impede adoption of ICT. Therefore, this company has affected by economic factor to adopt ICT on supply chain management.

4.3.1.3. Legal Factors

The researcher identified some factors affect the adoption of ICT by legal factors and the respondents were required to state their level of agreement. The responses presented in table 4.3. As shown on the above table the mean value of legal factors variable items is between 3.57 and 3.64 with the standard deviation between 0.814 and 0.884. The overall mean value for the economic factors variable items is 3.6 with standard deviation 0.86, which means there is an agreement among employees that the company has an adversely impact on ICT adoption by legal factors. The company has the highest adverse impact on adoption of ICT by unstable law

and regulation of the sector with mean value 3.64, whereas the lowest influence adoption of ICT by the capability of legal expertise in understanding role ICTs with mean value 3.57.

Kapurubandara and Lawson (2006) have mentioned external barriers that impede adoption of ICT by SMEs in a developing country such as legal and regulatory factors.

In respect to the study, the implication of this result mean value more than 2.5 meant that the respondents agreed that the legal factor has a negative effect of ICT adoption in ethio telecom. This observation is congruent to Kapurubandara and Lawson (2006) who observed that the legal factor has barriers to impede adoption of ICT by SMEs in a developing country. Therefore, this company has affected by legal factor to adopt ICT on supply chain management.

4.3.1.4. Technology Factors

The researcher identified some factors affect the adoption of ICT by technological factors and the respondents were required to state their level of agreement. The responses are presented in table 4.3. As shown on the above table the mean value of technology factors variable items is between 3.65 and 3.96 with the standard deviation between 0.845 and 1.04. The overall mean value for the technological factors variable items is 3.8 with standard deviation 0.92, which means there is an agreement among employees that the company has an adversely impact on ICT adoption by technological factors. The company has the highest adverse impact on adoption of ICT by Unstable infrastructure of ICT systems in use of SCM with mean value 3.96, whereas the lowest influence adoption of ICT by the complexity to implement in SC system with mean value 3.64.

According to Hoffman and Mehra (2000) stated that the technological factors can cause the failure of any information system in supply chain so that technological barriers need to be tackled at the earliest. also, according to Karanasios and Burgess (2008) one of the barriers to the adoption of technology in the Least Developed Countries (LDC) is the unreliable telecommunication infrastructure. Lal (2007) investigated the adoption of ICT in SMEs in Nigeria and found that one of the major factors inhibits ICT diffusion and intensive utilization is poor physical infrastructure.

In respect to the study, the implication of this result mean value more than 2.5 meant that the respondents agreed that the technological factor has a negative effect of ICT adoption in ethio telecom. This observation is congruent to Hoffman and Mehra (2000) who observed that the technological factor has barriers to impede adoption of ICT by SMEs in a developing country. Therefore, this company has affected by technological factor to adopt ICT on supply chain management.

4.3.2. Internal factors that affect adoption of ICT

This section presents information on the internal factors that influencing on the adoption of ICT at the ethio-telecom, and such factors are skill of the employees, focus of the top management, and employees fear of technology. The results presented as follows and the researcher used descriptive statistics like Mean and Standard Deviation

As shown on table 4.3 the average mean value for the internal factors that affect adoption of ICT variables is between 3.29 and 3.8 with standard deviation between 1.06 and 1.19. The overall mean value of the three factors that affects the adoption of ICT is 3.56 with standard deviation 108, which indicate that there is an agreement among ethio_telecom employees that there is an adversely impact by internal factors on adoption of ICT. As shown on the table above there is a relatively highly affected by the lack of employees Skill on adoption of ICT with mean value of 3.8. With a mean value of 3.29, the company has the lowest ICT affected by employee's fear of technology variables for internal factors.

Dawes (1996) found that differences in level of the technological capabilities of chain members might be an important barrier in participation in inter-organizational information systems. One of the issues affecting the adoption of ICT in developing countries is skills deficiency (Kapurubandara and Lawson, 2006).and the other barrier for the adoption of ICT is the awareness and commitment of top management about the use of IT tools in a supply chain (Bender, 2000; Kilpatrick and Factor, 2000).

In respect to the study, the implication of this result mean value more than 2.5 meant that the respondents agreed that the internal factors have a negative effect on ICT adoption in ethio telecom. This observation is congruent to Dawes (1996) who observed that the level

technological capability different barrier in participation in inter-organizational information systems and skills deficiency affecting the adoption of ICT in developing countries (Kapurubandara and Lawson, 2006).Therefore this company has affected by internal factors to adopt ICT on supply chain management.

4.3.2.1. Skill of the employees

The researcher identified some factors affect the adoption of ICT by the lack of employee's skill and the respondents were required to state their level of agreement. The responses are presented in table 4.3. As shown on the above table the mean value of employee's skill variable items is between 3.68 and 3.93 with the standard deviation between 0.845 and 1.07. The overall mean value for the employee's skill variable items is 3.8 with standard deviation 1.00, which means there is an agreement among employees that the company has an adversely impact on ICT adoption by the employee's skill. The company has the highest adverse impact on adoption of ICT by the lack of user's skill with mean value 3.93, whereas the lowest impact on adoption of ICT by the less interest of employees to upgrade their ICT skill with means value 3.68.

One of the issues affecting the adoption of ICT in developing countries is skills deficiency (Kapurubandara and Lawson, 2006)

In respect to the study, the implication of this result mean value more than 2.5 meant that the respondents agreed that the lack of skill has a negative effect on ICT adoption in ethio telecom. This observation is congruent to (Kapurubandara and Lawson, 2006) who observed that the skills deficiency affects the adoption of ICT in developing countries. Therefore, this company has affected by skill deficity to adopt ICT on supply chain management.

4.3.2.2. Focus from top management

The researcher identified some factors affect the adoption of ICT by the lack of focus from top management and the respondents were required to state their level of agreement. The responses presented in table 4.3.

As shown on the above table the mean value of focus of top management variable items is between 3.43 and 3.81 with the standard deviation between 0.98 and 1.1. The overall mean value for the lack of focus from top management variable items is 3.59 with standard deviation 1.06,

which means there is an agreement among employees that the company has an adversely impact on ICT adoption by the lack of focus from top management. The company has the highest adverse impact on adoption of ICT by the failer to facilitate ICT adoption related training to the employees, whereas the lowest impact on adoption of ICT by underestimates the effect of ICT expert's contribution towards the success of the company with mean value 3.43.

Adaptability and previous experience of both data processing management and the user managers will be crucial for the planning and implementation of new systems (Williams, 1997). However, the top management support and due investment in training and education are essential 276 A. Gunasekaran, E.W.T. Ngai / European Journal of Operational Research 159 (2004) 269–295 for successful application of IT in SCM. Additionally, the attitude of CEO (top manager) or owners influenced the use of ICT (Golding, Donaldson, Tennant & Black, 2008; Maryeni, Go-vindaraju, Prihartono, & Sudirman, 2014).

Based on the comments from the survey of the top management attitude toward adoption of ICT for the supply chain department of this company, it has adversely impacted by management attitude. Because the mean value of this factor result show more than 2.5 means the respondents are agree on the negative impact of management attitude on the adoption of ICT for ethio-telecom company. In addition, our survey result shows the same result with (Golding, Donaldson, Tennant & Black, 2008; Maryeni, Go-vindaraju, Prihartono, & Sudirman, 2014). on the managers' attitude toward influencing the use of ICT for ethio telecom. Therefore, this company has affected by the attitude of top managements to adopt ICT on supply chain management.

4.3.2.3. Fear of technology of employees

The researcher identified some factors affect the adoption of ICT by the employees fear of technology and the respondents were required to state their level of agreement. The responses presented in table 4.3. As shown on the above table the mean value of the employees for fear of technology variable items is between 3.21 and 3.43 with the standard deviation between 1.14 and 1.29. The overall mean value of the employees toward fear of technology variable items is 3.29 with standard deviation 1.19, which means there is an agreement among employees that

the company has an adversely impact on ICT adoption by the employees fears towards technology. The company has the highest adverse impact on adoption of ICT by the lack of background experience towards technology with mean value 3.93, whereas the lowest influence adoption of ICT by the complex nature of technology for employees with mean value 3.21.

Technology changes can also influence the nature and culture of an organization. Changes have the possibility of influencing an employee's job responsibilities, which can create feelings of uncertainty. The uncertainty of what new technology means for employees' can trigger more resistance to their acceptance of it. Resistance can also come in the form of attachment to old processes and legacy tools that employees are comfortable with. Employees can become accustomed to a situation that are not the most beneficial and will strongly resist any suggestions to change it (Caruth, Middlebrook and Rachel, 1985).

Based on the comments from the survey of the fear of technology toward adoption of ICT for the supply chain department of this company, it has adversely influenced by employees fear of technology. Because the mean value of this factor result show more than 2.5 means the respondents are agree on the negative impact of fear of technology on the adoption of ICT for ethio-telecom company. In addition, our survey result shows the same result with (Caruth, Middlebrook and Rachel, 1985) on resistance to their acceptance of new technology for ethio telecom. Therefore, this company has affected by the fear of technology by employees to adopt ICT on supply chain management.

4.4. Inferential statistics

4.4.1. Correlation analysis

Objective 3. to determine the relationship between supply chain integration and supply chain performance by the role of ICT at ethio telecom?

Correlations are the measure of the linear relationship between two variables. A correlation coefficient has a value ranging from -1 to 1. Values that are closer to the absolute value of 1 indicate that there is a strong relationship between the variables being correlated whereas values closer to 0 indicates that there is little or no linear relationship. To answer the above research objective, the researcher used Bivariate Pearson's Correlation (r) Among Independent Variables, Dependent variables, and between Independent and Dependent Variables. Correlation Coefficients indicated the strength and direction of relationship whereas the p-value indicates the significance of relationship.

Table 4.5 Bivariate Pearson's Correlation (r) Among Independent Variables, Dependent variables, and between Independent and Dependent Variables. **N=108**

		Supplier Integration	Information Integration	internal integration	customer integration	company supply chain integration	cost	Flexibility	quality	responsiveness	supply chain performance
Supplier Integration	Pearson Correlation	1	.627**	.650**	.448**	.820**	.523**	.389**	.386**	.501**	.504**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000	.000
Information Integration	Pearson Correlation		1	.691**	.510**	.851**	.689**	.447**	.535**	.579**	.631**
	Sig. (2-tailed)			.000	.000	.000	.000	.000	.000	.000	.000
internal integration	Pearson Correlation			1	.562**	.872**	.691**	.500**	.505**	.592**	.641**
	Sig. (2-tailed)				.000	.000	.000	.000	.000	.000	.000
customer integration	Pearson Correlation				1	.770**	.641**	.569**	.551**	.632**	.668**
	Sig. (2-tailed)					.000	.000	.000	.000	.000	.000
company supply chain integration	Pearson Correlation					1	.769**	.578**	.599**	.697**	.739**
	Sig. (2-tailed)						.000	.000	.000	.000	.000
Cost	Pearson Correlation						1	.719**	.738**	.765**	.903**
	Sig. (2-tailed)							.000	.000	.000	.000
Flexibility	Pearson Correlation							1	.716**	.745**	.882**
	Sig. (2-tailed)								.000	.000	.000
Quality	Pearson Correlation								1	.765**	.895**
	Sig. (2-tailed)									.000	.000
Responsiveness	Pearson Correlation									1	.911**
	Sig. (2-tailed)										.000
supply chain performance	Pearson Correlation										1
	Sig. (2-tailed)										.000

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

Source: Survey result 2019

The correlation between SCI elements with supply chain performance dimensions run as seen in the above table. The result of correlation matrix between each supply chain integration elements and supply chain performance dimensions analyzed as follow: Bivariate Pearson correlation (r) table (4.4) shows that the relationships among supply chain integration variables are very strong, since R-value ranges between 0.448 and 0.691 and P values are less than 0.001. Therefore, the result showed that there are strong positive and significant relationships among supply chain integration variables. The relationships among supply chain performance dimensions are also strong and significant since r-value ranges between 0.716 and 0.765 and p values are less than 0.001. These results indicate that there is a strong positive and significant relationship among supply chain performance dimensions. As indicated in the above table there is a significant positive correlation between supplier integration and supply chain performance with correlation coefficient of 0.504($r=0.504$) and $p<0.001$. Therefore, supplier integration and supply chain performance have a genuine correlation. The correlation between information integration and supply chain performance have a correlation coefficient value of 0.631($r=0.631$) and $p<0.001$, which shows that information integration and supply chain performance have a strong, significant and positive relationship. Moreover, the relationship between internal integration and supply chain performance have a coefficient value of 0.641($r=0.641$) and $p<0.001$, which indicates that internal integration and supply chain performance have a significant and strong relationship. In addition, the correlation between customer integration and supply chain performance have a correlation coefficient value of 0.668($r=0.668$) and $p<0.001$, which shows that customer integration and supply chain performance have a strong, significant and positive relationship.

When we observed the correlation result between supply chain performance dimensions and supply chain integration, there are strong positive and significant relationship among them. As indicated in the above table there is a significant positive correlation between cost and supply chain integration with correlation coefficient of 0.769($r=0.769$) and $p<0.001$. Therefore, cost and supply chain integration have a strong correlation. The correlation between flexibility and supply

chain integration have a correlation coefficient value of 0.578(r=0.578) and p<0.001, which shows that flexibility and supply chain integration have a strong, significant and positive relationship. Moreover, the relationship between quality and supply chain integration have a coefficient value of 0.599(r=0.599) and p<0.001, which indicates that quality and supply chain integration have a significant and strong relationship. In addition, the correlation between responsiveness and supply chain integration have a correlation coefficient value of 0.697(r=0.697) and p<0.001, which shows that responsiveness and supply chain integration have a strong, significant and positive relationship.

Through correlation analysis, the results of the study showed that there are strong inter-relationships and interactions among the four elements of SCI and SCI, Supply chain performance dimensions and SCP and SCI and SCP. The result shows that the relationships among supply chain integration variables are very strong, since r-value ranges between 0.448 and 0.691 and P values are less than 0.001. Therefore, the result showed that there are strong positive and significant relationships among supply chain integration variables. The relationships among supply chain performance dimensions are also strong and significant since r-value ranges between 0.716 and 0.765 and p values are less than 0.001. These results indicate that there is a strong positive and significant relationship among supply chain performance dimensions. Finally, the relationship between supply chain performance and supply chain integration is strong since r-value is 0.739 and value of p is less than 0.001.

4.4.2 Regression Analysis

Objective five: To analyze the of supply chain integration elements impact on supply chain performance in ethio-telecom.

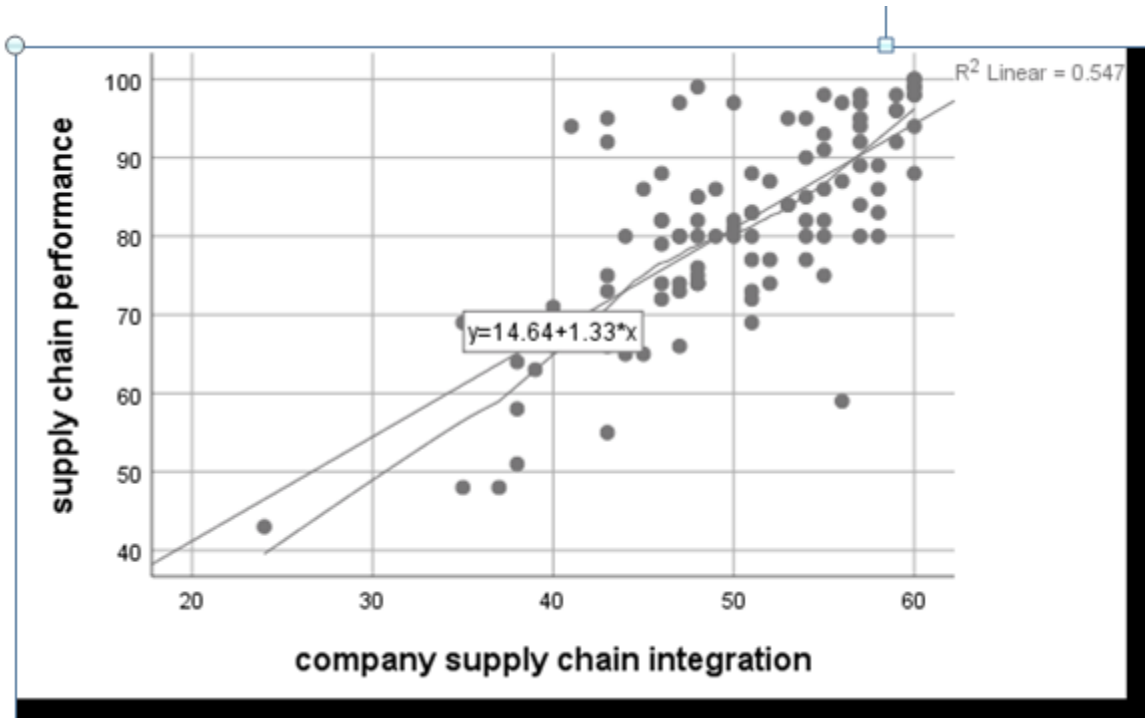
To answer this question multiple regression analysis was used to analyze the effect of the supply chain integration variables on supply chain performance variable. This regression analysis conducted to know by how much the independent variable explains the dependent variable. The regression conducted between supply chain integration elements (independent variable) and supply chain performance (dependent variable). To be able to use multiple regressions, however, the assumptions of validity, reliability, and multi-colleanearity should be satisfied. This study addressed content validity through the review of literature and adapting instruments used in

previous research. Reliability tests made using Cronbach's Alpha. The results of the test provided on table 3.2. Its coefficient values for all variables are accepted and highly reliable. The remaining assumptions discussed as follows:

Linearity test

Figure (2) shows that the relationships between independent and dependent variables are linear.

Figure: 2.3. Linearity test



Source: survey 2019

Multi collinearity test

VIF (Variance Inflation Factor) and tolerance used to test multi-collinearity. If VIF is less than 10 and tolerance is more than 0.2, the model does not violate the multi-collinearity assumption.

Table: 4.6. Collinearity statistics

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Supplier Integration	.514	1.945
	Information Integration	.454	2.203
	internal integration	.408	2.451
	customer integration	.652	1.533

a. Dependent Variable: supply chain performance

Source: survey 2019

As shown on the above table, all of the independent variables have a tolerance value above 0.2 and the values of VIF are less than 10. Therefore, there is multi-collinearity within the independent variable of the study.

Table (4.6) shows the regression of the four independent variables of supply chain integration against the dependent variable (supply chain performance). R^2 shows the fitness of the model for multiple regressions and explains the variance of independent variable on dependent variable.

Table 4.7. Results of Multiple Regressions Analysis (ANOVA)

Model Summary				
Model	R	R Square	Adjusted R Square	Sig.
1	.765[a]	.585	.568	.000[b]
a. Predictors: (Constant), customer integration, Supplier Integration, Information Integration, internal integration				
b. Dependent Variable: supply chain performance				

Source: survey 2019

As shown on the above table (4.7) the model is fit and significant as R^2 is 0.57 (57%) and p value is less than 0.01. Since R^2 is 0.57 (57%) then the independent variables can explain 0.57% of variation on dependent variable. This implies that Supply chain integration variables can account for 0.57% of the variation in supply chain performance.

Table (4.8) again shows the significance effect of each independent variable on dependent variable.

Table 4.8 Results of Multiple Regressions Analysis (Coefficients)

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	15.025	5.746		2.615	.010
	Supplier Integration	.074	.530	.012	.139	.890
	Information Integration	1.577	.567	.262	2.781	.006
	internal integration	1.394	.612	.226	2.278	.025
	customer integration	2.252	.442	.401	5.100	.000
a. Dependent Variable: supply chain performance						

Source: survey 2019

Table (4.8) shows that there is a negative impact of supplier integration on supply chain performance, since (Beta= 0.012, b and p (0.890)>0.05) means it is insignificant effect on supply chain performance and rejected the hypotheses. However, information integration has a direct positive impact on supply chain performance, since (Beta= 0.262, p (0.006) <0.05). This means information integration is significantly affect for the supply chain performance and the hypotheses is accepted. Internal integration has also a positive significant influence on supply chain performance with a coefficient value of 0.226 and the value of P (0.025) is less than

0.05.and finally customer integration has also a positive significant influence on supply chain performance with a coefficient value of 0.401 and the value of P (0.000) is less than 0.05. From the above table (4.8), the researcher concludes that all supply chain integration variables have a significant and positive impact on supply chain performance at ethio-telecom except the supplier integration. Customer integration has the highest impact (Beta= 0.401, p= 0.000), followed by information integration variable (Beta= 0.262, p=0.006), and internal integration variable (Beta= 0.226, p=0.025) and finally supplier integration holds the negative impact (Beta= 0.012, p=0.8900) on supply chain performace..

The results of regression analysis of the study show that supply chain integration have a significant and positive impact on supply chain performance at ethiotelecom. This result goes in line with different previous studies, such as Huo (2012) who found that supply chain integration had a significant impact on business and organizational performance. Zhao, *et al.* (2011) also suggested that supplier integration and customer integration play different roles in performance improvement and capability development. The study shows that Supplier integration has a negative impact on supply chain performance of ethiotelecom, since (Beta= 0.012, p (0.890) >0.05). The result is match with the findings of Flynn, *et al.* (2010) that showed internal and customer integrations more strongly related to performance improvement than supplier integration. The results of this study showed that customer integration has a strong impact on supply chain performance next to information integration and internal integration but supplier integration has the negative impact on supply chain performance.

The study believes that the highest impact of customer integration among supply chain integration variables is due to the fact that customer satisfaction is the ultimate goal that all organizations seek to achieve. And the equation SCP=15.03+0.262II+0.226II+0.401CI+e.

and excluded the supplier integration because the p value is greater than 0.05 then it is rejected the hypothesis.

Since, coefficients of predictor variables are statistically significant at less than five percent for internal integration, information integration and customer integration hypothesis related to these dimensions are accepted. Supplier integration is not significant and as a result, null hypothesis related to this dimension is failed to reject.

Table 4.9. Summary of the overall outcome of the research hypothesis

HYPOTHESIS		Result	Reason
H1	H0: ICT has significant negative effect on SCI of ethio telecom with respect to supplier integration. H1: ICT has significant positive effect on SCI of ethio telecom with respect to supplier integration.	H0: Accepted H1: Rejected	ß=0.012 p>0.05
H2	H0: ICT has significant negative effect on SCI of ethio telecom with respect to information integration H: ICT has significant positive effect on SCI of ethio telecom with respect to information integration .	H0: Rejected H1: Accepted	ß=0.262 p<0.05
H3	H0: ICT has significant negative effect on SCI of ethio telecom with respect to internal integration. H1. ICT has significant positive effect on SCI of ethio telecom with respect to internal integration	H0: Rejected H1: Accepted	ß=0.226 p<0.05
H4	H0: ICT has significant negative effect on SCI of ethio telecom with respect to customer integration. H1: ICT has significant positive effect on SCI of ethio telecom with respect to customer integration	H0: Rejected H1: Accepted	ß=0.401 p<0.05

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary of Major findings

The study illustrated the relationship that exist between supply chain integration elements and supply chain performance dimensions and the external and internal factors effect on the adoption of ICT on ethio telecom.

The study revealed that the role of ICT on overall level of supply chain integration in the company is high with the mean value 4.16. From among the four dimensions under study, the company has a high result of information integration with mean value of 4.22. Next supplier integration with the mean value 4.17. Then internal integration with mean value 4.16. Finally, customer integration with the mean value 4.08 this result is least but it does not mean it is low integration in customers.

The company has also high supply chain performance by the role of ICT with over all mean value of 4.04. This study revealed four dimensions of supply chain performance. The company has highest supply chain performance by using ICT with the mean value 4.04 regarding to quality. but it has lowest supply chain performance regarding to responsiveness variable with mean value 3.98 but it doesn't mean low performance by using ICT in this study. The other two variables such as flexibility and cost are moderate mean value 4.05 and 3.99 respectively.

Finally, this study revealed the external and internal factors affect the adoption of ICT for this company. When this study revealed the external factors such as political, economic, legal and technological, it has adversely impact on the adoption of ICT with aggregate mean value 3.70. The highest adverse impact of ICT adoption from four factors is economic and technological factors with their common mean value 3.8. the lowest adverse impact of ICT adoption is political factor with the mean value 3.57. and the moderate adverse impact is legal factor with the mean value 3.61. Whereas the three internal factors affect the adoption of ICT are skill of the employees, focus of top management and fear of technology of employees. The aggregate mean value of the internal factor is 3.56. Which means the internal factors adversely affect the

adoption of ICT in ethio telecom? The highest adverse impact of ICT is skill of the employees with the mean value 3.8. In addition, the lowest impact of ICT adoption is fear of technology of employees with mean value 3.29. Finally, the moderate impact of ICT adoption is lack of focus from top management.

Through correlation analysis, the results of the study showed that there are strong inter relationships and interactions among the four components of SCI and four dimension of SCP and between SCI and SCP. The relationships among supply chain integration variables are strong and significant, since r value ranges between 0.448 and 0.691 and P values are less than 0. 001.And the relationships among supply chain performance variables are strong and significant, since r value ranges between 0.716 and 0.765 and P values are less than 0.001. Finally, the relationships between supply chain integration and supply chain performance are also strong since r value 0.739 and p values are less than 0.001.

The results of regression analysis of the study show that supply chain integration have a significant and positive impact on supply chain performance at ethio telecom. The study shows that Supplier integration has a direct positive impact on supply chain performance of ethio telecom, since (Beta= 0.012, p (0.890) >0.05). Information integration has also a positive significant influence on supply chain performance of ethio telecom with a coefficient value of 0.262 and the value of P (0.006) is greater than 0.05.

Internal integration has also a positive significant influence on supply chain performance of ethio telecom with a coefficient value of 0.226 and the value of P (0.025) is less than 0.05. Finally, customer integration have a strong positive direct impact on supply chain performance of ethio telecom, since (Beta= 0.401, p (0.000) <0.05).

5.2. Conclusions

The study discovered that the role of ICT on overall level of supply chain integration in the company based on the perception of respondents is high. From among the four dimensions under study, the company has a highest result of information integration by the adoption of ICT. The second highest rank result for the use of ICT is supplier integration for this company. Third's rank result for the use of ICT to integrate internally. The final rank result got customer integration by the use of ICT of this company.

The study discovered that the role of ICT on overall level of supply chain performance in ethio Telecom Company based on the perception of respondents is high. The company has highest supply chain performance by using ICT regarding to quality. but it has lowest supply chain performance regarding to responsiveness variable, but it doesn't mean low performance by using ICT in this study. The other two variables such as flexibility and cost are moderate result of supply chain performance by the use of ICT for ethio Telecom Company.

Finally, this study revealed the external and internal factors affect the adoption of ICT for this company. When this study revealed the external factors such as political, economic, legal and technological, it has adversely impact on the adoption of ICT. The highest adverse impact of ICT adoption from four factors is economic and technological factors. The lowest adverse impact of ICT adoption is political factor and the moderate adverse impact is legal factor. Whereas the three internal factors affect the adoption of ICT are lack skill of the employees, lack of top management focus and fear of technology of employees. The aggregate result shows that, they are adversely affected on the adoption of ICT in ethio telecom. The highest adverse impact of ICT is skill of the employees. In addition, the lowest impact of ICT adoption is fear of technology of employees. Finally, the moderate impact of ICT adoption is lack of focus from top management.

The results of the study showed that there are strong inter-relationships and interactions among the four components of SCI and four dimensions of SCP and between SCI and SCP by the role of ICT. The regression a result indicates that supply chain integration has a significant and positive impact on supply chain performance by adopting ICT at ethiotelecom based on the perception of respondents.

Customer integration has the highest impact followed by information integration variable and internal integration holds the least impact by use of ICT. but supplier integration is insignificant because p (0.890) > 0.05.The researcher believes that the use of ICT highest impact on customer integration among supply chain integration variables is due to the fact that customer satisfaction is the ultimate goal that all organizations seek to achieve.

5.3. Recommendations

The following recommendations can be drawn from the analysis and conclusions made.

- It recommended that ethiotelecom should work more on the increase efficiency through utilization of ICT with suppliers and its major customers in order to increase the level of external integration and it helps to increase information integration by sharing with all partners in accurate and timely ways. Finally, it allows business functions to align around a single company goal for integrate internally. Then the integrated supply chain helps to increase supply chain performance by providing higher quality, improved service level, and reduced cost for customers.
- This company should engage in sharing and facilitating new technology to implement for local suppliers and customers for facilitating the integration process of the ethio telecom. Because it helps to minimize the level of inventory, which in turn will result in a lower cost and a better supply chain performance.

- Since ethiotelecom is a technological oriented company its materials or inputs have a higher rate of obsolescence. So it should also increase the efficiency of inventory tracking system to keep inventory valid that will result in having minimum level of scraps and obsolete materials. Minimum level of scraps and obsolescence can improve supply chain performance through quality dimension.

- This company should minimize the adverse impact of the external factors (political, economic, legal, and technological) by communicating with the higher states of governmental officers. Whereas the adverse impact of internal factors (skill of the employees, lack of focus from top management and fear of employees for technology) should minimize by continuous interaction of the concerned body to the problem areas by ethio telecom company.

Recommendations for academicians and future research:

- This study dedicated to the service providing company ethio-telecom, so it is advisable to study the role of ICT on supply chain integration of other service providing companies in order to compare the results and stand on the differences, if available, and provide the suitable interpretations.
- It recommended that to restudying the same topic on the same company by using ICT elements (phone, internet, intranet, software's, and other ICT elements) as variables to integrate supply chain.

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ANNEX

ADDIS ABABA UNIVERSITY
School of Commerce
Department of Logistics and Supply Chain Management
Program: MA in LSCM

QUESTIONNAIRE

Dear respondents, the purpose of this questionnaire is to gather data on the role of ICT in supply chain integration in ethio-telecom and being prepared for partial fulfillment of master's degree in Logistics and Supply Chain Management at Addis Ababa University School of Commerce. The study is purely for academic purpose and thus not affects you in any case. So, your genuine, frank and timely response is necessary for successfulness of the study. The accuracy of the information you provide highly determine the reliability of the study. Therefore, I kindly request you to respond to each items of the question very carefully.

Do not hesitate to contact me with the following contact address if you have any question/comment about the questionnaire.

Contact Address:

Berhane Tikabo

Tel - +251 911 510403

E-mail – tikaboberhane84@gmail.com

Thank you in advance for your unreserved cooperation!

General Instructions

- There is no need of writing your name

- For Section I please tick (√) for the answer in the appropriate box and indicate the number for your response to each statements of Section II.

Section I: Demographic Characteristics

1. Gender

A) Male ☐ B) Female ☐

2. Qualification

Certificate ☐ Diploma holder ☐ First Degree holder ☐

Masters and above ☐

3. Experience in the company(ethio-telecom)

Less than 1 year ☐ 1-5 years ☐ 6-10 years ☐ More than 10 years ☐

Section II:

The Following Statements relate to the role of ICT in supply chain integration the Case of Ethio-telecom.

Follow the instructions given for your responses (1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree)

The role of ICT on SCI		1	2	3	4	5
	Supplier Integration					
A	ICT adoption improve information exchange with major supplier.					
B	ICT adoption improve quick ordering system with major supplier.					
C	ICT help to stable procurement through network with major supplier.					
	Information Integration					
A	ICT adoption help to high level of free sharing of accurate information across members of supply chain					
B	ICT improves the timely sharing of information across the members of supply chain.					
C	ICT help to strong coordination in the flow of information among partners.					
	Internal Integration					

A	ICT improves data integration among internal functions.					
B	There is enterprise application integration among internal function					
C	ICT adoption helpsto have strong and integrated inventory management					
	Customer Integration					
A	Adoption of ICT helps to link the company with customer					
B	Adoption of ICT helps to have effective communication b/nthe company's major customers.					
C	Adoption of ICT help to establish quick ordering system with major customers.					
	The role of ICT on SC performance					
	COST					
A	Adoption of ICT reduces operational cost					
B	The company provides cost effective service to customer by using ICT					
C	ICT helps to lower inventory holding cost					
D	Adoption of ICT helps to reduce warehouse cost					
E	Adoption of ICT helps to reduce transport management cost					
	FLEXIBLITY					
A	Adoption of ICT helps to accommodate the different test and preference of customers.					
B	Adoption of ICT helps to have diversity of product usage.					
C	ICT helps to know the demand and supply products and services					
D	ICT help to facilitate sourcing process					
E	ICT helps to control and follow up the logistic activity					
	QUALITY					
A	Adoption of ICT helps ethio telecom to give quality customer service.					
B	Adoption of ICT helps ethio telecom to increase the efficiency of its operational activity					
C	Adoption of ICT helps to increase the effectiveness of operational activity					
D	Adoption of ICT increases accuracy of the ethio telecom service					
E	Adoption of ICT maximizes neatness of the ethio telecom service					

	RESPONSIVNESS/TIME					
A	Adoption of ICT helps to reduce time wastage in ethio telecom operation					
B	Use of ICT shortens lead time (the time which elapses between the receipt of customer's order and the delivery of goods)					
C	ICT helps to quick response by the company to changes in market demand					
D	Major suppliers provide quick inbound logistics to ethio telecom by using ICT.					
E	ICT helps to responds rapidly to changes in product volume demanded by customers					
	Factors that Affect adoption of ICT					
	External Factors					
A	**Adoption of ICT is affected by the political system**					
	Adoption of ICT affected by monopoly system of economic police of the Nation					
	Adoption of ICT affected by political affiliated decisions					
	Adoption of ICT affected by the political instability of the country					
B	**Adoption of ICT is affected by economic factors**					
	Adoption of ICT in SCM is too costly to implement					
	Adoption of ICT is affected by lack of budget					
	Adoption of ICT is affected by lack of affording to use international experts					
C	**Adoption of ICT is affected by legal factors**					
	Adoption of ICT is challenged by the perception of the law towards security					
	Adoption of ICT is affected by the legal system of nations.					
	ICT adoption is affected by the capability of legal expertise in understanding ICT					
	ICT adoption is affected by stability of law and regulation					
D	**Adoption of ICT is affected by technology**					
	Unstable infrastructure poses challenge in use of ICT systems in SCM					
	System failures are challenges in use of ICT system in SCM					

	Adoption of ICT is affected by unsuitable, incompatible programs and/or information					
	Adoption of ICT in SCM is complex to implement					
	Poor implementation and deployment of the systems have created problems on SCM					
	Adoption of ICT is affected by Internal Factors					
A	**Adoption of ICT is affected by skill of employees**					
	Lack of skills by users has posed a challenge in adopting ICT in SCM					
	IT Employee of a company lack technical and IT knowledge					
	The employees don't like to spend enough time in upgrading ICT skill					
B	**Adoption of ICT is affected by lack of focus from top management**					
	The top managements fail in facilitating enough ICT training to the employees					
	The top managements underestimate the effect of ICT expert's turnover.					
	The top management don't give due attention for value of ICT					
	The top management underestimates the economic benefit of using ICT					
C	**Adoption of ICT is affected by fear of technology of employees**					
	Adoption of ICT is affected by the negative attitude of employees towards technology					
	Adoption of ICT is affected by the complex nature of technology for employees					
	Adoption of ICT is affected by lack of background experience towards technology					