ADDIS ABABA UNIVERSITY

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SCHOOL OF COMMERCE

THE ROLE OF SUPPLY CHAIN DIGITALIZATION IN THE CASE OF ETHIOPIAN COMMODITY EXCHANGE

A THESIS SUBMITTED TO THE AAUSOC FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER OF ART DEGREE IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

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Declaration

I, Biruk Engida declare that this thesis is a result of my independent research work on the topic entitled T**he Role of Supply Chain Digitalization in the case of Ethiopian Commodity Exchange** in partial fulfillment of the requirements for the Degree of Masters of Art in Logistics and Supply Chain Management at Addis Ababa University School of commerce. This work is original in nature and has not been presented for a degree in any other University. All the references are also dully acknowledged.

Biruk Engida

Signature _____

Date _____

Statement of Certification

This is to certify that Biruk Engida has carried out this research work on the topic entitled “The Role of Supply Chain Digitalization in the case of Ethiopian Commodity Exchange” under my supervision. This work is original in nature and it can be submitted for the partial fulfillment of the requirements for the award of the degree of Masters of Art in Logistics and Supply Chain Management.

Shiferaw Mitiku, PhD

Signature _____

Date _____

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List of Acronyms and Abbreviation

SCM - Supply Chain Management

DSCM - Digital Supply Chain Management

ECX - Ethiopian Commodity Exchange

IMF - International Monitor Fund

GDP - Gross Domestic Product

IOT - Internet of Things

CLM - Council of Logistics Management

RFID - Radio Frequency Identification

SCIT- Supply Chain Information Technology

ERP - Enterprise Resource Planning

IT - Information Technology

GPS: - Global Positioning System

GRV: - Good Receiving Voucher

SPSS: - Statistical Package for social science

ICT: - Information & communication Technology

ESC- electronic supply chain

PO- Purchase Order

APS- Automated purchasing system

MRO- Maintenance, repair & Operation

WMS- Warehouse management system

LIFO:- First in first out

FIFO:- Last in first out

AC:- Average cost

SC:- Standard cost

EDI:- Electronic data interchange

RFID:- Radio frequency identification

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Abstract

There are different studies conducted in the area of digitalized supply chain management practice, performance & adoption. Therefore, the main objective of this study is to assess the role digitalization of the supply chain practices of the Ethiopian commodity exchange, examine the performance of supply chain digitalization, to identify the major barriers & enablers exhibited in the adoption of digitalized procurement in Ethiopian commodity exchange and finally identifying the role of information communication technology in supply chain are the objectives of this research. The researcher employed a descriptive research design to investigate the problem under study by employed census method. The collected data were analyzed by using international business machines Corporation Statistical Package for social science statistics 29 version. The study shows that respondents from the company have a good awareness level about e-procurement. Whereas major procurement activities like preparing purchase order, making approval, identifying new potential suppliers & administering contract management are not well practiced or the activities are not digitalized. From digitalized supply chain practices warehouse & inventory management is well practiced & automated in the enterprise. Electronic good receiving voucher is issued; items are tagged & tabled, maintaining balance and other warehouse activities are well automated & practices at satisfactory level. Regarding the performance of digital supply chain management from the four performance indicator both responsiveness & cost effectiveness count the low level of responsiveness & minimizing supply chain costs. Whereas, data accessibility & flexibility count high level of practice in the company. Major barriers that have been identified under the study are social & cultural, economic, political, legal & regulatory barriers are major barriers for adopting digitalized supply chain at Ethiopian commodity Exchange. Regarding the enablers of digital supply chain management are major types of enablers have been identified under this study such as, technological, top management commitment, legal ground and human resource are items included in enablers of digital supply chain management. Finally, about role of information communication technology the study identifies a major role by adopting technologies transparency, minimize costs and enhance integration. The study recommended that the company shall fully automate major supply chain activities and practices like procurement, logistics & transportation and also outsource other supply chain actives Ethiopian commodity exchange top managements review the procurement strategy and improve their strategy or develop a new one that includes digital supply chain aspects.

Keywords: *Practice, Digitalization, Supply Chain Management*

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Growth of business world today has created tighter market competition, because the existing industrial Markets have globalized and have penetrated the international boundaries. At the same time to survive and to maintain a sustainable competitive advantage in this global market, it is necessary for organizations to identify emerging digital technologies that can be used to develop a new business model. In today's competitive world the way supply chain operations are being executed has forced the organizations to adopt advanced supply chain Technologies like use of internet of things for using information and analysis. In this competitive and turbulent environment, the target of every business is to satisfy the customer with exact product quality, quantity and price in optimum time.

Supply Chain Management (SCM) is expected to generate a massive impact on corporate success and customer satisfaction for large industrial companies. Supply chain do not remain static, but evolve and change in their size, shape, configuration and the manner in which they are coordinated, controlled and managed (Mc Carthy *et al*, 2016).

According to Gimpel and Roglinger (2018) Conference paper on digital supply chain management: an overview suggests that effectively address & implementing supply chain management which involves operations management, procurement, production, information technology and logistics. Therefore it is necessary to present the current developments in these areas and how the emerging technologies can be used in these processes to attain competitive advantage. Today, in addition to have a highly standardized and efficient supply chain, companies also need to alter business streams to adjust to customer demands. Researchers predict the movement into the digital world and expect a digital SCM for the coming years. Traditional supply chains will transform into demand sensitive networks.

Digitalization refers to "the increasing penetration of digital technologies in society with the associated changes in the connection of individuals and their behavior" (Gimpel and Roglinger et al.2015). Digitization will create great opportunities for organizations and supply chain practices.

According to the scholars define digital supply chain, as the development of information systems and the adoption of innovative technologies. Strengthening the integration and the agility of the supply chain and thus improving customer service and sustainable performance of the organization. Digitalization means adding digitality to interactions, communications, business functions and business models.

A Digital Supply Chain (DSC) is a smart, value-driven, efficient process to generate new forms of revenue and business value for organizations and leverage new approaches with novel technological and analytical methods. DSC is not about whether goods and services are digital or physical; it is about how supply chain processes are managed with a wide variety of innovative technologies.

To conclude that employing digital technology in a supply chain management practice it enhance efficiency & effectiveness to achieved through the joint application of digital and information systems. For example, electronic procurement and automated vendor search are instruments that use digital technologies and Internet applications in combination with ERP systems, which allow the automation of both internal and global business processes. Procurement specialists worldwide can easily share information to simplify the process and to save time and money without a negative impact on product quality and standards.

Ethiopian Commodity Exchange (ECX), established in 2008, is a new initiative for Ethiopia and the first of its kind in Africa. It is a trading platform where buyers and sellers come together to trade, assure quality delivery and payment. Through the sale of membership seats, which are privately owned by wholesalers, cooperatives, exporters, processors and food agencies. It is Ethiopia's latest attempt to enhance the performance of agricultural markets. Conceived as a meeting point for buyers and sellers of grains (sesame, haricot beans, maize, and wheat) and coffee, ECX seeks to organize efficient and transparent market operations and thus contribute in solving the country's long standing problem of starvation. Before ECX was established, agricultural markets in Ethiopia had been characterized by high costs and high risks of transaction forcing much of Ethiopia in to global isolation. With only one third of output reaching the market, only buyers and sellers tended to trade only with those having close information, to avoid the risk of being cheated. This is done on the basis of visual inspection because there was no assurance of product quality or quantity, this drove up market costs leading to high customer prices. Small-scale farmers who produce around 95% of Ethiopia's output came to the market with little information and are at the mercy of

merchants in the nearest and only to the market they know; unable to negotiate better prices or reduce their market risk.

Ethiopian commodity exchange (ECX) is a modern trading system based on standard crop contracts, establishes standard parameters for commodity grades, transaction, size, payment and delivery, and trading order matching, while at the same time, preserving the origins and types of crops as distinct unlike the previous. The existing auction trading system in the document is to mean the marketing system before the establishment of the ECX.

By now the existing trading system is the one which currently works in ECX. Quality control is undertaken in liquoring and inspection units located in the major crop producing areas and the crop is then weighted and inventoried in ECX operated warehouses. Trade is thus on the basis of warehouse receipts issued to the depositor rather than on sample basis.

ECX manages a central depository of electronic warehouse receipts, removing the risks of paper loss or fraud. ECX quality certification is based on a modification of the existing quality grading system, with a new crop classification based on classes, types and grades of the commodity. Currently ECX has over 20 warehouse branches at different regions; namely Hawassa, Dilla, Wolyita Sodo, Gimbi, Asossa, Nekemte, Adama, Gonder, Dansha, Metema, Hummera, Abirhajira, Shiraro, Dire Dawa, Kombolcha, Bedelle, Bonga, Jimma, Bure, and Pawi.

The major roles of these warehouses are arrival, sampling, coding and decoding, grading, weighing, deposit, reconciliation, and reporting. For the transaction to be applied at the exchange, primary depositors should bring their commodity to their nearby branch so that the load shall be sampled, graded and weighted. Trade/price is determined based on the information given on the grade, the weight and the location of inventory.

1.2. Statement of the Problem

The recent development & researchers indicates that digitalization is a strong wave leading to pervasive changes in many industries. Digitalization forces companies to reinvent their new way of doing business in a new era. (Bouwman et al. 2017, pp2).

In a large scale survey indicates that 73% of respondents acknowledged that digitalization helps them reach operational excellence (Lehmann 2018, pp27). According to McKinsey & Company (2016) digitalization is going to reshape supply chain model in which the automation will boost

supply chain efficiency & effectiveness by automating the physical tasks and planning. For instance, combining RFID (Radio Frequency Identification) and EID (Electronic Data Interchange) via system connected with physical workflow and ERP automated EID transactions will bring improvement in time and accuracy in supply chain over all process (Radley Corporation 2017).

The potential & the above mentioned results of digitalization to supply chain need further investigation. The time of digitalization in supply chain becomes more vivid, which creates an advantage to start research in this field.

Unlike researches conducted around the world to identify the advantage of being digitalize supply chain management. According to (Prakash Agrawal *et.al* 2018) identifies major benefits of digitalization are greater transparency throughout the supply chain process , reduced inventory levels, clear visibility of inventory levels, reduce the delivery times. Moreover, Mckinsey & company (2016) also identifies profits of using automate supply chain management enable the company faster, more flexible, more accurate and more efficient.

Irrespective of the above mentioned research indicates that a company without automating the supply chain process fully or partially it lacks transparency, visibility and lack of integration among the supply chain members. the above mentioned all aggregate factors will lead to lack of customer satisfaction.

Regarding to barriers & enablers of digitalize the supply chain a number of researches have also identifies barriers & enablers to DSC practice. According to Graham Parker (2019) cost, lack of skilled man power, changing company culture, integration the highly complex and often rapidly changing interfaces among the organizational entities and disciplines involved in business processes.

The study by insight drives innovation report (2020) identifies major barriers of DSC these are, no clear, well defined goal, reliance with traditional communication channels, integration with existing system, plan to stay on paper.

Difference between how the researchers and practitioners understood the barriers & enablers to the uptake of DSCM was observed. technical, infrastructure, political, social, and cultural issues. Lack of top management support was the three strongest predictors of low uptake practice of DSCM by the organizations surveyed.

The researcher feels that there needs to be further investigation to fill these gaps such as; different research conducted identified different major barriers & enablers which shows that technological environment is volatile and there are always different barriers that needs to be investigated to get better insight about different barriers, enablers, practice & role of DSM and no study has specifically examined to assessing the role of supply chain digitalization in Ethiopian commodity exchange.

1.3. Objective of the Study

1.3.1 General Objectives

The general objective of the study is to assess the role of digitalization in supply chain management of the Ethiopian Commodity Exchange.

1.3.2. Specific Objectives

1. To assess the digitalization of the supply chain practices of the Ethiopian Commodity Exchange.
2. To examine the performance of the supply chain digitalization implementation in Ethiopia Commodity Exchange.
3. To identify the major barriers of digital supply chain adoption in the Ethiopia Commodity Exchange.
4. To identify the major enablers of digital supply chain adoption in the Ethiopia Commodity Exchange
5. To identify the role of ICT on supply chain Management.

1.4. Research questions

The following key research questions will be addressed,

1. How digitalization of supply chain management is being practiced at the ECX?
2. What is the performance of supply chain digitalization implementation at the ECX?
3. What are the major barriers of digital supply chain management at ECX?
4. What are the major enablers of digital supply chain management at ECX?
5. What is the role of ICT on supply chain management at ECX?

1.5. Scope of the Study

DSCM compressive vast area of managerial practices. However, due to shortage of time, finance and manageability issue the study is delimited to DSCM practices, performance, major barriers, enablers and identifying the role of ICT on supply chain management in the case of ECX. The conceptual scope of the research is also limited as area of DSCM practice such as, procurement, inventory & warehouse management and transportation management. DSCM performance such as, responsiveness, cost effectiveness, data access & flexibility. Regarding barriers to DSCM practices social & cultural, technical, economic, political, organizational & legal and regulatory barriers. About enablers of DSCM technological enablers, top management commitment, legal ground & Human Resource. Concerning the role of ICT on SCM are maximizing transparency, minimizing Cost, enhance Integration. The geographical scope will be the Ethiopian Commodity Exchange Head office departments located in Addis Ababa.

1.6. Significance of the study

One of the core activities in a business enterprise is having a well-developed and automated supply chain management practices. Digitalizing the supply chain can enhance the overall supply chain activities within the enterprise.

The study was therefore, intended to help the enterprise management to redirect their attention to digitalize the essential supply chain management function. Assessing the role digitalization of supply chain management in this complex and dynamic business word is believed to have the following importance to the business practitioners, and specifically the case enterprises. Specifically this study has the following main significances in two perspectives such as theoretical and, practical:

Theoretical Perspective: it helps to gain new understanding in theories addressed in this research. **Practical Perspective**: it helps to identifying digitalized SCM key performance indicators, identifying major barriers and improves opportunities in the implementation & adoption of digital SCM, help to identify major enablers in the process of implementation of DSCM in the enterprise, keep identifying the role of ICT in SCM and help future researchers who are willingly to conduct study on this topic.

1.7. Limitation of the study

Due to shortage of finance & time the researcher unable to include a sample from ECX warehouses which is found out of Addis Ababa.

1.8. Definition of Terms

1.8.1. Conceptual Definition of Terms

Procurement: - is the act of obtaining goods or service, typically for business purpose. Procurement generally refers to the final act of purchasing but it can also include the procurement process overall which can be critically important for companies leading up to final purchasing decision, (Google encyclopedia).

E-commerce: is the buying and selling of goods and services on the internet or other computer network, (Hearst newspapers, LLC, 2016).

Supply Chain management: Supply chain management is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served, (Michael Hugos, 2003).

Electronic Supply Chain (ESC) is a supply chain that is electronically managed in form of EDI based or Internet based between or among participating organizations (Gunasekaran *et al*., 2004).

ERP: a process by which a company (often manufacturer) manages and integrates the important part of its business. An ERP management information system integrates area such as planning, purchasing, inventory, sales, marketing, finance and human resources, (investopedia, LLC, 2016).

E-procurement the concept of E-procurement has many different meaning ranging from shopping on the internet (through reverse auction) to collaborative initiative taking place in virtual meetings. Van weele (2010) consider that "e-procurement include web technologies based purchasing solution aimed at simplifying commercial transaction within and between organization & information technology solution for ordering, logistics & handling system as well as for payment system.

1.8.2. Operational Definition of Terms

Warehouse: - is a building for storing goods. Warehouse are used by manufacturing, importer, exporters, wholesalers, transport businesses, customs etc. they are usually building in industrial parks on the outskirt of cities, towns, or villages. (Wikipedia)

Good Receiving Note: - is a record of goods received from suppliers, and the record is shown as a proof that ordered product has been received. The recorded is used by the buyer for comparing the number of goods ordered to the ones delivered, (Shredall group, 2021).

Delivery Note: - is a document that accompanies a shipment of goods and provides a list of the products and quality of the goods included in the delivery. A delivery note can be known as a "dispatch note" or a "good received note" although they are normally printed, delivery note is commonly sent by email (Shredall group, 2021).

Electronic Receipt: - e-receipt is a proof of purchase issued instead of a paper receipt, usually via email, for any goods or service that has been paid for, (conferencecall.co.uk blog).

Customer: - is a person or a company that receives, consumers or buyers a product or service and can choose between different goods and suppliers. The main goal of all commercial enterprise is to attract customers or clients, and make them purchase what they have on Sale, (MBN Market Business News).

1.9. Organization of the Study

The research paper has five chapters; the first chapter contains introduction of the study and discussion of research background, statement of the problem, research questions, objectives of the study, definition of terms, significance of the study, and delimitation/scope of the study.

The second chapter discusses; Theoretical Literature review, empirical literature review and develops conceptual framework which to address the problem statements that indicated in chapter two. The chapter three is describe the research with research approach, design, sampling design, sources of data collection, research instrument, method and procedure of data collection and data analysis method.

In Chapter four summarizes the results/findings of the study that collected as per the above chapter research methodology and interprets and/or discuss the findings to able to summarize the research paper with the next chapter conclusion and recommendation.

Finally, Chapter five discusses four compositions which are summary of findings that drawn from the previous chapter, Conclusion that drawn from the summary of findings, specifying of any limitations that follows to the conclusion and realistic and practical recommendations.

CHAPTER TWO

2. REVIEW OF RELATED LITRATURE

The literature review explains concept of Supply Chain Practices, enablers of digitalization, challenges of supply chain digitalization & supply chain performance discusses the result of previous studies related to digital supply chain. The source considered in the review includes books, websites, past article journals, previous thesis and other documents from international institutions related to digital supply chain.

2.1 Theoretical Literature Review

2.1.1 Digital Supply Chain Management

An effective Digital Supply Chain helps organizations keep up with increasing business demands but many are having trouble creating and optimizing their Digital Supply Chain. According to McKinsey, only 43% of supply chains are digitized, which creates a host of missed opportunities. The same study found that companies who digitize a majority of their supply chain can boost their earnings by 3.2 percent and their annual revenue growth by 2.3 percent on average.

Digital supply chain Management is defined as a customer-centric platform model that captures and maximizes the utilization of real-time data coming from a variety of sources. It enables demand stimulation, matching, sensing and management to optimize performance and minimize risk.

Digitalization refers to "the increasing penetration of digital technologies in society with the associated changes in the connection of individuals and their behavior" (Gimpel and Roglinger *et al*. 2015). Digitization will create great opportunities for organizations and supply chain practices. Many organizations want to become more „digital" because they have observed the criticality and value of digital technologies for their growth and their own businesses, and the management support is also increasing for such initiatives (Bughin *et al*. 2015). However, the implementation of digital technologies in current supply chain requires a detailed understanding of its impact and benefits on business. It has been observed that digitalization of supply chain processes will present solution to the serious supply chain worries. But, formation of a practical implementation in order to achieve the target level of digitalization is still a complex topic. The remaining of the paper is arranged as follows:

Digital Supply Chain is the result of the application of electronic technologies to every aspects of the end to end supply chain process.

The crucial goal of digital supply chain is to allow insight for increase efficiencies, minimize wastes and facilitate grater profits. Companies with a digital supply chain take advantages to mobilize resources, asset, people and inventory to where they needed at any given time in order to reduce costs by responding proactively to transportation and manufacturing risks (Parkash Agrawel *el.* Rakesh Narain 2018).

2.1.2 Practices of Digital Supply Chain Management

A supply chain is a network of partners who collectively converts a basic commodity (upstream) in to finished products (Downstream) that is valued by end-customers, and who manage returns at each stage. Each partner in a supply chain is responsible directly for a process that adds value to a product, (Matiwos Ensermu, 2015).

According to Dawei.Lu Fundamentals of supply chain management book defines supply chain as a group of inter connected participating companies that add values to a stream of transformed inputs from there source of origin to the end products or services that are demanded by the designated end customer.

The concept of Supply chain management has been defined by several authors. Tan, *et al.* (2002) defines SCM as the simultaneous integration of customer requirements, internal requirements and upstream supplier performance.

Council of Logistics Management (CLM) defines SCM as the systemic, strategic coordination of the traditional business functions and tactics across these businesses functions within a particular organization and across businesses within the supply chain for the purposes of improving the long-term performance of the individual organizations and the supply chain as a whole.

SCM has been defined to explicitly recognize the strategic nature of coordination between trading partners and to explain the dual purpose of SCM: to improve the performance of an individual organization, and to improve the performance of the whole supply chain (Li *et al*., 2006).

As Li *et al.* (2006) described, SCM is a concept which its goal is to integrate both information and material flows seamlessly across the supply chain as an effective competitive weapon.

Li *et al.* (2006) also stated that SCM applies to show the collaborative relationships of members of different echelons of the supply chain and refers to common and agreed practices performed jointly by two or more organizations.

Supply chain digitalization defined as a completely integrated ecosystem that is fully transparent to all the actors involved in the supply chain it starts from suppliers of raw materials, components, and parts, to the transporters of those supplies and finished goods, and finally to the customer demand fulfillment. (Stefan Schrauf & Philipp Berttram, 2016).

2.1.2.1 E-procurement

E-procurement while used informally to refer to many things, the term technically refers to An Internet- or intranet-based solution that provides a self-service utility for buying goods and Services, creating requisitions, viewing catalog content with pre-negotiated prices, finding Preferred suppliers, obtaining approval for purchases, managing spend against a budget, and Communicating POs to suppliers, (Patrick, Robert and Amy 2014).

2.1.2.2 Advantages of e- procurement

According to Hossein and Jawid (2014) some disadvantages of traditional procurement process, such as complex error prone purchasing processes, administrative costs, expensive human resources etc. can be avoided with adopting e-procurement systems and methods. Moreover, enterprises can achieve the benefit of performing easily most of the sourcing activities, rapid flow of data between suppliers and purchasers in addition to increasing the transparency and enhancing cycle time of the over-all process. E-procurement allows on time interaction and communication between all sourcing project resources and knowledge and suggestion sharing from the previous participants of sourcing project. According to Joseph and Ralph (2000) procurement technologies have three major advantages:-

1. **Reduced costs of goods and services**: e-Procurement solutions make the purchasing process easy for and visible to unsophisticated business customers, leading to increased compliance with negotiated purchase agreements. Recognizing this, Pepsi-Cola streamlined its purchasing process with an automated purchasing system (APS). This system reduced transaction times from days to 15 minutes and reduced purchase errors from 10% to less than 1%, (Joseph and Ralph, 2000).

2. **Higher productivity and reduced processing costs**: e-Procurement automates paper intensive tasks, reducing cycle times and purchase order processing costs, allowing purchasing professionals to spend time on higher-value activities. One Fortune 500 company found that processing costs for 60% of their purchases fell from $80–$125 to $10 per transaction using e-Procurement and on-line catalogs. General Electric's Trading Post Network (TPN) reduced average purchase order processing costs from $50 to $5, (Joseph and Ralph, 2000).
3. **Better information and better planning**: Purchase data collected from integrated systems can be used to evaluate and improve sourcing policies and process owes and prepare for supplier negotiations. Integrating business process information with suppliers reduces working capital requirements and inventory levels. For example, the software developer Descartes Systems Group will be releasing a website to help computer manufacturers and distributors with inventory levels and assembly time by tracking inventory purchases real time via a Web-based tracking system, (Joseph and Ralph, 2000). Other benefits are centralized procurement governance, automated processes/workflow, integration with contract compliance and finance, invoice integration, online credit card transactions (p-cards) ,enabled supplier relationship, conducting spend data analysis, increasing visibility through reporting tools, custom vendor e-catalogues, (dimension data, 2014).

2.1.2.3 Forms of E-procurement

According to Boer, Harink, & Heijboer (2001) there are basically six main forms of e-procurement: E-MRO, Web-based ERP, E-sourcing, E-tendering, E-reverse auctioning and E-informing.

- E-MRO as well as web-based ERP

E-MRO as well as web-based ERP is the process of creating and approving purchasing requisitions, placing purchase orders and receiving goods and services ordered, by using a software system based on Internet technology. In the case of e-MRO the goods and services ordered are maintenance, repair and operation (MRO) supplies (i.e., non-product related). The supporting software system (an ordering catalog system) is used by all employees of an organization. In the case of web-based ERP the goods and services ordered are product related.

Usually only the employees of the purchasing department (or the planning department) are using the supporting software system (a web-based ERP-system) (Enterprise Resource Planning), (Boer et al 2001).

- E-sourcing

This is the process that identifies new suppliers for a specific purchasing category which can be achieved by utilizing the Internet technology as usual the internet itself. A purchaser can, by identifying new suppliers, maximize the competitiveness during the process of tendering in the case of this procurement category, (Boer et al 2001).

- E-tendering

This is the process of sending RFIs and RFPs to suppliers and obtaining the suppliers response, through Internet technology. E-tendering is sometimes also supporting the analysis and comparison of responses. However, the point shall be noted that e-tendering is not used to close the deal with a supplier, (Boer et al 2001).

2.1.2.4 Role of Procurement in Digital Supply Chain Management

In the context of Supply Chain Management (SCM), purchasing can be defined as the act of obtaining merchandise; capital equipment; raw materials; services; or maintenance, repair, and operating (MRO) supplies in exchange for money or its equivalent (Wisner et al., 2005:32).

In addition to the above definition, traditionally, the main activities of a purchasing manager were to beat up potential suppliers on price and then buy products from the lowest cost supplier that could be found. That is still an important activity, but there are other activities that are becoming equally important. Because of this the purchasing activity is now seen as part of a broader function called procurement. The procurement function can be broken into five main activity categories: Purchasing, Consumption Management, Vendor Selection, Contract Negotiation, and Contract Management (Hugos, 2003:64).

Purchasing is the eyes and ears of the organization in the supplier market place, continuously seeking better buys and new materials from suppliers. Consequently, purchasing is in a good position to select suppliers for the supply chain and to conduct certification programs. As firms increasingly pursue supply chain management strategies in response to competitive pressures, internally and externally, has increased the importance of purchasing function (Mentzer, 2001:211)

2.1.3 Warehouse Management System (WMS)

According to Natesan Andiyappillai (2020) Warehouse Management System can be selected based on the business and customer requirements as there are many in the market and choosing and implementing the right one is critical for the success of the business. As it can be seen, there have many new technologies been evolved in the market in the last decade or so in general and these digital technologies are helping the businesses and changing the traditional way of doing any business and Logistics and Supply chain has no exception to it. The key here is to evaluate if and which technology is suitable for the business and get it implemented with the right strategy.

Very interestingly, the IT product companies have been taking advantage of these technologies and getting them implemented onto their IT applications. Thus helps the businesses to advance their IT capabilities which have a great impact on their logistics and supply chain to keep them seamless.

Warehouse Management System (WMS) is a great tool or application that helps the Logistics business to manage the inventory effectively and efficiently. And, it helps tremendously in providing the inventory visibility to all the business stakeholders.

The latest advancements in the digital technology field are also contributing to the WMS Implementations concurrently where WMS application is integrated with these digital technologies. This is due to the fact that the customer expectations are changing as these digital technologies are being evidently seen as the following primary value adds to their business includes Increasing Warehouse productivity, Seamless Electronic communications, Providing Dashboards and Real-time Inventory / Business Data

Below are some of the key digital technologies that have been recently contributing to the Logistics business thru WMS implementations, where these are integrated with WMS system or application for different reasons as detailed above. Some of them are Automation such as Conveyors, Robots. Drones, Automated Picking Tools such as Pick-to-Light, (Natesan Andiyappillai, 2020).

2.1.3.1 The role of Inventory Management in Digital Supply Chain Management

Inventories are materials and supplies that business or institutions carries for sale or provide input or supplies to the production process (Padmanava Samanta 2015). The objective of inventory management is to meet customer needs while keeping inventory cost at a reasonable level to produce a profit for the firm. The objective is not simply to reduce cost of ordering and holding

inventory, nor is it just meeting customer demand. These two objectives are clearly opposed to each other when considered by them. To reduce inventory cost, we may simply hold no stock and reorder only when customer place order. This will result in low inventory cost. However, this can result in dissatisfaction of customer; on the other keep high level of inventory in anticipation of customer need. We could be incurring huge cost that may eventually put the company out of business. Actually, keeping a high level of inventory does not guarantee that we will be able to meet all customer needs. It is clear that a delicate balancing act is needed to achieve these two objectives simultaneously. (Edc.Mercado-2007).

2.1.3.2 Methods of Evaluating Inventory

There are four methods accounting uses to cost inventory namely first in first out (FIFO), last in first out (LIFO), average cost (A.C) and standard cost (S.C). 11 First In First Out (FIFO): This method assumes that the oldest (first) item in stock is sold first. In rising prices, replacement is at a higher price than the assumed cost. This method does not reflect current prices and replacement will be understated. The reverse is true in a falling price market. Last In First Out (LIFO): This method assumes the nearest (last) item in stock is the first sold. In rising prices, replacement is at the current price. In a falling price market existing inventory is overvalued. However, the company is left with an inventory that may be grossly under stated in value. Average Cost (A.C): This method assumes an average of all prices paid for the article. The problem with this method in changing prices (rising or falling) is that the cost used is not related to the actual cost. Standard Cost (S.C): This method uses cost determined before production begins. The cost includes direct material, direct labor and overhead. Any difference between the standard cost and actual cost is stated as a variance (Arnold, *et al.* 2008).

2.1.3.3 Warehousing Decisions Areas

***Location Selec*tion** it refers to the geographical setting of supply chain facilities also includes the decisions related to which activities should be performed in each facility. The responsiveness versus efficiency trade-off here is the decision whether to centralize activities in fewer locations to gain economies of scale and efficiency, or to decentralize activities in many locations close to customers and suppliers in order for operations to be more responsive. When making location decisions, managers need to consider a range of factors that relate to a given location including the cost of facilities, the cost of labor, skills available in the workforce, infrastructure conditions, taxes and tariffs, and proximity to suppliers and customers. Location decisions

have strong impacts on the cost and performance characteristics of a supply chain. Once the size, number, and location of facilities are determined, that also defines the number of possible paths through which products can flow on the way to the final customer. Location decisions reflect a company's basic strategy for building and delivering its products to market, (Langley et al., 2006:285)

***Warehouse Space Arrangement:* -** In arranging warehousing space, a company has two basic alternatives: private (or leased) ownership of facilities or use of public warehouses, (Langley et al., 2006:285)

2.1.3.4 Warehouse operation in Ethiopian Commodity Exchange

ECX offers an integrated warehouse system from the receipt of commodities on the basis of industry accepted grades and standards for each traded commodity by type to the ultimate delivery. Commodities are deposited in warehouses operated by ECX in major surplus regions of the country. At the ECX warehouse, commodities are sampled, weighed and graded using state-of-the-art technology grading and weighing equipment. ECX warehouses issue Electronic goods received note and provide the depositor or his/her representative with a signed print copy. The electronic goods receiving Notes are not negotiable, transferable or represent legal title to the deposited commodity. The depositor has to get electronic warehouse receipt issued by the ECX Central Depository in order to establish legal title to the deposited commodity. The Deposited commodities are stored using global standards of inventory management which rely on First-In-First-Out principles, rotation, and careful environmental control. ECX Inventory Management system guarantees the quality and quantity of the commodity throughout the pre-determined period of storage. Further, ECX warehouses are insured at maximum coverage to protect against loss and damage of deposits (http://www.ecx.com.et/Pages/Operation.aspx#WH).

2.1.4 Performances of Digitalized Supply Chain Management

Increasingly, firms are adopting Supply Chain Mangement (SCM) to improve comptataivness in the bussness world.

2.1.4.1 Supply Chain Effectiveness

Supply chain effectiveness is focused on external criteria, with a special emphasis on the organization success at meeting the expectation and demands of investors, customers, and suppliers. Consideration for the external standard which includes customer satisfaction and strategic spending

based on market condition an external standard of how well an organization is meeting the demand of the various group and organization that are concerned with its activities.

2.1.4.2 Supply Chain Efficiency

Supply chain efficiency is an internal standard for measuring performance with regard to how well a company leverage its available resource to meet its goals for cost saving, process optimization. Supply chain efficiency as "doing things well"

2.1.4.3 Supply Chain Agility

A new paradigm known as "agility" is being as the solution related to maintaining competitive advantage and enables to collaborate in order to achieve mutually agreed on goals (Zhang & Sharifi, 2000). This is because agility is perceived as vital characteristics that supply chain firms need in order to maintain their competitiveness. Agility can be defined as the ability of an organization to adopt and react to unexpected or unforeseen changes is critical to achieving and maintaining a comparative advantage (Ganguly,Nichiani & Farr, 2009).

The key elements of an agile approach are very similar to the elements of the agile supply chain.

Agility is all about customer responsiveness, people and information, cooperation within and between firms and fitting a company for change. To be truly agile, a supply chain must possess a number of distinguishing characteristics which include: market sensitivity, virtuality, process integration, and networking (Kisperska-Moron and Swiercze, 2008)

According to Swafford *et.al,* (2006) organization agility can be defined as a response to short term changes in demand or supply quickly and can control disruptions external smoothly.

2.1.5 Barriers to Digital Supply Chain Management practice

Supply chain and logistics is a complex diversity of processes that can no longer be managed without the implantation of digitization. Consider large retail stores such as Alibaba or Amazon. They do not stock actual inventories, but they supply to millions of consumers and businesses around the world every month. Factor in the management of hundreds of thousands of product suppliers, and you begin to grasp the scale at which these companies operate. It is no longer practical to do things the old-fashioned way (Darry Sacckett 2020).

Large-scale digitization of supply chains, however, comes with their own sets of challenges. A major challenge in the digitization of the supply chain is the lack of understanding and adequate preparation.

A major challenge in the digitization of the supply chain is the lack of understanding and adequate preparation. While the digitization of supply chains has automated many processes, it hasn't adequately answered questions such as where does a product originate from? Who is the real owner of a product? Is a certain product genuine or counterfeit? All these questions challenge the integrity of a supply chain network there is no unanimous agreement on standards for information sharing.

This lack of integration causes a poor experience for users, which can have a widespread ripple effect on the organization. For example, a user may request software and not receive a license for weeks due to a lack of agility. In the meantime, they may download unauthorized software which causes its own host of problems.

Infrastructural problem Although ECX is intended as an innovative institution tailored to the particular requirements of the Ethiopian agricultural commodities, the country's deficiencies in terms of infrastructure, access to technology and finance and technical services pose significant challenges to its ability to really transform the country's agricultural markets.

Exploitation of farmers at the farm gate: Private traders were not interested in disclosing information. Lack of information and transparency problem between farmers and traders had adversely affected smallholder farmers. This kind of exploitation from traders by hiding market information was the prevailing chain problems among the other.

2.1.6 Enablers to Digital Supply Chain Management practice

In today's business environment it is necessary for a business to use modern technologies in order to improve the efficiency & effectiveness of the entire supply chain process. Some the technologies used in modern Supply Chain Management are:-

Electronic Data Interchange (EDI):- Introduced in the 1970s and popularized in the 1980s, Electronic Data Interchange (EDI) technology has been widely used by firms in supply chains to facilitate transactions and information exchanges. EDI is defined as computer to computer exchange of structured data for automatic processing. EDI is used by supply chain partners to exchange essential information necessary for the effective running of their businesses. These structural links are usually set up between organizations that have a long-term trading relationship Vishal Vikramsinha Jadhav (2015).

According to Vishal Vikramsinha Jadhav (2015) the main advantages of using EDI are to enter the informative only needs on the computer system once, and then it is able to speed of transaction and to reduce cost and error rates. Other benefits of EDI are quick process to information, good customer service, less paper work, increased productivity, improved tracing and expediting, cost efficiency and improved billing. Through the use of EDI supply chain partners can overcome the distortions and exaggeration in supply and demand information by improving technologies to facilitate real time sharing of actual demand and supply information.

Enterprise Resource Planning (ERP):- Enterprise Resource Planning (ERP) Systems are Enterprise-wide Information Systems used for automating all activities and functions of a business. These are transaction-based information systems that are integrated across the whole business. Basically, they allow for data capture for the whole business into a single computer package which gives a single source for all the key information activities of business, such as inventory, customer orders and financials. ERP systems are enterprise-wide transaction processing tools which capture the data and reduce the manual activities and task associated with processing inventory, financial and information regarding customer order. ERP system gain a high level of integration by utilizing a single data model, developing a common understanding of what the shared data represents and establishing a set of rules for accessing data (Vishal Vikramsinha Jadhav 2015).

Bar Coding and Scanners: - Bar Codes are the representation of a number or code in a form suitable for reading by machines (Rushton *et al.*, 2000). Bar codes are widely used throughout the supply chain to identify and track goods at all stages in the process. Bar codes are a series of different width lines that may be presented in a horizontal order, called ladder orientation, or a vertical order, called picket fence orientation. The use of bar codes can speed up operations significantly. Bar code scanners are most visible in the checkout counter of super markets and hyper markets. This code specifies name of product and its manufacturer (Vishal Vikramsinha Jadhav 2015).

Social Media & Electronic Commerce, Computerized Shipping & Tracking (Parkash (Agrawel & Rakesh Narain 2018).

Digital supply chain has processes that monitor real-time inventory levels, customer interaction with products, carrier location, and equipment and uses this information to help plan and execute at increased level of performance. Technologies such as GPS tracking, radio frequency identification (RFID), barcodes, smart labels, location-based data and wireless sensor networks all play a part in a

digital supply chain. In addition, cloud technologies integrated with web services can unify information and processes to create trading-partner visibility and more efficient collaboration.

2.1.7 The Role of Information Technology in a Supply Chain Management

Information Technology revolution changed the world and all aspects of business processes. The developments in Information technology has resulted in many possible alternative solutions for managing the supply chain effectively. Supply chain management is information driven function. Information Technology enabled supply chain management will provide a competitive advantage to an organization over rest of the competitors in market place. IT plays a vital role in decision making process. IT is beneficial for cooperation and coordination within the supply chain. This paper highlights the overview of information technology for effective supply chain management, software focused supply chain characteristics as well as IT tools used in IT enabled supply chain management (Vishal Vikramsinha Jadhav 2015).

According to Vishal Vikramsinha Jadhav (2015) Information Technology affects every part of the supply chain. Information serves as the connections between various stages of the supply chain, allowing them to coordinate, maximize the supply chain profitability. Information is also important to the day today operation of each stage in supply chain. To become more responsive and efficient, companies need to consider information as an important driver, information plays vital role in competitive strategy. Timely and accurate information is more critical now that at any time.

Electronic Commerce (e-Commerce)

Electronic Commerce (e-commerce) means tools and techniques to manage business in a paperless environment. E-commerce includes electronic data interchange (EDI), email, electronic funds transfers, electronic publishing, image processing, electronic bulletin boards, shared databases, and magnetic/optical data capture such as bar coding (T. N. Varma & D. A. Khan 2014).

E-Procurement

E-procurement while used informally to refer to many things, the term technically refers to an Internet- or intranet-based solution that provides a self-service utility for buying goods and services, creating requisitions, viewing catalog content with pre-negotiated prices, finding preferred suppliers, obtaining approval for purchases, managing spend against a budget, and communicating POs to suppliers, (Patrick, Robert and Amy 2014).

An e-procurement is expected to be integrated into the wider purchase-to-pay (P2P) value chain with the trend toward computerized supply chain management. An e-procurement is done with a software application that includes features for supplier management and complex auctions with value chain consisting Indent Management, e-Tendering, e-Auctioning, Vendor Management, Catalogue Management, and Contract Management (T. N. Varma & D. A. Khan 2014).

E-Auctions

The electronic auction (e-Auction) is carried out in real time, where participants log in to an auction site using a browser at a specified time and bid for an article as conventional auctions. This is a transparent process and reduces the malpractices (T. N. Varma & D. A. Khan 2014).

E-Tailing

An e-tailing is a use of the Internet for selling goods over the Internet. The Amazon Company is renowned for the fact that it only sells books over the Internet and doesn'teven take telephone orders (T. N. Varma & D. A. Khan 2014).

2.1.8 Benefits of Digital Supply Chain Management

Employing digitalization in the process of Supply Chain Management provides the following benefits, Greater transparency leading to better decision making, Reduce inventory levels **,** Clear visibility of inventory level because of fully integrated system throughout the entire value chain, more decentralization warehouse in order to reduce delivery time, Better understanding of customers requirement through demand sensing and up to date sales information, Higher sales, higher profit margin, strong bonding with customer, Improved supply chain flexibility and reducing the risks and costs involved in supply chain, More number of alternative will be available in the decision making process leading to better supply chain management decision. (Parkash Agrawel *et.al* 2018).

2.2 Empirical review of related literature

2.2.1 Practices of Digital Supply chain Management

This section presents the assessment of research papers written in digital supply chain management areas. The following research papers which were conducted in Ethiopia and other nations which is selected because of their similarity in the current study.

A study which was conducted by Michael Bekele (2017) on assessment of electronic procurement practice and barriers of automotive importers located. Accordingly, the study revealed that the local automotive industry has a good awareness level about digitalized procurement system. It was also found out that most of automotive company's procurement activities like e-requisition, e-negotiation, delivery, contracting & e-invoicing are not adopted by most automotive companies in the industry. Other procurement activities are well automated & adopted. This result shows that e-procurement is not fully practiced with somehow moderate implementation of e-procurement in the industry. Based on the findings the researcher recommends that the government including other responsible body should promote e-procurement or e-trading legislation and also banks in the country should expand their capacity of internet banking that links companies, buyer, government and other stakeholders relay on. The other recommendation suggested from the researcher is the companies should review and revised their procurement strategy that incorporates with e-procurement concept.

Another study which was conducted by Helen Tekelehaimanot *et.al* (2014) on assessment of inventory management practice and its impact on financial performance of ECX. The study revel that inventory receiving & and issuing process the company uses online internet system. The researchers identifies a problem occurs when the network is going down that create long queues of track in the warehouse.

2.2.2 Performance of Digital Supply chain Management

A study which was conducted by Angel Martinez *et.al (2005)* on supply chain flexibility and performance in automotive industry. Accordingly, the study reveal and conclude that supply chain flexibility improve firms overall performances.

Another study which was conducted by Salman Manzor (2020) on analyzing the impact of supply chain agility on customer satisfaction through responsiveness and innovation. According to the

study reveal that responsiveness is time oriented concept where by customer expect the company handle all interaction in a timely and prompt manner. Based on the findings the researcher recommend that to improve customer responsiveness through supply chain process the company should adopt technology in the supply chain process. Customer responsiveness achieved & improved through customer service options, such as live chat, video conferencing & email saddiqi (2001).

2.2.3 Barriers to Digital Supply chain Management

A study which was conducted by Michael Bekele (2017) on assessment of electronic procurement practice and barriers of automotive importers located. Accordingly, the study identifies under the study are Lack of popularity for online procurement and sales, linguistic barriers', lack of e-procurement infrastructure, increase innovations and new technologies, competitive pressure, lack of secure payment infrastructure, change in regulations with each government, change in government policy, low level of readiness among government institutions, limited use of internet banking and web portals, absence of legal and regulatory systems, No simple procedures and guidelines, lack of e-procurement standards, lack of e-trading legislations, lack of integration with business partners, lack of co-operation of business partners and inadequate e-procurement solutions.

2.2.4 Enablers to Digital Supply chain Management

A study which was conducted by Mohesen Attaran (2020) on assessment of digital technology enablers and their implication for supply chain management. Accordingly, the study identifies several technology have played a part in digital supply chain to unify information and process and monitor real time inventory levels and customer interaction with the product. It includes GPS tracking, radio frequency identification (RFID), bar codes, smart labels, location based data, wireless sensor network and cloud technologies.

2.2.4 Role of ICT to Digital Supply Chain Management

A study which was conducted by Mamta Kumari *et,al* (2020) on assessment of role of ICT in supply chain management. ICT helps to integrate all possible functions within and outside organizations and organizations itself which results a better exchange of information and/or supply chain related data and activities between and among all the stake holders. Supply chains connect the key players of the transport and logistics business, and information & communication technology represents the means for their cooperation and the glue that binds them together. The study has

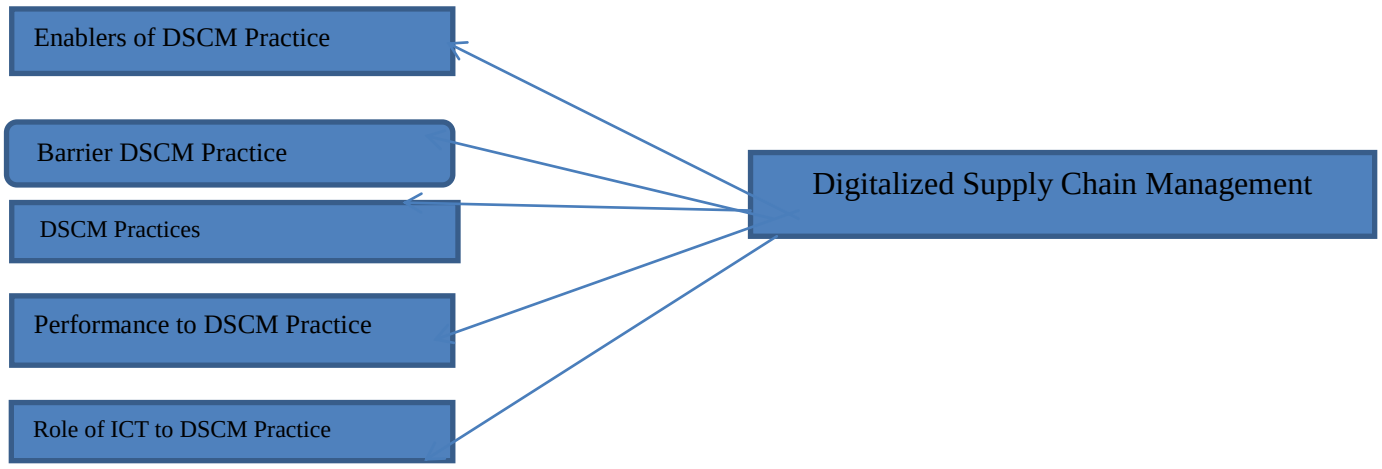
explained the roles of ICT in SCM. (X. Zhang, 2011) also found that there is a positive impact of ICT to Supply Chain and its performance. The objective of this study is clearly defeated by the clear explanation and understanding on the roles of information & communication technology in Supply Chain management. The crux of the study is that the role of information & communication technology is vital in today's complex supply chains and hence it cannot be ignored as it is an integral part of modern supply chain management. Avoiding the application of ICT means the firm is out of business as it cannot compete in the market even if its products are world class. Therefore, study recommends using ICT wherever possible and collating maximum benefits out of it to streamline the business processes and manage your supply chain efficiently & effectively.

2.3 Identified Literature Gaps

Generally, the above reviewed articles and research papers have the following major gaps; failure to make industry specific conclusion, poor sampling method, failure to justify sample size selection.

2.4 Conceptual framework

For this particular research, the researcher will try to assess digital supply chain practices, challenges & enablers of digital supply chain, supply chain performances & role of ICT to DSCM practices.



Source: - own survey -2021

The above diagram shows five various aspects of digital supply chain management. Regarding barriers to digital supply chain practice includes technical, economical and organizational. Whereas barriers to DSCM practice is divided in to internal & external barriers based on this external barriers are political, legal & regulatory and social & cultural barriers. Internal barriers are technical, economic & organizational. A DSCM practice includes procurement, warehouse & inventory management & transportation management. Enabler to digital DSCM practice includes technological, top management commitment, legal ground and human resource. Regarding role of ICT to DSCM practice includes transparency, minimize cost & maximize integration. Finally the diagram shows performance to DSCM practice includes responsiveness, cost effectiveness, data accessibility and flexibility.

CHAPTER THREE

3. RESEARCH METHODOLOGIES

This chapter explores the research methodology used in carrying out the research study by describing the research process, research design, population and sampling, data collection approaches and instrument, and finally approach to data analysis.

Selection of research methods depends on the research objectives, nature of the subject and implementing facilities. The purpose of selection of research methodology is to identify an approach to find out the answer to the research questions more exactly and easily.

3.1 Research Design

The research design enables the researcher to answer the basic research question. According to saunders, Lewis and Thornhill (2009) showed that the choice of research design depend on the objective of the study, the availability data source, the cost of obtaining the data and the availability of time. The purpose of this research is to assessing the role of supply chain digitalization in the case of Ethiopian Commodity Exchange". Therefore, the research has employed descriptive study to describe about the DSCM practice, examine the performance of DSCM, identifying major barriers & enablers of DSCM and identifying the role of ICT on supply chain management at Ethiopian Commodity Exchange.

3.2 Research Approach

There are three types of approach such as qualitative, quantitative and mixed types of research approach. Qualitative research is a means for exploring and understanding meaning individual or group a scribe to a social or human problem and quantitative research approach is a means of testing objective theories by examining to the relationship among variables in turn can be measured typically on instruments, so that numbered data can be analyzed using statical procedures. Whereas, mixed method research approach is an approach to inquiry that combines or associates both qualitative & quantitative approach.

In this research, the research approach that was followed is mixed method research approach is an approach to inquiry that combines or associates both qualitative & quantitative approach expressed

in number it includes observation, records as number and survey with structures questionnaire and closed-ended interview questions.

3.3 Population and Sample Design

According to Hair *et al*, (2010) target population is said to be a specified group of people or object for which questions can be asked or observed made to develop required data structures and information.

3.3.1 Population

The target populations for this study are employees of Ethiopian Commodity Exchange, who are working in Addis Ababa office, the researcher used purposive & judgmental sampling technique for selecting departments such as, Procurement, inventory & warehouse, logistics & transportation, BIS, information technology and infrastructure, IT support related with digital supply chain management activities. Rendering to Paul J. Laraks (2008) explain that the reason for using this type of research is to produce a sample that can be logically assumed to be representative of the population. According to the data gathered from human resource department are 36.

3.3.2. Sampling Size

Census is used when the total population is minimal & to increase the level of accuracy. The researcher was taking all the employee of each department due the number of employees in the department. Since the study focus on those people who have knowledge and awareness about DSCM practice, examine the performance of DSCM, identifying major barriers & enablers of DSCM and identifying the role of ICT on supply chain management in Ethiopian Commodity Exchange, such census techniques were used to collect the information through questionnaires from every concerned department employees.

The total numbers of workers in ECX selected departments, who have been working at Addis Ababa office, are 36. And the number of employees each departments is tabulated as follows; procurement 9 employees, warehouse and inventory management 6 employees, BIS 6 employees, information Technology & infrastructure 5, Logistics & transport 5 and finally Information Technology, 5 Employees. Therefore the total 36 concerned employees (concerned department) were considered as target population and the questionnaires were distributed for 36 concerned people.

3.3. Data type & Source

Structured questionnaire and interview data gathering methods were applied for this research paper. Closed end questions have been rated with likert scale method. A psychometric response scale primary used in questionnaires to obtain participants preference or degree of agreement with a statement or set of statement. Likert scale is a non-comparative scaling technique in nature. Respondents are asked to indicate there level of agreement with a given statement by way of ordinal scale. Multiple closed-end questions were developed. Those questions are adopted from different scholar's works which have conducted researches on similar topics of this research. An interview were conducted within 7 (Seven) department manager's the interview is selected decisively that could maximize the possibility of obtaining optimum data for the research objective due to minimum number of sample & population in these particular research. According to Jack S Damico (2016) from university of Colorado points that the researcher can study the entire population when the population is well defined (complete sampling frame) and small.

3.4 Procedures of Data Collection

Structured questionnaire and unstructured interview were designed and then primary data collected from professionals who took part in supply chain management functions & company's managers. Questionnaires were prepared in English language and the types of questions are closed ended using five points liker's scale.

Questionnaire: Close ended questionnaire in a 5 point liker's scales was used to collect data from the respondents. The questionnaire has 5 rating scales ranging from 1-Very Low to 5-Very High. Data gathered through questionnaires is simple and clear to analyses and it allows for tabulation of responses and quantitatively analyzes factors the questionnaire has a total of 82 close ended questions.

Interview: In order to obtain sufficient information the researcher has used unstructured interview to management bodies of the case companies on the assessing the role of digitalized supply chain management.

3.5 Data Analysis Techniques

Before processing the responses, the completed questionnaires were edited for completeness and consistency. The data were analyzed by the help of statistics namely, descriptive statistics.

Objective is to assessing the role of supply chain digitalization in the case of Ethiopian Commodity Exchange was analyzed using descriptive statistics such as mean and standard deviation.

After the researcher completed the data collection, the researcher used statistical process for social science (SPSS) 29 versions to analyze and present the data.

The following table shows the summary of reliabilities of all constructs of supply chain management and all values are greater than 0.7, which confirms acceptability of the research instrument.

3.6 Validity and Reliability Test

3.6.1 Reliability Test

To test the reliability of the questionnaire cronbach's alpha was used. According to Zikmud *et al* (2010) cronbach's alpha is a measure for the internal consistency of items to the concept. Scales with coefficient alpha between 0.8 and 0.95 are considered to have very good reliability, scales with coefficient alpha between 0.7 and 0.8 are considered to have good reliability and coefficient alpha between 0.6 and 0.7 indicates fair reliability. The following table shows the summary of reliabilities of all constructs of supply chain management and all values are greater than 0.7, which confirms acceptability of the research instrument.

Table 3.1 Reliability Test

Variable	Cronbach's alpha Coefficient	Number of items
Digitalization of Supply chain Management Practices	.722	15
Performances of Digitalized supply Chain Management	.703	17
Barriers of digitalized supply chain management	.900	23
Enablers of Digital Supply chain management practices	.723	14
The role of ICT on SCM	.718	13
Overall Reliability	.761	82

Source: own survey, 2021

3.6.2 Validity Test

Malhotra & Peterson (2006) mentioned about three types of validity in his study: content validity, predictive validity, and construct validity. This study addressed content validity through the review of literature and adapting instruments used in previous research.

3.7 Ethical consideration

An official letter will take from Addis Ababa University School of commerce, Department of Logistics and Supply Chain Management and permission will be brought from ECX that will be included in this study. During data collection, each respondent will tell the purpose and scope of the study. Finally, the findings of this study will be presented in a complete and truthful fashion.

CHAPTER FOUR

4. Result, Discussion and Interpretation

This chapter presents, analyzes, and interprets the data obtained from the primary source. The primary data was obtained from the questionnaire which is designed to collect the necessary data to answer the research questions. In this study, data were collected mainly through questionnaire, and these questionnaires were disseminated to different departments in Ethiopia Commodity Exchange head office located Addis Ababa and the next step was to analyze the collected data and to present the results. Data were coded so that they will be understood and analyzed by SPSS 20 version 29.

4.1 Response Rate

A total of 36 questionnaires were disseminated to different department of ECX in Addis Ababa and out of those 36 questionnaires 33of they were collected representing approximately 91.6 % response rate. According to vice-chancellors committee and careers council of Australia (2001) which is cited by Duncan D.Nulty (2008) regarded an overall response rate of 70% is to be both desirable and achievable.

4.2 Descriptive Statistics

To examine the digital supply chain practice, to measure digital supply chain performance of the company, barriers & enablers of DSC and role of information technology in DSC mean & standard deviation analysis were performed among these statistical analysis tools mean value is an important indicator to determine the extent of the company's practice on each variables. Accordingly and its interpretation was made on the basis of suggestion as mean between 1.00-1.79 interpreted as very un-influential, 1.80-2.59 as un-influential, 2.60-3.39 as Neutral/do not know, 3.40-4.19 as influential and 4.20-5.00 as very influential Alfarra, W.A., (2009).

4.3 Demographic Profile of the Respondent

This section describes the respondents' general characteristics about gender, age, education And work experience.

Table 4.1 Demographic profile of the respondent

Demographic Profile		Frequency	Percent
Gender	Male	20	60.6
	Female	13	39.4
	Total	33	100.0
Age	18-25	11	33.3
	26-35	14	42.4
	36-45	5	15.2
	45-55	3	9.1
	Total	33	100
Educational Back ground	Degree	18	54.5
	Masters	15	45.5
	Total	33	100
Work Experience	0-5	8	27.3
	6-10	13	39.4
	11-15	9	24.2
	16-20	3	9.1
	Total	33	100

Source: Researcher's Survey Result, 2021

The demographic profile of the sample respondents is presented above in Table 4.1. The result of gender frequency analysis of the respondents showed that male respondents were higher (60.6%) than that of female (39.4%). Moreover, the research divided the age of the respondents in to four and majority of the respondents (42.4%) found at age category of 26 – 30 years, (33.3%) in 18-25 years, while, (15.2%) in 36-45 years and the least respondent (9.1%) the range between 45-55 years. Concerning educational background, majority of the respondents (54.5.2%) had first degree, (45.5) second degree. This shows that most of the respondents have first degree and People with higher level of education have more exposure to computer skills and different technological environments from this it can be concluded that the respondents have good knowledge to give relevant information regarding the topic under study.

In regard to respondents' service year experience, 27.3%, 39.4%, 24.2% and 9.1% of respondents had working experience between 0-5, 6-10, 11-15 and 16-20 years in the organization in the same order. It can be seen that most of the respondents are well experienced which means that they have a good knowledge about the environment they are operating and it can be concluded that the information they provide is relevant.

4.4 Digitalization of Supply Chain Management Practices

This research used descriptive statistical analysis based on the five components of the conceptual framework developed for this study to assess the level of supply chain management practice of the company under this investigation. The most common supply chain management practices are strategic Procurement, Warehouse & inventory management, transportation management.

4.4.1 Digitalization of Procurement Practices

According to Joseph and Ralph (2000), the procurement function continues to grow in Importance and complexity. As world markets open to new sourcing networks and companies Learn to link critical business functions across enterprises, the procurement process will become a primary element of any successful company's competitive strategy. To measure digitalized procurement practice, six items were developed in this research.

Table 4.2 Digitalization of Procurement Practices

Procurement	Mean	Std. Deviation
Rate the level of awareness & knowledge about the concept of e-procurement	4.12	.740
The company sends purchase requests, request for quotation, request for proposal to suppliers to obtain suppliers response through e-Procurement Technology.	1.88	1.139
The company uses e-procurement/automated system to identify new potential suppliers.	1.75	0.803
The company uses automated system for making and approving procurement requisitions and placing purchase order.	1.61	.788
The company uses any software system to administer contract management regarding the purchased or ordered items.	1.70	.883
The company handles gathering and disseminating of purchasing information both from the internal and external parties using automated procurement system.	1.76	.751
Grand Mean	2.14	0.850

Source: Researcher's Survey Result, 2021
Note: - a 5 point likert scale ranging from 1-Very low to 5-Very High

Regarding the interview response from the managers about the digitalized procurement practice indicate that the company has low level of implementation & adoption of automated procurement practice. According to the dialogs with the managers the company uses paper based types of procurement activities. Moreover, all most all types procurement activities and process are manipulated manually activities like preparing purchase request, issuing purchase order, identifies potential suppliers, approving purchase requisition & purchase order, administering contract management additionally procurement related reports are generated and extracted from various excel sheet.

To analyze the digitalization of procurement practice, six items were developed in this particular research. Accordingly, the grand mean of digitalized procurement practice were 2.14 and it is indicate un-influential practice with respect to the overall measure taken in to consideration. From the mean interpretation & interview responses from the managers conclude that digitalized type procurement activities are not well practiced in ECX.

The result is presented in the table 4.2 below as follows. From the above table it can be noted that the majority of the respondent has awareness & knowledge about the concept of e-procurement with the mean value of 4.12. Doing procurement activities, identifies potential suppliers, approving purchase requisition & purchase order, administering contract management by using e-procurement technologies with a mean value of 1.88,1.75, 1.61, 1.70, and 1.76 for disseminating purchase information. From the above indicated mean value result majority of respondents agrees that digitalized procurement practice is not practiced at this enterprise.

4.4.2 Digitalization of warehouse & inventory Management Practices

Table 4.3 Digitalization of Warehouse & inventory Management Practices

Digitalization of warehouse & inventory Management practice	Mean	Std. Deviation
The company issues electronic good receiving vouchers to its internal customers.	3.94	1.248
The company stocked items are tagged & registered through automated technologies	3.94	.609
The company warehouse lay out & arrangement is supported by ICT Technologies.	3.03	2.97
The company has automated (electronic system) to maintain maximum and minimum inventory levels for stocked items.	3.62	1.212
The company has a Computerized data base system to manage and control the warehouse materials?	3.97	.529
The company warehouse & inventory management are well integrated with ICT technology (system).	3.88	.696
Grand Mean	3.73	1.21

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-Very low to 5-Very High

Interview with the managers of the organization responded that the organization adopt digitalized warehouse management system. The commodity warehouse issues electronic good receiving note to its customer. Additionally, the digital system generate on time report and maintaining online balance.

To study Digitalization of warehouse & inventory Management practice, six items are developed in this category presented in the above table based on the result majority of the respondents agreed that the company issues electronic good receiving voucher, tagging and registering items, through automation technologies, lay out arrangement, indicating inventory stock level amount, using electronic types of warehouse technologies ICT integration with a mean value of 3.94,3.94,3.03,3.62,3.97 and 3.88 respectively.

From the above questionnaire & mangers interview responses result majority of the respondent indicates agree digitalized warehouse and inventory system are well practiced in Ethiopia commodities exchange with a group mean value of 3.73. According to Alfarra, W.A (2009) the group mean value 3.73 indicate influential.

4.4.3 Digitalization of Transportation Management Practice

Table 4.4 Digitalization of Transportation Management Practice

Transportation Management	Mean	Std. Deviation
The firm uses fuel management system to monitor fuel utilization	2.97	1.403
The company use GPS Technologies to track company's vehicles	1.39	.659
The company uses ICT technologies to plan transportation route and carrier selection.	2.36	.822
Gran Mean	2.24	.961

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-Very low to 5-Very High

Rendering to the manager's interview response the company has poor digitalized transportation system. According the interview & questionnaire of this study majority of the respondents disagree and un-influential with regard to implementation of digitalized transportation system with a grand mean of 2.14.among the items listed for digitalized transportation using of ICT technologies to control fuel utilization, using GPS technologies and using ICT technologies to plan transportation route with a mean score of 2.97, 1.39, 2.36 respectively. In general using ICT technologies in transportation management is not well practiced in Ethiopian commodity exchange.

4.4.4 Summary of DSCM Practices

Table 4.4 Summary of DSCM Practices

DSCM Practices	No of items	Grand Mean	Rank
Procurement	06	2.14	3
Warehouse & inventory management	06	3.73	1
Transportation Management	03	2.24	2

Source: Researcher's Survey Result, 2021

From the above summarized table shows that the rank of digital supply chain practice in ECX. Based on the managers interview response & structures questionnaire tabulated result and interpreted though SPSS 29 version. As the result, the above rank result reveal that from DSCM practice warehouse & inventory management is well automated & digitalized. Whereas, the

remaining two procurement & transportation management practice is not fully automated or digitalized.

4.5 Performances of Supply Chain Management

4.5.1 Responsiveness of digitalized SCM

Table 4.6 Responsiveness of digitalized SCM

Responsiveness of digitalized SCM	Mean	Std. Deviation
The company responds customer request within an appropriate time frame digitally.	3.73	.876
The company accepts any customer requests online.	2.42	1.062
The company measure customer satisfaction electronically (digitally).	2.52	1.661
The company use automated customer service option, such as live chat, video conferencing and email.	2.45	1.394
The company adopt any ICT system to receive any complaints from customers	2.52	1.523
Grand Mean	2.728	1.30

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-Very low to 5-Very High

According to the manager's interview response justify that the company has low level of responsiveness in DSCM practices after the customer deposited the unique code is generated specific but the customer is unable to trace the progress and the stage of each goods in chain.

From the above interview & questionnaire tabulated result shoes that majority of the respondent is neutral/do not known about responsiveness of digitalized supply chain management. Company response to customer request within an appropriate time frame score the high mean with 3.73 agree on influential in responsiveness of the company to the customer inquiries. The remaining parameters are company accepts any customer requests online, automated customer service option and adopt any ICT system to receive any complaints from customers with dis agree and un-influential Alfarra, W.A (2009).

4.5.2 Cost effectiveness of the digitalized Supply Chain Management

Table 4.7 Cost effectiveness of the digitalized supply chain management

Cost effectiveness of the digitalized supply chain management	Mean	Std. Deviation
In order to reduce the overall supply chain cost the company uses digitalized (automated) system to optimize warehousing storage space, reduced stocked items damage and obsolescence.	3.67	.890
The company uses automated system in order to minimize (decrease) order related costs associated with issuing purchased order.	2.15	.566
The company uses any automated system to reduce transportation & shipment costs	2.06	.747
Grand Mean	2.63	0.734

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-Very low to 5-Very High

Interview with the managers of the organization verify that automated warehouse storage system reduce companies costs in relation to obsolescence, damage and other risks. Regarding digitalized procurement system it lacks automation and most procurement activities are operated manually and paper based as the result, it is not cost saving & effective supply chain activities.

The result obtained from both interview & questionnaire tabulated result this study revealed that the majority of the respondents grand mean 2.63 indicate that neutral about the cost effectiveness in digitalized supply chain management.

4.5.3 Data Accessibility of the digitalized supply Chain Management

Table 4.8 Data Accessibility of the digitalized supply Chain Management

Data Access ability of the digitalized supply Chain Management	Mean	Std. Deviation
The company share inventory information electronically.	3.52	1.302
The company share market information data for all stakeholders	4.67	.854
The company share demand & sales data electronically.	3.97	.728
ECX has an ability to provide fast responses to customers request or inquiries of data electronically.	3.27	1.353
All members of the chain access information (data) any time anywhere	4.55	.666
Grand Mean	3.996	0.9806

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-Very low to 5-Very High

According to manager's interview response regarding data accessibility. ECX's disseminating real market information to all market actors and the public on minute-by minute and on a daily basis through its English and Amharic across 90 electronic displays bored across the country. Moreover, an automatic short service (SMS) 934 for rural farmers & actors in the chain information & data about the agricultural products. ECX form business information department to disseminate data & information to all stakeholders. In addition to this, the company create telegram channel to access daily data to all members. Also, internally ECX has a large gaga bite server to store all records, daily transaction and others since its establishment governmental office like coffee & Tea authority also access data for preparing & establishing countries policy & strategy.

According to the results obtained from mangers interview response & tabulated data indicates that, group means of data accessibility ware 3.996 agree influential. From the above table it can be noted that the majority respondent agrees that company share inventory information electronically, share market information data to all stake holders, provide fast response to customer request & access to information with a mean score of 3.52,4.67,3.97,3.27 4.55 and are respectively.

4.5.4 The Flexibility of the digitalized SCM

Table 4.9 The Flexibility of the digitalized SCM

The Flexibility of the Digitalized SCM	Mean	Std. Deviation
The company's supply chain is flexible (coup up with changes) when emerging new technologies.	3.45	.833
The company has Flexible procurement system with internal enterprise procedure provide unique response for immediate changing of user department requirements digitally.	2.79	1.083
The company has sourcing flexibility which is the ability of procurement function to exploit different options as a customer requirement changes.	3.70	.918
The company supply chain is capable to react internally & externally toward market changes.	3.82	.769
Grand Mean	3.44	2.631

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-Very low to 5-Very High

Regarding flexibility digitalized supply chain management response verify that the company uses advanced types of technologies to satisfy customer requirements. Digitalized supply chain applications like inventory management applications.

The result obtained from both interview & tabulated grand mean of 3.44 indicate that agree & influential types of supply chain performance measurement. From the total tabulated questions flexibility is a key performance indicator & measurement tool of digital supply chain management. Supply chain is flexible (coup up with changes), Flexible procurement system with internal enterprise procedure, sourcing flexibility and supply chain is capable to react internally & externally toward market changes mean score result is 3.45, 2.97, 3.70 & 3.82 respectively. Whereas, flexible procurement system is the least mean score value which is 2.79 this mean value interpreted as neutral value.

4.5.5 Summary of DSCM Performance

Table 4.10 Summary of DSCM Performance

DSCM Performance	No of items	Grand Mean	Rank
Responsiveness	05	2.73	3
Cost effectiveness	03	2.63	4
Data Accessibility	05	3.99	1
Flexibility	04	3.44	2

Source: Researcher's Survey Result, 2021

From the above summarized table shows that the rank of digital supply chain performance in ECX. Based on the managers interview response & structures questionnaire tabulated result and interpreted though SPSS 29 version. As the result, the above rank result reveal that from DSCM performance indicator data accessibility is ranked as a first, flexibility is 2nd in a process of automation in a supply chain. Whereas, the remaining two performance indicators responsiveness & cost-effectiveness low level of performance indicator with a minimum grand mean result.

4.6 Barriers to Digitalization of SCM practice

This section presents part four of the questionnaire and respondents were asked to indicate their level of agreement on a five point Likert response format ranging from 1(strongly disagree) to 5(strongly agree) with reference to the extent to which the statements in the following tables. Twenty-three statements representing potential barriers were included.

For the purpose of analysis, the challenges were grouped in to social and cultural barriers, technical barriers, economic barriers, political barriers organizational barriers, legal and regulatory barriers and others. The mean & standard deviation per statement is presented in the following tables.

Table 4.10 Barriers to Digitalization of SCM practice

Social and cultural barriers	Mean	Std. Deviation
Lack of popularity for online procurement and sales	4.21	1.053
external pressure from suppliers	3.24	1.032
Lack of awareness of e-procurement benefits	3.76	1.062
Linguistic barriers	3.64	1.342
Grand Mean	**3.71**	**1.122**
Technical barriers		
Lack of internet security	1.94	1.116
Lack of digitalized supply chain infrastructure	3.64	1.168
Lack of qualified staff	2.39	1.748
Increase innovations and new technologies	3.61	1.088
Grand Mean	**2.895**	**1.28**
Economic barriers		
Lack of financial infrastructure	3.15	1.088
Unclear benefits from digitalized supply chain adoption	2.88	1.516
Cost too high	3.15	1.439
Lack of secure payment infrastructure	3.39	1.499
Grand Mean	**3.32**	**1.385**
Political barriers		
Changing government rule & regulations	3.76	1.001
Change in government policy	3.58	1.032
Low level of readiness among government institutions	3.58	1.226
Grand Mean	**3.64**	**1.086**
Organizational barriers		
Difficulty in changing the existing working procedures	2.79	1.453
Lack of management support	2.94	1.391
Organizational resistance to change	2.73	1.232
Limited use of internet	1.85	1.004
Grand Mean	**2.57**	**1.27**
Legal and regulatory barriers		
Absence of legal and regulatory systems	3.88	1.386
No simple procedures and guidelines	3.91	.914
Lack of digitalized supply chain standards	3.97	.984
Lack of e-trading legislations	4.52	.667
Grand Mean	**4.07**	**.987**

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-strongly disagree to 5-very agree

Barriers like social & cultural, Technical, Economic, Political, Organizational, Legal and regulatory barriers are items included as barriers in adoption of digitalized supply chain management. Based on

the result tabulated in the above table majority of the respondent agrees and found to be influential barriers in a process of adopting DSC. According to the respondents, social & cultural, Economic barriers, Political barriers & Legal and regulatory barriers are found to be influential factors with mean score is 3.71, 3.32, 3.64, 4.07 respectively. The remaining two barriers such as Technical barriers and Organizational barriers the respondents are un-influential barrier with a grand mean value of 2.89 and 2.57 respectively.

This result is similar with a study conducted by Michael Bekele (2017) Electronic Procurement Practice and Barriers of automotive importers located in Addis Ababa.

4.6.1 Summary of barriers to DSCM Practices

Table 4.11 Summary of barriers to DSCM Practices

barriers to DSCM Practices	No of items	Grand Mean	Rank
Social & Cultural	04	3.71	2
Technical	04	2.89	5
Economic	04	3.32	4
Political	04	3.64	3
Organizational	04	2.57	6
Legal & regulatory	04	4.07	1

Source: Researcher's Survey Result, 2021

From the above summarized table shows top six barriers to DSCM practice in ECX based on respondents tabulated questionnaire result and analyzed by SPSS version 29 grand mean results. As the result, Legal & regulatory, Social & Cultural & Political barriers are ranked as the top three barriers to DSCM practice respectively. The remaining three barriers are Economic, Technical & Organizational barriers are the least three barriers to digital supply chain management practice in ECX.

4.7 Enablers of Digitalization of Supply Chain management Practice at ECX

This section presents part four of the questionnaire and respondents were asked to indicate their level of agreement on a five point Likert response format ranging from 1(strongly disagree) to 5(strongly agree) with reference to the extent to which the statements in the following tables major enablers of digital supply chain adoption.

Table 4.12 Enablers of Digitalization of Supply Chain management Practice

Technological Enabler's	Mean	Std. Deviation
Warehouse Management System software package	4.09	.914
wireless technologies like barcode, radio frequency identification tags (RFID)	3.64	1.451
sourcing software like SAP, ORACLE to	4.21	.650
using of E-procurement	3.94	.933
Grand Mean	**3.97**	**1.316**
Top Management commitment		
Support the organization climate for adopting new technologies	4.76	.435
Create necessary infrastructure within the organization	3.58	1.119
Provide financial support	3.79	.820
Grand Mean	**4.04**	**0.791**
Legal Ground		
Adoption of legal and regulatory systems	3.76	.708
Preparing procedure and guideline in order to automate the supply chain	4.00	.935
Using legally permitted & activated supply chain software	3.27	1.306
Grand Mean	**3.67**	**0.983**
Human resource		
Providing Training	4.03	.810
Research and development program	3.97	1.045
Skilled and trained man power	4.39	.788
Grand Mean	**4.13**	**0.881**

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-strongly disagree to 5-very agree

Enablers like Technological, Top Management commitment, Legal Ground, Human resource, are items included as enablers in adoption of digitalized supply chain management in Ethiopian Commodity Exchange. Based on the result tabulated in the above table majority of the respondent agrees and influential enablers in a process of adopting DSC. According to the respondents, Technological, Top Management commitment, Legal Ground, Human resource is enablers influential enablers and the grand mean score with 3.97, 4.04, 3.67, 4.13 respectively (Alfarra, W.A., 2009). This result is similar with a study conducted by Michael Bekele (2017) Electronic Procurement Practice and Barriers of Automotive Importers located in Addis Ababa.

4.7.1 Summary of Enablers to DSCM Practices

Table 4.13 Summary of Enablers to DSCM Practices

Enablers to DSCM Practices	No of items	Grand Mean	Rank
Technological	04	3.97	3
Top Management commitment	03	4.04	2
Legal Ground	03	3.67	4
Human Resource	03	4.13	1

Source: Researcher's Survey Result, 2021

From the above summarized table shows top 4 enablers to DSCM practice in ECX based on respondents tabulated questionnaire result and analyzed by SPSS version 29 grand mean results. As the result, Human Resource, Top Management commitment & Technological enablers are ranked as the top three enablers to DSCM practice respectively. The remaining one enabler is legal ground barriers are the least enabler to digital supply chain management practice in ECX.

4.8 The role of ICT on supply Chain Management

4.14 Table: - The role of ICT on supply Chain Management

Transparency	Mean	Std. Deviation
ICT bring fair competition in a supply chain (Procurement).	4.27	.839
ICT technologies minimize corruption and increase accountability.	4.52	.508
ICT technologies in the supply chain minimize data distortion among supply chain members.	4.52	.508
Supply chain data are transparent & accurate.	3.06	1.368
Grand Mean	**4.09**	**.805**
Cost		
ICT technologies in the supply chain eliminate transactional cost.	4.34	.602
ICT in supply chain management results in spreading of value adding activities.	4.52	.508
Using ICT technologies in the supply chain enhance better utilization of capital	4.39	.496
Grand Mean	**4.41**	**0.535**
Integration		
Using ICT technologies in supply chain can integrate the whole supply chain process that the can optimize the overall performance of the chain.	4.21	.650
Using ICT technologies create Integration among internal & external supply chain members.	4.39	.496
Using ICT technologies in supply chain can access real time information exchange.	4.39	.609
Grand Mean	**4.33**	**0.585**

Source: Researcher's Survey Result, 2021

Note: - a 5 point likert scale ranging from 1-strongly disagree to 5-very agree

The above table shows the respondents agree on the items of ICT plays a major role to enhance the digitalization process of the company. From the above results majority of respondents agree and influential enablers in supply chain management. Based on respondent's tabulated data all categorized enablers are influential in adopting ICT technologies in the supply chain management. The grand mean score are 4.09, 4.41 & 4.33 for ICT brings transparency, reduce cost & enhance integration respectively**.**

4.8.1 Summary of Role of ICT DSCM Practices

Table 4.15 Summary of Role of ICT DSCM Practices

DSCM Practices	No of items	Grand Mean	Rank
Maximize Transparency	04	4.09	3
Minimize Cost	03	4.41	1
Enhance integration	03	4.33	2

Source: Researcher's Survey Result, 2021

From the above summarized table shows top 3 roles to DSCM practice in ECX based on the respondents tabulated questionnaire result and analyzed by SPSS version 29 grand mean results. As the result, both three roles are the most influential role with a grand mean of more than 4.00 grand mean the roles are Enhance integration, Minimize Cost & maximize Transparency.

CHAPTER FIVE

5. Summary, Conclusion and Recommendation

This chapter summarizes detailed conclusions with the possible recommendation. Conclusions are drawn based on the obtained results from the data presentation and analysis. Recommendations are given based on the conclusion of the study finally; a direction for future study is included in this chapter.

5.1 Summary

Regarding DSCM practice in ECX, based on respondents tabulated result warehouse & inventory management ranked with the first place as the result of well automated & digitalized with a grand mean of 3.14. The second ranked DSCM practice is transportation management with the grand mean of 2.24 which indicate lower level of automation. When we came to the third ranked DSCM practice is procurement with the grand mean of 2.14 indicated that low level of automation.

On other hand, digitization of transportation management practice is not well practiced in ECX. The grand mean indicate that 2.24 disagree & un-influential which is interpreted as digitalized transportation management is not practiced in ECX.

Items treated under digital supply chain performance indicators access to data to all members of the chain, access information (data) any time anywhere have higher grand mean 3.99 ranked as a first performance indicator. In relation to Agility (flexibility) has moderate types performance indictor with grand mean of 3.44 rank as a second place which is flexible DSCM when emerging new technologies, sourcing flexibility, capable to react internally & externally toward market changes. Regarding effectiveness or responsiveness ranked as the third place were found to be to a low with the grand mean value of 2.73.

Among items included under cost as a digital supply chain performance factor ware found to be low and rank as 4^{th} place with grand mean of 2.63 due to lack of digitalization in SC currently the company incurred costs to procurement, transportation & shipment activities.

Major barriers that have been identified ranked under the study are legal and regulatory, social & cultural and political barriers are the top three identified barriers with respondent's tabulated grand

mean result 4.07, 3.71 & 3.64 respectively. Whereas economic, technical & organizational barriers are raked as 4th, 5th and 6th place with a grand mean of 3.32, 2.89 & 2.57 respectively.

Major enablers that have been identified under the study are human resource, top management commitment, technological enabler's are the top three enablers identified based on respondents tabulated result with grand mean of 4.13, 4.04 & 3.94 the last & the fourth ranked enabler are legal ground with the grand mean of 3.67.

In relation to the role of ICT in supply chain management the study recognizes the top three major roles of ICT those are minimize cost, enhance integration & maximize transparency based on respondent's tabulated result with a grand mean of 4.41, 4.33 & 4.09 respectively.

5.2 Conclusion

In today's global competition the traditional Supply chain holds a lower hand to company policy. Because a new concept of digitalization is making its way in Supply Chain model. New technologies such as RFID, ERP Codes, and GPS Technology etc. are making Supply Chain Management very easy and cost and time effective and they can be efficiently applicable into Supply Chain Management.

The following conclusions were drawn based on the current findings from data collected and analyzed on the digitalization of supply chain management practice.

This study arrives at a conclusion that Ethiopian Commodity Exchange (ECX) digitalized supply chain management practices in procurement is low. According to the finding of the study e-requisitioning, e-negotiation, delivery, contracting and e invoicing are not adopted.

The research conclude that Ethiopian Commodity Exchange (ECX) digitalized supply chain management practices in, issuing electronic GRV, maintaining balance, items using ICT technology and electronic warehouse receipt are issued are well adopted and practiced by the company.

The implementation of digital technology in transportation & fleet management in ECX is very low.

Under the DSC performance indicator parameter both responsiveness & effectiveness and cost are found to be low. Whereas performance indicators like Agility & access to data is found to be moderate level of performance adopted at ECX.

Social, technical, economic, political, organizational & legal are major barriers identified for adoption of digital supply chain in ECX.

Regarding the enablers of DSC adoption the research conclude that using latest DSC software technological, top management support & drive the development of IT commitment adoption of legal & regulatory system & skilled & trained man power is the major enablers of DSC.

This study reveal that, the major role of adopting ICT in supply chain are transparency plays a major role to bring fair competition, minimize corruption, by adopting ICT technologies firms can enhance profit by minimizing costs, can create integration among supply chain members data computability & accuracy .

5.3 Recommendation

Based on the findings of this research and the subsequent conclusions drawn, the following points are recommended,

- As many literatures reflect that strategic thinking in adoption of DSCM is the major area that company should give priority to improve supply chain management practice. This requires mind shift to strategic and build knowledge on such area instead of the traditional.
- Regarding the digitalized procurement practice, the company shall adopt digitalized procurement system by using automated software like ERP, SAP ORACLE and the newly deployed e-GP (electronic government procurement) for such a procurement activities from end to end process. As the researcher findings revealed that there are more gaps in practicing digitalized procurement system.
- Ethiopian commodity exchange top managements review the procurement strategy and improve their strategy or develop a new one that includes digital supply chain aspects.
- Digitalization of transportation system were another portion of DSCM practices in the ECX was poor and at low level. Therefore, the company has invested more on IT and adopts fleet management software.
- To improve the responsiveness of digitalized supply chin practices the company shall automate the supply chain practices and activities by tracking each & every activities of the chain using ERP and other software are recommended to trace where the given task are and who is responsible for that particular activities.

- Regarding the supply chain costs, to minimize the cost automation is the key success factor in order to reduce the SC costs and outsource other supply chain activities for example out sources the logistic, including procurement tender process in order to create more efficient and effective supply chain management.
- The government or responsible body from the government should promote what kind of digitalized supply chain, e-procurement & e-commerce, online trade legislation the country have, since absence of legal and regulatory system and lack of e-trading legislation are some of the major barriers identified in the study it is clear that there is no e-trading legislation or there is low level of awareness about trading legislation that the country have. The government should also promote e-procurement and e-commerce example current pilot project e-GP (electronic government procurement)
- Technology companies should consider developing different software and applications to support e-procurement that are compatible with the country technological situation for example applications that doesn't require high speed connection.
- Ethiopian commodity exchange top managements prepare long term & short term action plan, policies strategies, and tackle the barriers by providing priorities based on identified rank.
- Ethiopian commodity exchange top managements work on identified enablers in adopting digitalized supply chain management (practices).

5.4 Direction for future study

Researchers can do a comparative study between companies that implement & adopt digitalized supply chain software's with another company which doesn't implement DSCM in relation to supply chain efficiency. Researchers also can do a study on DSCM and its effect on supply chain efficiency & effectiveness and benefits of digitalized the supply chain practices both for government & private entities.

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Appendixes

Addis Ababa University School of Commerce

Master of Art in Logistics and Supply Chain Management

Questionnaires on "Assessing the role of Supply Chain Digitalization in the case of Ethiopian Commodity Exchange"

Dear respondent, I thank you in advance for your cooperation, and honesty answering the following questions. The aim of collecting information through this questionnaire is to conduct a research on "Assessing the role of Supply Chain Digitalization in the case of Ethiopian Commodity Exchange" in connection with my partial fulfillment of MA degree in logistics and supply chain management. The data to be collected will help me asses digital supply chain practice, identify major barriers and give recommendation that will eliminate or minimize those barriers to be identified the questionnaire will be administered to various department of the selected organization.

In order to make the research outcomes complete, reliable and fruitful, genuine and accurate response to each item will have decisive contribution. Therefore, you are kindly requested to respond to each item frankly and accurately. I will like to assure you that, the information you provide me will be kept confidential and shall only be used for the purpose of academics.

Dear respondents! Please note that:

- You do not need to write your name on the questionnaire
- You need to respond to the entire research questionnaire
- You should not assign other respondents to fill it

Put right (√) mark inside the box provided next to each question

In case of any question or dilemma please contact me via phone: +251911173760/Email Address: - birukengida@gmail.com

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Email Address: - shiferaw.mitiku@aau.edu.et

Thank you in advance for your cooperation!!!

Part I: - To asses Digitalization of supply chain management practices of ECX

Please indicate your level of agreement using a 5 point likert scale from 1-5, where 1= very low, 2= low, 3= Medium, 4=High, 5 Very High

NO	Digitalization of supply chain management Practice	V. Low	low	Medium	High	V. High
	Procurement					
1	Rate the level of awareness & knowledge about the concept of e-procurement?					
2	The company sends purchase requests, request for quotation, request for proposal to suppliers to obtain suppliers response through e-Procurement Technology					
3	The company uses e-procurement/automated system to broth to identify new potential suppliers					
4	The company uses automated system for making and approving procurement requisitions and placing purchase order.					
5	The company uses any software system to administer contract management regarding the purchased or ordered items.					
6	The company handles gathering and disseminating of purchasing information both from the internal and external parties using automated procurement system.					
	Warehouse & Inventory Management	**V. Low**	**low**	**Medium**	**High**	**V. High**
1	The company issues electronic good receiving voucher to its internal customers.					
2	The company stocked item are tagged & registered through automated technology					
3	The company warehouse lay out & arrangement is supported by ICT Technologies.					
4	The company has a computerized data base system to manage and control the warehouse materials?					
5	The company warehouse & inventory management are well integrated with ICT Technology (System)					
6	The company records in the store automatically up to date when the requested items are issued from the store electronically (online)					
	Transportation Management	**V. Low**	**low**	**Medium**	**High**	**V. High**
1	The firm uses fuel management system to monitor fuel utilization					
2	The company use GPS Technologies to track company's vehicles.					
3	The company uses ICT technologies to plan transportation route & carries selection.					

Part II: - To measure the performance of Digitalized supply chain management implementation at ECX

Please indicate your level of agreement using a 5 point likert scale from 1-5, where 1= very low, 2= low, 3= Medium, 4=High, 5 Very High

NO	The performance of Digital Supply Chain Management	V. Low	low	Medium	High	V. High
	Responsiveness/Effectiveness					
1	The company responds customer request with in appropriate an appropriate time frame digitally.					
2	The company accepts any customer requests online.					
3	The company measure customer satisfaction electronically (digitally).					
4	The company use automated customer service option, such as live chat, video conferencing and email.					
5	The company adopts any ICT system to receive any complaints from customers.					
	Cost	**V. Low**	**low**	**Medium**	**High**	**V. High**
1	In order to reduce the overall supply chain cost the company uses digitalized (automated) system to optimize warehousing storage space, reduce stocked item damage & obsolescence.					
2	The company uses automated system in order to minimize (decrease) order related costs associated with issuing purchase order.					
3	The company uses any automated system to reduce transportation & Shipment cost					
	Data Accessibility	**V. Low**	**low**	**Medium**	**High**	**V. High**
1	The company share inventory information electronically					
2	The company share market information data for all stakeholders					
3	The company share demand & sales data electronically					
4	ECX has un ability to provide fast responses to customers request or inquiries of data electronically.					
5	All members of the chain access information (data) any time anywhere					
	Agility/Flexibility	**V. Low**	**low**	**Medium**	**High**	**V. High**
1	The company has digitalized supply chain is flexible (coup up with changes) when emerging new technologies.					
2	The company has Flexible procurement system with internal enterprise procedure provide unique response for immediate changing of user department requirements digitally.					
3	The company has sourcing flexibility which is the ability of procurement function to exploit different options as a customer requirement changes.					
4	The company supply chain is capable to react internally & externally toward market changes.					

Part III: - To identify the major barriers to digital Supply Chain Management practice

Please indicate your level of agreement using a 5 point likert scale from 1-5, where 1= strongly disagree, 2= disagree, 3= neutral, 4=agree, 5 very agree

NO	Barriers to digital Supply Chain Management practice	V. Disagree	disagree	neutral	agree	V. agree
A	**Social and Cultural barriers**					
1	Lack of popularity for online procurement and sales					
2	Lack of external pressure from suppliers					
3	Lack of awareness of e-procurement benefits					
4	Linguistic barriers					
B	**Technical barriers**	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Lack of internet security					
2	Lack of digitalized supply chain infrastructure					
3	Lack of qualified staff					
4	Increase innovations and new technologies					
C	**Economical barriers**	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Lack of financial infrastructure					
2	Unclear benefits from digitalized supply chain adoption					
3	Cost too high					
4	Competitive pressure					
5	Lack of secure payment infrastructure					
D	**Political barriers**	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Changing government rule & regulations					
2	Change in government policy					
3	Low level of readiness among government institutions					
E	**Organizational barriers**	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Difficulty in changing the existing working procedures					
2	Lack of management support					
3	Organizational resistance to change					
4	Limited use of internet					
5	Limited use of internet banking and web portals					
F	**Legal and regulatory barriers**	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Absence of legal and regulatory systems					
2	No simple procedures and guidelines					
3	Lack of digitalized supply chain standards					
4	Lack of e-trading legislations					

Part IV: - identify the enablers to digital Supply Chain Management practice

Please indicate your level of agreement using a 5 point likert scale from 1-5, where 1= strongly disagree, 2= disagree, 3= neutral, 4=agree, 5 very agree

NO	Enablers to digital supply chain management practices					
	Technological Enablers	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Warehouse management system software package					
2	Wireless technologies like barcodes, radio frequency identification tags (RFID)					
3	Sourcing software like SAP, ORACLE					
4	Using e-procuremnt					
	Top Management Commitment	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Support the organization climate for adopting new technologies.					
2	Create necessary infrastructure within the organization					
3	Provide financial support					
	Legal ground	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Adoption of legal and regulatory systems					
2	Preparing procedure and guideline in order to automate the supply chain					
3	Using legally permitted & activated supply chain software					
	Human Resource	**V. Disagree**	**disagree**	**neutral**	**agree**	**V. agree**
1	Provide training					
2	Research & development program					
3	Using legally permitted & activated supply chain software					

Part V: - What is the role of ICT on Supply Chain Management

Please indicate your level of agreement using a 5 point likhrt scale from 1-5, where 1= very low, 2= low, 3= Medium, 4=High, 5 Very High

NO	role of ICT on Supply Chain Management	V. Low	low	Medium	High	V. High
A	**Transparency**					
1	ICT bring fair competition in a supply chain (Procurement).					
2	ICT technologies minimize corruption & increase accountability.					
3	ICT technologies in the supply chain minimize data distortion among supply chain members.					
4	Supply chain data are transparent & accurate.					
B	**Cost**	**V. Low**	**low**	**Medium**	**High**	**V. High**
1	ICT technologies in the supply chain eliminate transactional cost.					
2	ICT in supply chain management results in spreading of value adding activities.					
3	Using ICT technologies in the supply chain enhance better utilization of capital					
C	**Integration**	**V. Low**	**low**	**Medium**	**High**	**V. High**
	Using ICT technologies in the supply chain optimize the overall performance of the chain					
	Using ICT technologies create integration among internal & external supply chain members.					
	Using ICT technologies in supply chain can accesses real time information exchange.					

Is there any additional major barriers to be mentioned which adversely affect the role of digital supply chain managements ECX? _____

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Is there any additional major Enablers to be mentioned which positively affect the role of digital supply chain managements ECX? _____

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Please write any additional points to be considered in this study_____

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Thank You!