THE EFFECT OF BUYER SUPPLIER COLLABORATION ON SUPPLY CHAIN RESILIENCE: THE CASE OF SELECTED FEDERAL HOSPITALS IN ADDIS ABABA ETHIOPIA

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Declaration

I, the undersigned, hereby declare that the work which is being presented in this thesis entitled the effect of buyer supplier collaboration on supply chain resilience: the case of selected federal hospitals in Addis Ababa, Ethiopia is the original work of my own, has not been presented in any of other university and that all sources used for the thesis have been duly acknowledged.

Name: Asrar Hassen

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Date: _____

Certification

This is to certify that **Asrar Hassen Mohammed** has carried out this research work on the topic entitled "**the effect of buyer supplier collaboration on supply chain resilience: the case of selected federal hospitals in Addis Ababa, Ethiopia**" under my supervision. This work is original in nature and it can be submitted for the partial fulfilment of the requirements for the award of the degree of Masters of Art in Logistics and Supply Chain Management.

Dr. Busha Temesgen (PhD)

Signature: _____

Date: _____

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Acronyms and Abbreviations

COVID: Coronavirus

EDI: Electronic data interchange

EKGH: Eka Kotebe General Hospital

EPSS: Ethiopian Pharmaceutical Supply Service

HCSCR: Health Care Supply Chain Resilience

MOH: Ministry of Health

RDF: Revolving Drug Fund

RBV: Resource Based View

RDT: Resource Dependent Theory

PSCM: Pharmaceutical Supply Chain Management

SC: Supply Chain

SCC: Supply Chain Collaboration

SCM: Supply Chain Management

SCR: Supply Chain Resilience

SPSS: Statistical Package for the Social Sciences

St Paul MMC: Saint Paul Millennium Medical Collage

WHO: World Health Organization

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Abstract

The study aimed to assess the effect of buyer supplier collaboration on supply chain resilience: the case of selected federal hospitals in Addis Ababa, Ethiopia. The study used a quantitative methodology with explanatory study design to test the research hypothesis. Primary data were collected through questionnaire from employees, hospital administrators and supply chain managers of the hospitals and key supplier of the case companies. A total of 112 questionnaires were administered to EKGH, SPMMC and selected two EPSS branches staffs. From the total of 112 administered questionnaires for the quantitative study, 106 were returned which showed an overall response rate of 94.6%. Data collected through questionnaire were analyzed by means of descriptive statistics such as frequency and mean. And also, correlation analysis was used so as to assess the relationship between buyer supplier collaboration and supply chain resilience. Multiple regression was employed to test the hypothesis of research. The findings from the study revealed that buyer supplier collaboration is positively related to supply chain resilience. And also found that buyer supplier collaboration is a statistically significant predictor of the of the supply chain resilience of the case organizations. Based on the findings recommendations were forwarded that the hospitals under investigation has to maintain their practice of collaboration to sustain their supply chain resilience. And also recommended that the hospitals shall make an effort to increase collaboration practice with the suppliers towards long term, strategic and full-fledged form of collaboration for maintaining steady and continuous supply chain.

Keywords :-Disruptions, Collaboration, Buyer–supplier collaboration, Supply chain resilience

CHAPTER ONE

INTRODUCTION

This chapter presents the background of the study, statement of the problem, research question, the objective of the study, the significance of the study, the scope of the study, limitation of the study, definition of terms, and organization of the study.

1.1 Background of the Study

Nowadays, supply chain is surrounded by various causes of disruptions, including natural disasters like floods, earthquakes, and pandemics as well as man-made adversities like terrorism and political instability, all of these are examples of the turbulence that can affect the supply chain (SC) process as a whole. In this rapidly evolving and complex world firms must act as part of supply chain grid in order to survive to such unanticipated events (Qazi et al., 2022).

According to Alajmi et al., (2021) due to this risks of disruptions supply chain today need to get focus better than any other time, specially the health care supply chain, since the theme of the healthcare supply chain is saving lives, which sets it apart from other industries and making it challenging to manage. Hospitals must strike a balance between the cost of goods and the right amount of inventory while providing high-quality patient care. Having stock out not only aches health care industry bottom lines and day-to-day operations, but it also drastically raises patient healthcare costs, lowers their quality of care, and even puts their lives in danger.

Given that the supply of pharmaceuticals, a strategic good, is subject to more significant risks and vulnerabilities in developing countries with high levels of economic, social, and political volatility (Jaberidoost et al., 2013).

The impact of COVID-19 in Africa has overwhelmingly revealed the vulnerabilities of the health care systems capabilities for local health security and resilience. African health

systems have been heavily overburdened during the COVID-19 pandemic by a combine reason of high import dependence, low purchasing power leading countries to be outbid for resources and relatively low local manufacturing capabilities seen in the continent. The resultant supply chain crisis has shown the stakeholder's role to tackle the problems (Banda, Geoffrey *et. al*, 2021).

Ethiopia cannot be considered an outlier country to face challenges regarding supply chain disruption. The nation's political and economic unrest and the coronavirus outbreak are the main risk factors. Ethiopia's healthcare system was severely overburdened by coronavirus (COVID-19), making it difficult to handle even in a well-prepared setup. Decreased manufacturing capacity, export restrictions, and national stockpiling impact the global pharmaceutical supply chain (Jifar et al., 2022).

The political and economic sanctions put on the country would also have a detrimental effect on the robustness of the pharmaceutical supply chain and raise its vulnerability to various fluctuations. Even though these products are purportedly exempt from political and economic sanctions, they can still have negative effects because of transportation restrictions, cash transfer hitches, foreign currency shortage and investment restrictions (Jifar et al., 2022).

Because of the increased frequency and severity of unanticipated adverse events, researchers and practitioners have shifted from a standard risk management method to a resilience approach which is referred as supply chain's ability to withstand and quickly return to its pre-disturbance state, has been touted as a risk reduction strategy for the past years (Qazi et al., 2022) and (Alfarsi et al., 2019) .

Today the new source of business competitiveness lies outside the walls of organizations, and is determined by the company ability to collaborate with its supply chain partners, including suppliers, distributors, wholesalers, retailers, and end customers (Okon, 2018). Collaboration aids a corporate organization to operational efficiency, including lowering expenses and inventories, and raising customer satisfaction levels (Bastani et al., 2021). According to Shin et al., (2019) buyer supplier collaboration is a buyer supplier business strategy where

members agree to share knowledge, resources, rewards, and responsibilities in order to achieve goals, as well as to invest resources, attain objectives, and to make decisions and resolve issues jointly.

Scholars often regarded supply chain collaboration (SCC) as a crucial component of controlling business risks associated with supply-related disruption because when a calamity strikes, the supply chain behaves like a neural network, and its traditional models become ineffective due to the unavoidable and unknowable pressures (Bastani et al., 2021). Dung, L.T., (2015) have emphasized that collaborative strategies have been found to provide a wide variety of advantages to increase competitiveness and performance of the firm in terms of better cost management, faster delivery, better resource management, better risk management, and improve the ability to provide and serve the customers by achieving the firm objectives.

According to Scholten and Schilder (2015) a successful buyer supplier strategy contains basic dimensions (incentive alignment, information sharing, collaborative communication, decision synchronization, goal congruence, resource sharing, knowledge creation) that are important to maintain long-term relationships and increase supply chain resilience through increased agility (velocity, flexibility and visibility). So in order for firms to maintain and sustain their competitiveness they must take into account this collaborative dimensions in their day to day activity.

According to Qazi et al., (2022) effectively responding to changes in the supply chain's internal and external environment is essential and it is everyone’s responsibility within the supply chain network. While all stakeholders play an important role in improving supply chain management and developing a resilient supply chain, there is limited empirical research on suppliers' and buyers' connections, particularly with regard to supply chain resilience (SCR). This study tries to show how such alliance in the form of buyer-supplier collaboration affects the resilience of a supply chain.

1.2 Statement of the Problem

The pharmaceutical industry is one of those that embrace a multifaceted number of stakeholders in the complex supply chain world where medical products move back and forth constantly and seamlessly with the aim of saving lives. The interruptions in these products might have a detrimental operational and financial impact on the health sector, increasing costs and lead times. Considering the severity of the impacts of disruptions in supply chains, building supply chain resilience, and assessing the state of the resilience of the supply chain is of utmost importance (Haque and Islam, 2018) and (Darouich Chaimaa and Dhiba Youssef, 2020).

According to Bastani et al., (2021), the sustainability of pharmaceutical supplies is crucial. Hospitals can engage in extensive interactions and build cooperation with suppliers and manufacturers to lessen the effects of interruptions and improve supply chain resilience, due to the supply chain's growing vulnerability to risks and the failure of conventional supply chain risk management techniques, there is a need to improve risk management in the supply chain with the new idea that can help to address such disruptive events which motive the researcher to study such topic.

Ethiopia has many business industries with a huge supply chain networks, the health sector in particular its expense has reached more than 50 billion birr but still the country is facing interruption of drugs and supplies that render the health service (Ethiopia's Health Financing Outlook). According to Senbeta, T. (2020), the order fill rate of the Ethiopian pharmaceutical supply service (EPSS) is very low, which is less than 30% from 2018-2020 G.C for revolving drug fund (RDF), and 40-50% for program items. The above problems were mainly derived by currency deficit, lack of collaborative relationship between stakeholders and poor supplier's capacities.

Eka Kotebe General Hospital is one of the governmental hospitals that provide emergency treatments in the country for the past three years. According to the quarter report of the hospital made in early 2014 E.C, the average supply fill rate of both RDF and program drugs showed that there is a 37% supplier fill rate from its main supplier (EPSS hub 2), which is by

far lower than from what is expected. This exemplifies and lead to that ultimately incur additional 11,493,000 birr the hospital to purchase items from private suppliers through Performa and open bid to provide adequate service and in order to avoid disruptions even by performing under difficult situations in the presence of lack of notifying means and delayed notifications provided by EPSS regarding stock out items to the hospitals before they are stock out from their stock.

This phenomenon drags down the private suppliers due to inconvenience and absence of contingency making them unable to fill the gap when they are utmost needed by hospitals when EPS fail to provide the demand.

Based on informal interview with DSM team of Saint Paul Millennium Medical College (St Paul MMC) and Eka Kotebe General Hospital (EKGH), the collaboration among EPSS and the two hospitals has become minimal during the pre-era of COVID-19, prevailing; there is poor information sharing, delayed decision making and coordination among central EPSS and its hubs and hospitals regarding availability if items rendering the supply of pharmaceuticals, that show some improvement in the era of COVID-19.

According to Abagero, A. *et al.* (2022), during the COVID-19 era the Government of Ethiopia established a national COVID-19 response and coordination platforms, and implemented response measures in collaboration with funders, business sector partners, and development partners, to put this platform into action and to make measures. Massive pandemic response efforts have been put in place by the national preparedness and response coordination platform through an emergency operation center that improve the overall supply system.

This lead to improvement in collaboration between hospitals and EPSS as well as main stakeholders and help the hospitals and EPSS to prepare, withstand and recover from supply chain disruptions during the COVID era. But what next is the main focal point for future continuity and sustainability of this supply chain when performing in conditions when there is no pandemics but still having glitches in the supply chain due to nation's political and

economic unrest, currency deficit and so on. Ethiopia's pandemic response challenges, however, have not been adequately studied and documented. Studies on how to strengthen Ethiopia's healthcare system's ability to withstand pandemics and different crisis in addition to understanding about pandemic response difficulties is utmost important and can be used as a springboard for future preparedness. since generating and maintaining resilience is a process in itself rather than a one-time occurrence.

There are several studies that point to collaboration as an SCR enabler. Yet, studies particularly concentrating on collaboration as an enabler of SCR are hard to come by, Scholten and Schilder (2015) argue that while collaboration enables SCR, exactly how this is achieved is not extensively understood and also do not give full picture how this is done. Some researchers like Yirgalem.A (2019), have conducted studies in Ethiopia regarding buyer supplier collaboration effect on organizational performance but they fail to address its impact on supply chain resilient.

To the researcher knowledge, there hasn't been any research was done on supply chain resilience in Ethiopian context explicitly addressing buyer-supplier collaboration as a risk-reduction strategy. These observations and concerns were what motivate the researcher to conduct such research.

1.3 Research Question

The study aims to examine the effect of buyer supplier collaboration on supply chain resilience: the case of selected federal hospitals in Addis Ababa Ethiopia. To this end, the following research questions is formulated.

1. What is the effects of buyer-supplier collaboration on supply chain resilience?

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of this study was to examine the effect of buyer supplier collaboration on supply chain resilience: the case of selected federal hospitals in Addis Ababa, Ethiopia.

1.4.2 Specific Objectives

The specific objectives of the study were:

1. To examine the effect of information sharing on the supply chain resilience.
2. To examine the effect of collaborative communication on supply chain resilience.
3. To examine the effect of resource sharing on supply chain resilience.
4. To examine the effect of goal congruence on supply chain resilience.
5. To examine the effect of decision synchronization on supply chain resilience.
6. To examine the effect of joint knowledge creation on supply chain resilience.
7. To examine the effect of incentive alignment on supply chain resilience.

1.5 Significance of the Study

The main significance of the study is, from a practical standpoint, this study will add to the experience of the health system's glitches on the availability, cost, and quality of medicines available to patients, as well as in ensuring the chain's sustainability by identifying the main causes of drug supply hindrances and assisting stakeholders in using the findings to improve their collaboration for better outcome and to take necessary measures to overcome drugs supply insufficiency in the country.

And from a theoretical standpoint, the outcomes of this study can add to the limited current literature on collaboration and supply chain resilience in Ethiopia.

Finally, this study and its findings may particularly contribute in providing additional knowledge to existing organizations to understand supply chain resilience practice and its influence on sustaining pharmaceutical supply chain practice. It also serves as a springboard for future researchers, scholars, and academics concerned in performing further research on the related topic.

1.6 Scope of the Study

The study examines the effect of supply chain collaboration on supply chain resilience, the case of selected federal hospitals in Addis Ababa, Ethiopia.

Based on the review, several researchers utilized different metrics to identify dimensions for measuring supply chain collaboration and supply chain resilience. According to (Jüttner and

Maklan, 2011; Botes et al., (2017) and Scholten and Schilder, 2015), resilience identified in terms of capacities, which correspond to three elements: agility which include (Flexibility, Velocity, Visibility). Also Umar and Wilson, (2021) and Cao and Zhang (2011) identify seven dimension of supply chain collaboration, i.e. incentive alignment, information sharing, collaborative communication, decision synchronization, goal congruence, resource sharing and knowledge creation.

The study was focused on the seven common dimension of supply chain collaboration to examine whether there is collaboration between the case companies and their suppliers i.e. incentive alignment, information sharing, collaborative communication decision synchronization, goal congruence, resource sharing, knowledge creation as independent variable and the three supply chain elements; agility which include (Flexibility, Velocity, Visibility) was considered as dependent variable in the study to examine whether there is effect of collaboration on the resilience of supply chain in the case companies.

1.7 Limitation of the Study

The study was focused only on Ethiopian federal hospitals that provided quality health care and those that have been treating emergency cases by facing high challenges during the past years under the Ethiopian Ministry of Health and do not include regional hospitals and other federal hospitals due to time constrain.

Another drawback of this study was time constraints. That is the research sample is not included all supply chain participants involved in the supply chain network that play tremendous role in collaboration efforts, such as private importers and exporters, manufacturers. Furthermore, the research is limited to the upper stream collaboration of a supply chain. Therefore, internal collaboration, downstream collaboration, horizontal collaboration of the case companies is not included.

1.8 Operational Definitions

Supply Chain (SC): it refers to the complete process of acquiring, storing, and distributing of substance used in diagnosis, treatment, or prevention of disease and for restoring, correcting, or modifying organic function (Huang et al., 2015).

Supply chain collaboration (SCC): refers to the establishment of close, long-term partnerships in which supply chain participants collaborate and share information, resources, and risk to achieve common objectives (Cao and Zhang, 2011) .

Buyer supplier collaboration: refers to buyer-supplier business process that includes information and resource sharing, goal congruence to work jointly to plan and execute SC operation and improve the efficiency and effectiveness of the supply chain (Shin et al., 2019).

SC resilience (SCR); refers to the capability of the SC to withstand, adapt and recover from SC disruptions and maintain the continuity of material, information, and cash flow (Wang et al., 2022).

1.9 Organization of the study

The research paper was organized into five chapters. The first chapter contracts with the background of the study, statement of the problem, research question, objectives of the study, significance of the study, delimitation, and limitations of the study, and operational definitions of terms used. The second chapter discusses the review of literature related to the subject matter of the study. Chapter three gives a detailed account of the research methodology involving research design, study site, study population, sample and sampling technique, measures, data collection procedure, method of data analysis, and ethical considerations. Chapter four presents the result and discusses the findings. The last chapter presents the summary of findings, conclusions, recommendations and suggestion for future research.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

In this section theoretical and empirical literature review is discussed and under theoretical literature review, overview of Ethiopian pharmaceutical supply chain, buyer supplier collaboration, supply chain disruption, supply chain resilience, health care supply chain resilience, buyer supplier collaboration and supply chain resilience, buyer supplier collaboration dimensions and supply chain resilience elements are included and also theoretical frame work of the study presented.

Under empirical literature review, review of empirical Studies on supply chain collaboration and supply chain resilience present and finally, conceptual frame work is discussed and hypothesis developed.

2.1 Theoretical Review

2.1.1 Supply Chain

A supply chain is described as a series of operations that facilitate the material movement from upstream to downstream alongside SC network. Pharmaceutical supply chain (PSCM), which is one of the largest and fastest growing sectors in the world which is estimated to spend hundreds of millions of dollars annually, is the main part of supply chain world that need more focus now than before due to numerous reasons. This sectors involve the management of product supply from raw material sourcing to active ingredient manufacturing through formulation, packaging and distribution to the patient for saving millions of lives (Nega, M. (2017).

According to Scala, B. and Lindsay, C.F. (2021), healthcare professionals in the public and private sectors have different approaches for managing SCs. The many healthcare systems throughout the world have their unique issues in terms of resource management. One thing

they all have in common is that they all differ from commercial SCs because of how vitally important it is to save lives.

Systems for pharmaceutical supply chain management are gaining more and more importance as a result of globalization and intense competition as it involves a network of different stakeholders including, supplier, manufacturing, distribution and logistics facilities of various pharmaceutical products that required integration of all activities involved in medicines selection, quantification, procurement, warehousing, distribution and use. An effective pharmaceutical supply chain relies on collaboration among independent parties to pursue the shared objective in the face of shifting market conditions rather than on any one participant's autonomous effort (Huang et al., 2015)

2.1.2 Buyer Supplier Collaboration

According to Cohen et. al., (2004) collaboration is the process through which businesses within a supply chain interact to achieve common goals by exchanging ideas, information, knowledge, risks, and rewards. Practically speaking, coordination and collaboration between members of a supply chain within the upstream and downstream are challenging due to demand and supply volatility and a lack of communication that is amplified by subsequent links in the chain.

According to Ho, T.et al, (2020) SCC is described as the inter-organizational procedures that occur within and between supply chain members in order to produce a smooth and synchronized supply chain that leads to enhanced responsiveness and performance to satisfy consumers. These activities are built on shared risk and reward, as well as common aims and trust.

Buyer supplier collaboration refers to buyer-supplier business process that includes information and resource sharing, goal congruence to work jointly to plan and execute SC operation and improve the efficiency and effectiveness of the supply chain. *B*uyer and supplier creates a strategic partnership that ultimately helps both parties achieve business objectives and achieve what they intended to do (Shin et al., 2019).

Supply chain collaboration is a complex idea that is incorporated into inter-firm interactions. These ties range in strength from straightforward arms-length agreements to high level alliances, including the practice of "coopetition," in which businesses work together with their rivals. Information sharing, joint planning, goal alignment, cooperative problem solving, risk and reward sharing, and resource sharing are all examples of supply chain collaboration behaviors. Through trust and dedication, collaboration may keep disparate businesses together and help them develop the skills needed for resilience (Umar and Wilson, 2021).

Supply chain collaboration empowers the advancement of synergies among partners, encourages joint planning and forecasting as well as energizes real-time data exchange that are significant for prepare, respond to and recover from supply chain disturbances while reducing their impact (Umar, M.; Wilson, M. 2021).

According to Dung (2015), it is widely acknowledged that effective buyer-supplier relationships are essential to a firm's performance, buyer-supplier collaboration is a crucial concept when examining the more general concept of SCR. Since it is increasingly imperative in organizations because of its commitments to success of supply chain management and organization competiveness within the worldwide economy.

These collaborative relationships can be divided into two main categories, vertical and horizontal collaboration. During disruption, companies work horizontally with support providers, governments, and competitors. Likewise, at the vertical level, these companies will inevitably work with suppliers and buyers as well (Umar and Wilson, 2021).

According to (Botes et al., 2017), collaboration between members of the supply chain could take place either vertical (suppliers or customers), horizontal (competitors and other organizations), or internal by integration of various internal interfaces (business functions). Additionally, investing in information integration, process integration, resource integration,

and reporting of performance indicators to assure accountability make vertical collaboration with suppliers an expensive supply chain exercise.

The core of achieving a successful supply chain is through the effective management of buyer-supplier relationships. Therefore, in order for buyers and suppliers to reach a more sustainable and successful relationship, both have to realize the benefit they will gain from managing such relation.

2.1.3 Supply Chain Resilience (SCR)

One of the most elusive concepts in supply chain management is SCR. A system's resilience is its capacity to bounce back from a disruption to its prior state (or a superior one). Meaning it as "the adaptive capability of a supply chain to prepare for and/or respond to disruptions, to make a timely and cost-effective recovery, and thereby progress to a post-disruption state of operations - ideally, a better state than prior to the disruption." so the system developed resilience when it became capable to withstand, adapt and recover from disruptive events in order to meet customer demand. The adaptive resilience capabilities in the supply chain has been constructed along three separate disruption phases: "readiness," "responsiveness," and "recovery." (Tukamuhabwa et al., 2015).

Juan et al., (2022) state SCR as a well-designed SC network with proactive and reactive capabilities that enables the SC members to lessen the likelihood of disruptive events and their effects in order to move the organization toward a stronger and more sustainable state by preserving the continuity of resources like materials, information, and cash flow. In order to ensure the integrity of cooperative structures and procedures, it is necessary for the focal business to collaborate with its suppliers and clients (Katsaliaki et al., 2022).

SCR also focuses on the system's ability to respond to transitory disruptive incidents. These interruptions produce instability and unpredictability in the supply chain, which collectively pose a danger to existing operations. The labels disruption, crisis, and even calamity are employed depending on the degree of these threatening situations (Jüttner, U. and Maklan, S 2011).

SCR act as reactive and proactive capacities, corresponding to two dimensions: agility and robustness. Collaboration within the SC, which pools SC resources to offer a survival capability and sustainability, is another essential component for fostering resilience (Juan et al., 2022). Most of the researchers identify four element/dimension of SCR (Jüttner, U. and Maklan, S (2011) and Scholten and Schilder, (2015)) stat that the four most commonly cited capabilities of SCR collaboration and agility (flexibility, velocity, visibility).

Numerous resilience strategies have been proposed, such as a quantitative strategy for selecting suppliers and assigning orders after a disruption, as well as temporary source diversification in the case of an interruption. In the wake of a disruptive occurrence, significant supply chain stakeholders must anticipate, prepare for, and comprehend the scope of a disruption. They must devise quick response strategies and restructure their resources to improve capabilities and adjust to the results. By modifying and updating capabilities in this way, businesses are better equipped to recover from disturbances and increase their resilience because resilience of supply networks is influenced now in a days by a number of variables (Raj et al., 2022).

2.1.4 Buyer Supplier Collaboration and Supply Chain Resilience.

According to numerous studies, recognized collaboration within the supply chain is crucial for addressing supply chain disruptions through innovation and problem-solving, a business can deal emergent difficulties (Madhavika et al., 2022) and (Juan et al., 2022).

Businesses have been working to enhance the excellency of their internal supply chain activities including sourcing, production, and logistics for a number of years. Moreover, it was shown that a company's receptivity to interacting with its upstream and downstream partners had showed a positive contribution to its performance success. In order to increase efficiency, organizations must concert on the idea of collaboration (Madhavika et al., 2022).

Because supply chain resilience is a network-wide, interorganizational concept, its capabilities must reflect the parties' tendency to align forces in the event of a risk occurrence. Furthermore, teamwork has been described as the glue that holds supply chain organizations

together in a crisis. It prohibits opportunistic conduct on the part of individual parties, which would have a negative impact on the overall system's reaction capabilities (Jüttner, U. and Maklan, S. 2011).

Collaboration within the SC, which pools SC resources to offer a survival capability and sustainability, is one of the important factors for developing resilience since generating and maintaining resilience is a process in itself rather than a one-time occurrence (Juan et al., 2022). While SC resilience can be classified into internal, supplier, and customer resilience (external) from a practical standpoint, it is more challenging for businesses to manage external activities and bounce back from disruptions with their suppliers and customers in uncertain environments than it is for them than to manage internal operations (Wang et al., 2022).

While external resilience is recognized as the important capability of the focal firm it is acknowledged that the focal firm's and its SC partners' capacity to maintain upstream material supply and downstream product delivery after interruptions is crucial for the firm's survival and performance improvement (Wang et al., 2022).

A number of resilience scholars point to collaboration among the organizational capabilities that offer the potential for overcoming turbulence and disruption in the supply chain (Christopher and Peck, 2004; Sheffi, 2005; Juttner and Maklan, 2011). visibility, flexibility, and shorter lead times are just a few of the advantages of supply chain collaboration, even if this advantage have been there it may not always be feasible to build long-term working relationships with all supply chain partners. A distinct business necessity and a convergence of interests should be the driving forces for conducting collaborative activities with suppliers. Reduce the effect of any supply chain interruptions since there is a clear business necessity and there are common interests (Scholten and Schilder 2015).

Purchasing organizations must undertake resilience investments in order to deal with disruptions, yet doing so would be too expensive. As a result, buying organizations must make trade-offs when allocating limited resources in order to get the best results and

maximize outcome. The building blocks of formative resilience are the integration and coordination of resources as they appear in supply chain operations (Wang et al., 2022).

2.1.5 Buyer supplier Collaboration Dimensions

Seven key components or elements that support supply chain capabilities might be regarded to make up the framework of supply chain collaboration. Those are information sharing, goal alignment, decision synchronization, collaborative communication, joint knowledge creation, resource sharing, and incentive alignment have been recognized by the most widely cited publications on supply chain collaboration as SCC dimension (Cao and Zhang, 2011) and (Scholten and Schilder, 2015).

2.1.5.1 Information Sharing Dimension

The capacity and desire of an organization to represent data in both strategic and tactical form across all organizational units that shape the SC is described as the information sharing. Due to the network-oriented structure of modern supply chain competitiveness, collaboration between supply chain participants needs a change from old commercial conventions toward the exchange of inventory, demand, planning, and financial information. Implementing information and communication technologies, such as electronic data interchanges and the internet, to facilitate the simplicity and correctness of the information flow between the cooperating entities, is often how this complexity is overcome. (Botes et al., 2017) and (Wee, S. *et al.* 2016)

According to Scholten and Schilder (2015), information sharing refers to the degree to which a firm shares a range of pertinent, precise, complete, and confidential information in a timely manner with its supply chain partners. Given the multifaceted nature of information sharing, Botes et al., (2017) assigns four aspects to information: content (the type of information), frequency of information sharing, detail of the information, and "up-to-datedness" of the information. These four factors are taken as a whole as the essential aspects to determine how well information is transferred in SCC.

Today's supply chains are increasingly vulnerable, and risks are a major worry, according to Shahbaz et al., (2018), information sharing is a useful technique for minimizing uncertainty in addition to having a favourable impact on performance. In relationships between buyers and suppliers, communication is crucial. It may be regarded as a crucial component of the organization since it increases visibility and lowers ambiguity.

2.1.5.2 Collaborative Communication Dimension

According to Scholten and Schilder (2015), Collaborative communication is the contact and message transmission process among supply chain partners in terms of frequency, direction, mode, and influence strategy. Cao and Zhang, (2011) also define it as the process of message and contact exchange between supply chain partners that considers frequency, direction, method, and influence strategy is known as collaborative communication. The presence of close interorganizational interactions is often indicated by open, regular, balanced, two-way communication at multiple tiers.

In order to build trust between supply chain partnerships, it is crucial to disseminate relevant information, which serves as the primary function of operational data and has a favorable impact on performance in a variety of ways, including higher service levels, improved customer response, lower costs, and lower levels of complexity. This requires openness from both buyers and suppliers during interactions. Access to confidential information between business partners allows them to track the development of goods and orders as they move through different supply chain processes (Botes et al., 2017) and (Cao and Zhang, 2011).

2.1.5.3 Resource Sharing

Leveraging assets, capabilities and investing on SC partners is what resource sharing is all about. It contains tangible resources like machinery for industry, buildings, technology, design and improvement processes, assigning employees to manage collaborative processes, sharing technical support, sharing different types of equipment like computers, networks, and machines, as well as gathering and utilizing financial and non-financial resources like time, money, and training, are all resources that should evolve around SC partners (Alhanatleh, H et al.,2021).

Due to resource sharing importance, businesses are able to lend resources, expertise, fixed assets, as well as money to assist operations. Sharing resources is a typical kind of cooperation. In the retailing area, practices such as vendor managed inventory (VMI) allow suppliers to evaluate stock-level data, via Electronic Data Interchange (EDI), and take the compulsory replenishment action (Cao and Zhang, 2011).

2.1.5.4 Goal Congruency Dimension

Goal can be defined as the extent to which supply chain members could have a solid understanding of their own attainable goals and are confident in their ability to meet the supply chain objectives established to satisfy a demand. Goal congruency essentially necessitates supply chain collaboration, which will necessitate some mutual understanding and agreement inside a systems belief, which includes, values belief and best practices where they function (Wee, S. et al. 2016) and (Cao and Zhang, 2011).

True goal congruence occurs when supply chain partners think that their goals may be realized as a direct result of working toward the goals of the supply chain, or when they feel that their goals do not entirely correspond with those of the supply chain (Cao and Zhang, 2011).

It is possible to clarify goal congruency by looking at how much the SC actors are aware that the SC accepts their corporate goals and purposes. There is a concordance in the goals inside the SC when the firm knows that attaining its own goals must take into consideration attaining the goals of the whole SC. The level of objective agreement between the SC parties might serve as a signal for goal congruency (Alhanatleh, H et al.,2021).

2.1.5.5 Joint knowledge Creation Dimension

According to Alhanatleh, H et al., (2021), sharing of knowledge dimension is the extent to which SC partners can develop a better perception and respond to the competitive environment by working together. Additionally, the sharing and absorbing of knowledge among SC partners ensures the SC's overall long-term competitiveness.

In today's business environment, knowledge exchange between buyers and suppliers is crucial. Sharing information improves efficiency and effectiveness inside the organization, which benefits performance. SC partners have a common assimilation of pertinent knowledge and an understanding of how to use it as they seek out new items and gain pertinent expertise. Together, SC partners analyse client demands, find new or developing markets, and are aware of the strategies and capabilities of rivals (Alhanatleh, H et al.,2021).

According to Wee, S. et al. (2016), there are two forms of knowledge creation: The processes of gaining, searching out, and comprehending new, pertinent information are referred to as "knowledge exploration" while, the mechanism by which they use this information to advance their buyer supplier relationship's is known as "knowledge exploitation."

An organization with a longer history of mutually beneficial knowledge development partnerships can build supply chain resilience by increasing visibility throughout the supply chain since partners are familiar with the procedures and confident in finding speedy solutions to problems (Scholten and Schilder (2015).

2.1.5.6 Decision Synchronization

The ability to make decisions quickly depends on having proper preparations, gathering enough information, solving issues quickly, and adhering to ever-evolving laws, regulations, and procedures. Decision synchronisation is regarded as a two-dimensional element, referring to joint decision-making in planning and operational contexts. Through demand-driven procedures, collaborative planning seeks to balance supply and demand within a supply chain network in the context of supply chain planning and also the replenishment and fulfilment procedures pertinent to these dyadic connections are thus included in the operational context (Botes et al., 2017) , (Wee, S. et al. 2016) and (Cao and Zhang, 2011).

By coordinating choices among cooperating supply chain participants, tasks including inventory management, demand forecasting, and product selection are projected to maximize the advantages of the supply chain (Botes et al., 2017).

It seeks to synchronize choices on order placement, inventory replenishment, and order fulfilment across partners. In the meantime, each partner has their own interests and ambitions, making it often difficult to agree on issues that might lead to uncertainty. So joint decision making has developed into a crucial strategy for modern company in order to decrease this uncertainty through plans, combine information, resolve problems and develop rules and regulation and procedures. (Shahbaz et al., 2018).

2.1.5.7 Incentive Alignment

According to Cao and Zhang (2011) and Scholten and Schilder (2015)., incentive alignment, is "the process of building mechanisms together with supply chain partners to evaluate and publicize each other's performance, sharing costs, risks, and advantages."

Buyers and suppliers that collaborate are encouraged to operate in a way that is compatible with the general goals of the formal collaboration agreement by aligning incentives. Thus, it may be claimed that the principles of mutual benefit should be the foundation of the cooperative agreement between customers and providers. In a system that ties reward with effort invested, supply chain partners are encouraged to operate in a way that is consistent with their shared strategic goals and to positively contribute to the partnership (Alhanatleh, H et al.,2021).

The sharing of risk amongst cooperative partners is another essential component of incentive alignment. Collaboration between buyers and suppliers is frequently driven by a desire to share the risks and costs of supply chain interruptions (Botes et al., 2017). Incentive alignment create new systems to track and enhance one another's performance, or thinking about improving an existing system to make sure information is shared between the parties, allowing for various transparency such as benefits, efficiency, risks, and the sharing or allocation of costs among supply chain partners. In addition, that incentives are profits that should be distributed fairly among providers. (Botes et al., 2017)

2.1.6 Elements of Supply Chain Resilience

Scala, B. and Lindsay, C.F. (2021) stated that frequently, supply chain resilience is measured using elements, which foster resilient capabilities. In previous studies, these elements have been referred to as dimensions, attributes, enablers, and enhancers. This wide variation in terminology within the literature is sited to be recognized as a source of fragmentation. These differences explain the divergence in how resilience is understood, investigated and applied in the SCM context. Multiple authors have sought to standardize this terminology by referring to these characteristics as elements (Christopher and Peck, 2004), and also Juan et al., (2022).

Most of the research identify that SCR has four elements recognizing as flexibility, velocity, visibility, and collaboration that foster resilient capabilities in order to achieve SCR, based on the coordination and integration of resources covering three functional areas: (Jüttner and Maklan, 2011; Botes et al., 2017) and Scholten and Schilder, 2015).

2.1.6.1 Agility

According to Juan et al., (2022), SC agility is the capacity of a SC to swiftly adapt or react to a volatile and uncertain business environment. The key to agility is speed, which is connected to the capacity to match closely supply with demand. Agility indicates that all SC players are in sync with one another from start to finish. Most agile businesses swiftly modify their strategies to response to unforeseen developments and adapt, making their supply chains more reflective of their designs, procedures, and technology (Scholten and Schilder, (2015). Flexibility, velocity, and visibility are the three elements that make up agility. The following details these elements:

2.1.6.1.1 Supply chain flexibility

The capacity to adjust to new, diverse, or changing needs or demand is known as flexibility. It enables a business to use routine performance to achieve high non-routine compliance levels to continually improve customer satisfaction (Scholten and Schilder, 2015).

Flexibility in the context of supply chain resilience refers to a supply network's current structure and its ease of reconfiguration. This makes it possible for the supply chain to

successfully react to interruptions brought on by shifting requirements and environmental instability, which helps it manage with high levels of uncertainty. Furthermore, it is more about shared duty of two or more roles among the SC members that directly impacts the consumer. It streamlines coordination procedures and equips businesses to handle high levels of unpredictability (Botes et al., 2017).

Supply flexibility is one of the three types of flexibility and it is the capacity to quickly change production levels, raw material purchases, and transport capacity to respond to the flow of commodities. Demand flexibility, sometimes referred to as customer flexibility is the other form of flexibility which is the capacity to adapt swiftly and economically to unpredictably changing market demands and an intensifying level of environmental disturbance, both in terms of volume and variety. while, Flexibility in production refers to the ability to recombine resources quickly, decrease switching costs, and promote the development of synergies. The production flexibility enhances the response to market volatility. (Juan et al., 2022)

2.1.6.1.2 Supply chain velocity

Velocity is the rate at which SC operations must be completed in order to maintain competitive advantages, such as the time it takes for customers to respond, for buyers to make decisions, and for products to be launched (Juan et al., 2022).

Thus, "velocity" in the context of SCR refers to the rate at which a supply chain adjusts to shifting demands following a disruption. When compared to flexibility, velocity places more emphasis on how quickly a supply chain can respond to a disturbance than on its capacity to endure shifting circumstances because the supply chain's response and recovery is a priority for velocity (Botes et al., 2017).

The foundation for increasing supply chain velocity following a disruption event is the streamlining of operations, the cutting of inbound lead times, and the elimination of non-value-added time (Scholten and Schilder, 2015). In this aspect, higher supply chain velocity

results in speedier responses to market changes or events and speeds up the rate of disruption recovery.

2.1.6.1.3 Supply chain visibility

Visibility is the degree to which players within a SC may obtain information they deem crucial or advantageous to their operations. The details contain the names, locations, and legal standing of the entities passing through the SC. Therefore, it is a result of sharing relevant or excellent knowledge by a means of electronic data interchange (EDI), automated identification technologies, and information and communication technologies (ICTs) (Juan et al., 2022) and (Christopher and Peck, 2004).

Visibility has been referred to as an antecedent of supply chain resilience since it may be seen as a requirement for reacting to changes and also has a significant impact on disruption recovery. In this aspect, higher supply chain velocity results in speedier responses to market changes or events and speeds up the rate of disruption recovery. (Scholten and Schilder, 2015).

To increase visibility, underline the necessity of data standardization across supply chain participants and emphasize the demand for fast information, preferably in real time. As a result, supply chain visibility is seen as a prerequisite for prompt and effective responses to supply chain disruptions, making it a prerequisite for attaining SCR. As a result, having timely and precise insight across the whole supply chain helps businesses to detect possible disruptions early and respond and recover quickly. (Botes et al., 2017).

2.2 Theoretical Frame Work of the Study

The notable theories that have been used so far in SCR researches are the resource based View and resource dependence theory (Benjamin R 2015, Valentina. M et al., 2012, Nandi, S. et al., 2020).

2.2.1 Resource based theory (RBT) and dynamic capabilities concept

A set of physical, human, and organizational resources can be regarded as an organization's strategic resources, according to Valentina M. et al. (2012). The performance and competitiveness of the businesses can be enhanced by the synchronization of all these resources.

Firms can build relational competitive qualities with the aid of tangible and intangible resources. Knowledge capability may help firms create intangible resources and enable dynamic organizational learning for the environment. Relational capability is intended to augment the resources of alliance partners to create, extend or modify their resource bases (Nandi, S. et al., 2020). In reaction to the upheaval in the business environment brought on by globalization, technical advancements, and economic crises, the RBV emerged (Barney, 2012).

The ability to integrate, build, and reconfigure internal and external abilities to react to a quickly changing environment is referred to as dynamic capability. Dynamic capabilities are seen as learnt, repeating behaviors based in part on tacit knowledge that give businesses a competitive edge. Businesses that can reorganize and redeploy their resources in a stressful climate are better positioned to build capabilities that lessen the effects of SC disruptions (Valentina. M et al., 2012).

In uncertain environments, dynamic capabilities themselves are frequently challenging to maintain, particularly in high-velocity markets. The ideas of resilience are put to use in these situations. This shows that resilience is important for preserving dynamic capabilities and the connection between dynamically integrated skills and long-term competitive advantage (Serhiy. P et al., 2009).

Resources and capabilities, according to research, produce superior results for constructing resilience while taking into account supply chain risk concerns. In order to introduce a model that illustrates the relationship between lesser capabilities that should be deployed to enhance resilience in line with the context of the risk factors in the supply chain, researchers choose to use resource-based View theory and dynamic capability theory. They established a distinction between three categories of skills that increase resilience: collaboration with

partners, flexibility, and integration through information exchange among partners. Their empirical research revealed that supply and outside risks lessen the beneficial effects of capacity on resilience (Alfarsi et al., 2019).

A useful approach for examining how organizations organize their resources and capabilities in response to SC threats is made up of RBV and dynamic capabilities. In this light, businesses must realign their processes and resources to quickly react to changes brought on by the challenges posed by disruptions. To clarify why and how some businesses do better than others and acquire competitive advantages, RBV examines intra-organizational linkages between resources and its capabilities (Sirmon et al., 2007).

2.2.2 Resource dependence theory (RDT)

Resource dependence theory provides relationships to resources that businesses might be able to get from their surroundings, increasing their level of competition. RDT emphasizes interorganizational efforts to secure resources and lessen environmental uncertainty since it makes the assumption that an organization's performance is dependent on its environment. RDT highlights two key organizational goals: to maximize other organizations' dependence on themselves and to decrease their reliance on other organization (Nandi, S. et al., 2020).

In today's globalized world, entire SCs, instead of single firms, compete against each other. This leads to dependencies on other players to successfully operate an SC. These conditions became apparent during the COVID-19 pandemic. Due to the SC disruptions unpredicted scale and simultaneous impacts on various geographies and SC tiers, managing externalities and maintaining product flows were among the biggest challenges for SC world (Gebhardit, M et al., 2022).

RDT also offers organizations efficient control mechanisms on how to modify their structure and behavior to lessen dependent on external environment and unpredictability in their external environment. Power-based, trust-based, or legally binding collaborations, coalitions, joint-purchasing agreements, and other forms of strategic alliances are examples of such control mechanisms. Partners have a higher flexibility to adapt to market changes and consumer demands through an effective organizational supply chain structure, which helps them become more competitive (Nandi, S. et al., 2020).

Accordingly, the researcher believes that the above theories have contributed a lot and they will contribute lot for this research paper.

2.3 Review of Empirical Studies

This empirical review part tries to show empirical evidence of prior researches which elucidates about the features that the researcher trying to explain and assess.

2.3.1 Ethiopian Pharmaceutical Supply Chain

The pharmaceutical industry in Ethiopia has experienced significant growth in recent years, with an increase in the number of local manufacturers and suppliers. However, the industry still faces challenges in ensuring the availability and affordability of essential medicines, particularly during times of crisis. The COVID-19 pandemic highlighted the vulnerabilities of the pharmaceutical supply chain and the need for more resilient supply chains.

Due to the size of the country and the comprehensive nature of the health program, the public health supply chain in Ethiopia is extremely complicated. The Ministry of Health launched many attempts to overcome these obstacles, including the development of a master plan for pharmaceutical logistics and business process reengineering using the different strategy with collaborating with Ethiopian pharmaceutical supply service. In order to guarantee that the necessary high-quality medications are available at public health sector facilities with appropriate time, appropriate quantity, and at a reasonable cost. Through this the nation will attempt to increase the efficacy and efficiency of its SC (FMOH, 2009).

But still Ethiopia face challenges concerning supply chain disruption the coronavirus pandemic and the current politico-economic instability of the country which overwhelmed the health care system of many countries like Ethiopia, which make it challenging to cope with even within a well-prepared setting like well-developed countries. (Jifar et al., 2022). Now, Ethiopia health care supply chain is performing under this condition.

2.3.2 Supply Chain Disruption

When there is a disruption in the regular flow of goods through the supply chain, there may be a reduction in supply, which might result in resource scarcities and shortages. New

strategic and non-strategic suppliers are created as a result of these disruptions, necessitating a new type of buyer-supplier relationship (Moeller et al., 2006).

According to Scholten and Schilder (2015), any potential or actual interruption to the movement of commodities, materials, and/or services can be supply chain disruptions. SC disruptions can be classified as random events of natural disasters or pandemic, accidents (e.g. machine breakdown or fire) or intentional disruptions (such as acts of terrorism or sabotage).

Disruptions in the pharmaceutical and healthcare industries disturb the ongoing provision of patient care and can have particularly massive consequences. In fact, interruptions to other supply chains often just result in firms losing money and potential market share, but disruptions to pharmaceutical and healthcare supply chains can endanger the lives of a large number of peoples crave quality health care (Nega, M. 2017).

2.3.3 Health Care Supply Chain Resilience (HCSCR)

The term "health supply chain" refers to the web of interconnections that exists between the procurement of the necessary raw materials for product manufacture and the distribution of products to health systems so that clinician teams may provide uninterrupted patient care. An interruption to any entity in this network of links at any time throughout this process would result in a supply chain disruption and reveal a point of supply chain fragility that put the lives of many in danger (Snowdon, A., et al, 2022).

Healthcare resilience, as described by Garcia-Perez, A. et al. (2023) it is “the ability of healthcare systems to flourish under unpredictable conditions”, has been enduring cause of concern in the past years for the health industry. According to Mandal (2017), HCSCR is the ability of health care supply chain teams to make sure that, in the event of a disruption, goods, equipment, and supplies are accessible to allow clinician teams to provide patients with medically essential treatment in secure working conditions.

The resilience of the health care supply chain is linked to health protection, the quality and safety of care settings, and the ability to provide quality of patient care. Quality healthcare and health supply chain strategy must be viewed as highly interrelated characteristics of healthcare systems that are crucial to the system's ability to offer patient care in safe working conditions. The health supply chain is a network of interactions that extends from the procurement of raw materials necessary for product manufacture through the distribution of products to health systems in order for clinician teams to provide patient care (Snowdon, A., et al, 2022).

The significance of resilience in healthcare SCs is to guarantees continuity in the capacity to offer uninterruptible services to patients, which might be disastrous in the absence of such continuity for the survival, but the healthcare supply chain has only been properly addressed in the last 20 years as a result of multiple tragedies. Even though that earlier studies have recognized pandemics as a SC risk, designation of pandemics as a low probability, high-impact disruptive event implies there are little considerations of resilience strategies in the concept so it need more focus (Scala and Lindsay, 2021).

2.3.4 Empirical Evidence on Buyer Supplier Collaboration and SCR

Qazi et al., (2022) stated that supplier relationships and customer relationships significantly and favorably affect SCR. Additionally, it was determined that there is a strong and positive correlation between customer relationships and organizational performance.

Botes et al., (2017) conducted a study to look at the fundamental factors that enable resilience in buyer-supplier partnership. A single case study approach was used to examine a significant case in the petrochemical sector. Interviews that were semi-structured were used to gather the data. According to this study, collaborative activities between the focal company and its suppliers do not directly affect SCR but it drives visibility, velocity, and flexibility, which in turn enable SCR.

The more vertical and horizontal collaboration there is in a company's supply chain, the more robust that company will be, according to Lotfi, M. and Larmour's (2022) when exploring the concepts of both vertical and horizontal collaboration and supply chain resilience. Moreover, they found that collaboration between supply chain participants on both a horizontal and vertical level will improve resilience. The partnership's governance and competitiveness both serve to favourably and adversely manage this relationship.

Aigbogun et al., (2014) look into the strengths and weaknesses of the supply chain for Malaysian pharmaceutical production. The study showed six aspects of supply chain capabilities (flexibility, visibility, adaptability, collaboration, reserve capacity, and supplier disparity) as well as four dimensions of supply chain vulnerabilities (turbulence, external pressures, sensitivity, and connection). The survey also found that there was a decreasing impact on supply chain vulnerabilities and an increasing impact on supply chain capabilities. Given that the concepts of supply chain vulnerabilities and capabilities may be used to establish supply chain resilience,

Based on Umar, M. and Wilson, M. (2021), The study builds on the specifically vertical and horizontal collaboration, examines how these capabilities influence the resilience of supply chains that experience regular natural disasters in rural communities, as their economic wellbeing depends heavily on the continuation of these supply chains. According to the result, good communication, mutual dependency, information sharing, informal financial assistance, and trust are some of the components of supply chain collaboration that improve supply chain resilience in natural catastrophes.

Kopanaki, E. (2022), in a paper titled Conceptualizing Supply Chain Resilience, attempts to analyse supply chain resilience using a comprehensive literature study and the authors' research experience. According to the study, IT infrastructures comprised of current technologies may help supply chain resilience by easing the sharing of real-time data, enabling situation awareness, providing scalable solutions, promoting collaborative practices, and aiding decision making.

Wieland, A. and Wallenburg, C.M. (2013), on their empirical work, discovered that communicative and collaborative relationships have a favourable influence on resilience. It has also been revealed that increased resilience, acquired by investing in agility and robustness, increases the customer value of a supply chain.

2.3.4.1 Information Sharing and SCR

Scholten and Schilder (2015) investigate the impact of collaboration on supply chain resilience in their study on their preliminary case study including eight buyer-supplier partnerships in the food processing sector to analyze collaborative behaviors and the underlying processes in connection to visibility, velocity, and flexibility. The key findings demonstrate how particular forms of collaboration: collaborative communication, mutually created knowledge, information-sharing and joint relationship efforts increase supply chain resilience by enhancing its velocity, flexibility, and visibility.

Further to this, Botes et al., (2017), gave managers understanding of the value of collaborative communication and information-sharing in achieving supply chain visibility and in assisting in the early detection of tackling problems. This therefore enables flexibility by giving enough time to organize and coordinate other supply chain resources to produce the desired result. Little information-sharing generates little visibility, yet, over the time, builds up knowledge on processes and procedures visibility that allows anticipation of a disruption early on and/or response to and recovery from a disturbance quickly (Christopher and Peck, 2004).

According to Maklan and Juttner (2011), visibility and collaboration are related in that both include the parties' willingness to provide even private information about risks and risk-related events. With such, collaboration helps to minimize uncertainty and increase event readiness. Collaboration has also been proposed as a glue that keeps supply chain organizations together during a crisis.

IT infrastructures based on current technologies, according to Kopanaki, E. (2022), Wieland, A., and Wallenburg, C.M. (2013), may help supply chain resilience by facilitating the sharing of real-time data, enabling situation awareness, providing scalable solutions, promoting

collaborative practices, and assisting decision making. with the above statements given the hypothesis below was formulated.

H1: *Information sharing has significant positive effect on supply chain resilience*

2.3.4.2 Collaborative Communication and SCR

Communication makes it easier to streamline supply chain operations, which increases the velocity at which the supply chain can react to a disruptive incident (Botes et al., 2017) and (Yang, J et al.,2022). According to Wieland, A. and Wallenburg, C.M. (2013), on their empirical work, discovered that communicative and collaborative relationships have a favourable influence on resilience. revealing that increased resilience, acquired by investing in agility and robustness, increases the customer value of a supply chain.

Scholten and Schilder (2015), State that the, the degrees of visibility, velocity, and flexibility increase as more businesses engage in collaborative communication. A supply chain may then respond quickly to interruptions because of good information sharing, which is built on cooperative relationships, incentive alignment, and risk-sharing (visibility and velocity). Further to this, Botes et al., (2017), gave managers understanding of the value of collaborative communication and information-sharing in achieving supply chain visibility and in assisting in the early detection of tackling problems. This therefore enables flexibility by giving enough time to organize and coordinate other supply chain resources to produce the desired result.

According to Kopanaki, E. (2022), Wieland, A., and Wallenburg, C.M. (2013), IT infrastructures based on current technologies, may help supply chain resilience by facilitating effective communication, and assisting decision making. Vertical collaboration relies heavily on effective communication and information exchange. Specific information (about interruptions or changes in the supply chain) may be obtained by communicating with other supply chain participants; these actions offer visibility and flexibility in supply networks to adapt to tough conditions (Umar, M. and Wilson, M. 2021). On the bases of the above statements given the hypothesis below was formulated.

H2: *Collaborative communication has significant positive effect on supply chain resilience*

2.3.4.3 Resource Sharing and SCR

Jung, K. (2017), on his study argued that local organizations with a bridging strategy may improve their capacity to recover from a catastrophic event by ensuring access to vital resources and information via comprehensive disaster preparedness such as collaborative response and recovery planning. Botes et al., (2017), also suggested that collaboration between buyers and suppliers does not directly lead to supply chain resilience, but rather enables the antecedents to supply chain resilience. So buyer supplier collaboration may help businesses to access complementary resources, share risks, lower transaction costs, increase efficiency, optimize profit performance, and gain a competitive edge over time.

Jung, K. (2017) study offers proof that networked firms holding a central position between two other actors recognise a higher level of disaster resilience. The result suggests that local organizations with a bridging strategy can improve their ability to recover from a catastrophic incident by gaining access to essential resources and knowledge via thorough disaster preparedness like collaborative response and recovery planning.

Additionally, managers can increase supply chain flexibility by mutually using partner resources to respond to a disruptive incident while operating within capacity constraints. Managers may acquire some understanding of how collaborative retrospective learning from disruptive events enables a supply chain dyad to swiftly recognize an imminent disruption by considering the significance of collective learning from previous disruptions in obtaining visibility and velocity (Botes et al., 2017). Based on the statement given we hypothesis that:

H3*: Resource sharing has significant positive effect on supply chain resilience*

2.3.4.4 Goal Congruence and SCR

Botes et al., (2017), suggested on his study that collaboration between buyers and suppliers does not directly lead to supply chain resilience, but rather enables the antecedents to supply

chain resilience by aligning their goals for effective management of their resource and capabilities.

According to Alhanatleh,H et al.,(2021), in a system that ties reward with effort invested, supply chain partners are encouraged to operate in a way that is consistent with their shared strategic goals and to positively contribute to the partnership in order to achieve consistent performing and uninterrupted SC. Aligning goals essentially necessitates supply chain collaboration, which will necessitate some mutual understanding and agreement inside a systems belief, to perform in a manner that benefit the whole supply chain (Wee, S. et al. 2016) and (Cao and Zhang, 2011).

H4: *Goal congruence has significant positive effect on supply chain resilience*

2.3.4.5 Joint knowledge Creation and SCR

According to Christopher and Peck (2004), the degree of collaborative activities grows as a result of accumulation of jointly created knowledge over the years and in tandem with the supply chain's resilience. The more jointly knowledge created when the companies have been working together longer and the likely of a disruption occurs independent of the level of collaborative activities will be lower. The fundamental tenet of collaborative supply chain functioning is that information sharing that may lessen uncertainty by using the term "supply chain intelligence" refer as to the practice of utilizing knowledge generated and circulated by supply chain partners.

Jung, K. (2017) study result suggests that local organizations with a bridging strategy can improve their ability to recover from a catastrophic incident by gaining access to essential resources and knowledge via thorough disaster preparedness like collaborative response and recovery planning. Scholten and Schilder (2015) on their study demonstrate how particular forms of collaboration: collaborative communication, mutually created knowledge, information-sharing and joint relationship efforts increase supply chain resilience by enhancing its velocity, flexibility, and visibility.

Collaboration across supply chain companies is what connects the network as a whole and makes a holistic approach that required to achieve supply chain resilience. The underlying idea of supply chain collaboration is that information exchange and the application of shared knowledge across the chain that reduce uncertainty, increase visibility, operational effectiveness and efficiency, and improve customer experience (Scholten, K., et al (2014). Based on the review the hypothesis below is given:

H5: *Joint knowledge creation has significant positive effect on supply chain resilience*

2.3.4.6 Decision Synchronization and SCR

According to Maklan and Juttner (2011), collaboration helps to minimize uncertainty and increase event readiness. Collaboration has also been proposed as a glue that keeps supply chain organizations together during a crisis. Effective system-level disruption responses depend on factors such as decision synchronization and incentive alignment, two of the architectural components of supply chain collaboration.

Partner has their own interests and ambitions, making it often difficult to agree on issues that might lead to uncertainty. So joint decision making has developed into a crucial strategy for modern company in order to decrease this uncertainty through plans, combine information, resolve problems and develop rules and regulation and procedures. (Shahbaz et al., 2018).

H6: *Decision synchronization has significant positive effect on supply chain resilience*

2.3.4.6 Incentive Alignment and SCR

Collaboration between buyers and suppliers enables the antecedents to supply chain resilience. So buyer supplier collaboration may help businesses to share risks, lower transaction costs, increase efficiency, optimize profit performance, and gain a competitive edge over time (Botes et al., (2017). Buyers and suppliers that collaborate are encouraged to operate in a way that is compatible with the general goals of the formal collaboration agreement by aligning incentives. Thus, it may be claimed that the principles of mutual benefit should be the foundation of the cooperative agreement between customers and providers (Alhanatleh, H et al.,2021).

Maklan and Juttner (2011) stated that, collaboration helps to minimize uncertainty and increase event readiness. Collaboration has also been proposed as a glue that keeps supply chain organizations together during a crisis. Effective system-level disruption responses depend on factors such as decision synchronization and incentive alignment, two of the architectural components of supply chain collaboration.

H7: *Incentive alignment has significant positive effect on supply chain resilience*

2.4 Research gap

As SCR literature develops, researchers frequently build upon each other's work, adding or adjusting elements they believe are necessary. There are only a limited number of studies done regarding the impact of supply chain collaboration on supply chain resilience in the health care supply chain because of its novelty for the research world (Scala B *et al.*,2015).

Collaboration amongst supply chain partners is crucial for improved supply chain performance and increased competitiveness. Regarding collaboration in the supply chain, certain research show that it has genuine benefits for supply chain resilience but this studies are not enough but it shows yet rather more effort is needed. (Karl et al., 2018)

2.5 Conceptual Framework and Hypotheses of the Study

Given the research subject under inquiry and based on the discussion of different literatures, the conceptual framework developed and it is shown below.

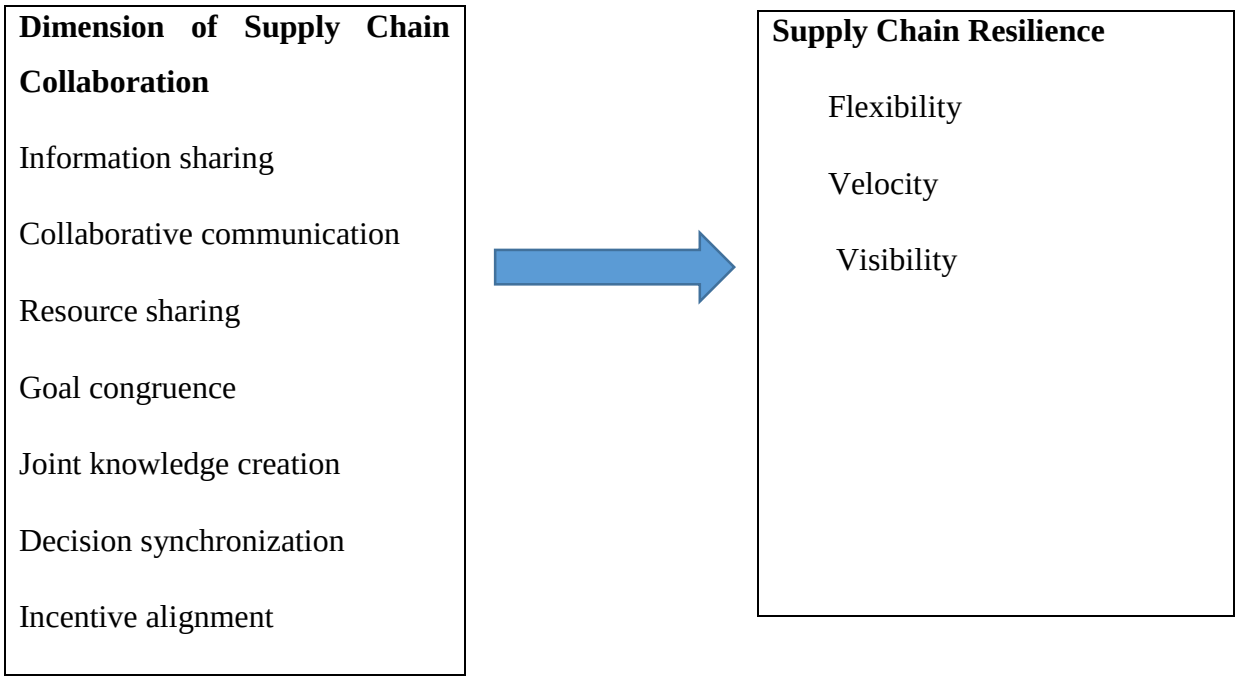


Figure 2.1: conceptual framework, Adapted from: (Scholten and Schilder, 2015)

As shown in the above figure and On the basis of the literature review the author hypothesizes as thus:

H1: *Information sharing has significant positive effect on supply chain resilience*
H2: *Collaborative communication has significant positive effect on supply chain resilience*
H3*: Resource sharing has significant positive effect on supply chain resilience*
H4: *Goal congruence has significant positive effect on supply chain resilience*
H5: *Joint knowledge creation has significant positive effect on supply chain resilience*
H6: *Decision synchronization has significant positive effect on supply chain resilience*
H7: *Incentive alignment has significant positive effect on supply chain resilience*

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology section of the study and consists of the study design, the study sites, the study population and sample size determination, Measures, reliability and validity of the instruments, data collection procedures, data analysis, and ethical considerations.

3.2 Description of the Study Setting

The study area of the research was Eka Kotebe General Hospital, St. Paul millennium medical college and their government sole supplier of pharmaceuticals; Ethiopian pharmaceutical supply service two branches. Eka Kotebe General Hospital which is located in Yeka sub-city, Addis Ababa, Ethiopia, established in 2009 E.C by the ministry of health. Half of the hospital's service is arranged to treat patients with mental illness. The rest services are arranged to contain different programs (surgery, Gynecology, obstetrics, internal medicine, pediatrics, ophthalmology, and dentistry) to make the service comprehensive.

After the emergence of corona virus, the hospital was selected by the Federal Ministry of Health of Ethiopia to be the first COVID-19 treatment center in the country. Besides, the hospital's inpatient capacity has been maximized to 600 beds. Hence, it has provided the service to COVID confirmed patients since the first case of COVID-19 was reported on March 13, 2020. After the number of COVID 19 patient decrease the hospital continue to provide service to casual military personals that affected by internal conflict starting from augest,2022 with its full capacity.

St. Paul's Hospital Millennium Medical College which is located in Gulale sub city, Addis Ababa is the 2nd largest government hospital in Ethiopia. Which is one of the referral hospital found in Addis Ababa under the Ethiopian Federal Ministry of Health. After the emergence of corona virus, the hospital was become the second designated hospital for COVID-19 treatment at its short period treatment site in millennium hall.

After the number of COVID-19 patient decrease the hospital continue to provide treatment for casual military personals in a year 2021 with its full capacity and now in one part of its service. This hospital currently has more than 800 beds, with an annual average of 200,000 patients and a catchment population of more than 5 million, currently the hospital starts to provide its normal day to day service in line with the above ones.

EPSS is one of the single largest government owned drug distributors and importers and major supplier of pharmaceuticals for government hospitals is designed to sustainably supply basic pharmaceuticals required to treat the country's major health issues, as well as medical equipment, while taking into account the purchasing capability of the society in delivering its services. It contains 19 branches that are organized into 7 clusters. The operations of the clusters are coordinated by the head office. The clusters and branches act as outposts for the distribution of medications, chemical reagents, medical supplies, and equipment purchased by the head office to communities around the nation (EPSS).

They also collect pharmaceutical demand within their domain and communicate it to the headquarters in order to generate a nationwide aggregate demand. The head office, on the other hand, issues tenders and purchases medications from national and international producers centrally before distributing them to branches based on their demand. This study attempted to visit its Addis Ababa branches, Nifas silk lafto sub city branch, which is the primary supplier of St Paul and Yeka sub city Jakrose branch, which is the main supplier of EKGH.

3.3 Research Approach

This study employed a mixed-method approach by using both qualitative and quantitative approach to allow collect, analyze and evaluate data effectively and efficiently. Using mixed approach might be superior because it gives in depth and well rich insight into the research phenomenon. (Dawadi et al., 2021)

According to Williams, C. (2011), in quantitative research, data are gathered in order to quantify information and statistically analyze it in order to support or reject alternative

knowledge claims. Using quantitative approach gives in depth and well rich insight into the research phenomenon, together with a logical foundation and methodological flexibility.

A researcher's ability to gather data from many individuals using a quantitative technique increases the likelihood that the results can be applied to a larger population. (Dawadi et al., 2021).

3.4 Study Design

The study designs that was employed are explanatory and descriptive study design type. Explanatory studies are useful in establishing causal relationships between variables. The researcher evaluates the effect of an exposure (or intervention) on an outcome. Because the purpose of this research is to evaluate the effect of supply chain collaboration on supply chain resilience. Therefore, the study design was suited for the study topic (Ranganathan and Aggarwal, 2018).

The researcher also deployed descriptive research design for obtaining existing information on events to describe the distribution of one or more variables without trying to make inference or causal statement, it aids in describing, displaying, or summarizing data in a more meaningful way (Guetterman, T.C. 2019).

3.5 Population and Sampling Design

3.5.1 Population

The study subjects for the research study comprised from EKGH, St Paul’s hospital and EPSS hub 1 and 2 staffs that have direct link to the pharmaceuticals, a total of 112 staffs identified and selected.

The target population for this research were, supply chain officers, pharmacy directors, pharmacy store managers, dispensing outlets coordinators, laboratory coordinators, biomedical coordinators, quality officers, hospital administrates and others who were directly related to the subject of the study.

While from EPSS the technical staffs working at the warehouse and inventory management and distribution and fleet management as well as forecasting unit staffs of EPSS branches,

only those who are experts/ technical and managerial staffs that are directly involved in the main functions of EPSS were selected. Specifically, the respondents were identified from two directorates (directorate**)** on Addis Ababa brances, Nifas silk lafto sub city and hanamariam branch, there are a total of 44 employees in these directorates. Therefore, all 44 subjects were used for the study using a census method.

3.5.2 Sampling Design

The two hospitals EKGH and St PMMC which has a total of 68 employees in those area. Accordingly, all the subjects were selected to be included in the study using the census method for the quantitative study. For EPSS, the respondents were identified from two directorates (directorate**)** on Addis Ababa brances, Nifas silk lafto sub city and hanamariam branch, there are a total of 44 employees in these directorates. Therefore, all 44 subjects were selected purposively.

3.6 Data Source and Types

The researcher main source of data was primary data. In addition, articles, academic journals, and helpful texts from many sources, including the library, academic books, relevant papers from institutions quarterly reports, and institutions annual reports, utilized to strengthen the study. While closed-ended questions were used to acquire primary data from employees of the study organizations.

3.7 Research Instruments

The study included quantitative measure that was adopted from Cao and Zhang (2011), (Juan et al., 2022) and Madhavika, N et al., 2022) which they used to measure supply chain collaboration and supply chain resilience. The authors have prepared the questionnaire based on five point Likert scale and the respondents were asked to indicate their level of agreement or disagreement using a five-point Likert scale (1 = strongly disagree, 2= disagree, 3= neutral, 4=agree and 5 = strongly agree) about the effect of supply chain collaboration on the performance of the case company.

3.8 Data Collection Procedures

Questionnaires were used as data collecting strategies for quantitative research methodologies of the study. The questionnaire is a data collection technique by distributing a set of questions or written statement to the respondent. Researcher visited respondents directly at their study area for distributing questionnaires.

Respondents surveyed using a closed-ended questionnaire using a 5-point Likert scale which has 5 rating scales on the survey, where respondents were required to indicate their views on a scale of 1 (very low) to 5 (very high). This questioner has three parts. Part A – personal data, Part B - questions related to buyer supplier collaboration Part C: questions related to Supply chain resilience of the hospital. The respondents get questionnaires via a 'drop and pick later' technique the author may interact with the respondent in case necessary to make sure the respondent understand and fill out correctly.

3.9 Methods of Data Analysis

The completeness of the questionnaire was checked before data entry and data was coded, entered and stored into computer and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. The data obtained were categorized and interpreted according to the research questions. The quantitative collected by questioner from the respondent carried out using descriptive statistics such as mean, standard deviation, percentage, and tables. In order to examine if buyer supplier collaboration existed between hospitals and EPSS. And to examine how resilient is their supply chain supply chain to disruptions. The findings presented using tables.

The association of independent variables with the outcome variables investigated using multiple regression and correlation analysis. The variable that show an association with the outcome variable at the analysis with p value < 0.05 was considered to declare the statistical significance in the relation.

3.10 Validity and Reliability Measures

3.10.1 Validity

To maintain the instruments' validity in this study, the questionnaires was adopted from past studies and a thorough reading of different pieces of literature. According to (Patino and Ferreira, 2018), a test's validity refers to how closely it measures the variables it claims to. In addition, the researcher also consulted subject matter experts to check content validity for an existing test to rate each question. Based on the feedback from the experts, redundant and ambiguous items were eliminated or modified. New items were added when it is necessary.

3.10.2 Reliability

Reliability was used to measure the internal consistency of items measuring a particular factor and the rationale for this internal consistency is that the individual items or indicators of the scale should all be measuring the same construct and thus be highly inter-correlated (Mandal, 2017). So this study deploys internal Consistency of the Scales Cronbach Alpha coefficient to determine the internal consistency of the instrument used.

Table 3.1 Cronbach's Alpha coefficient value

Constructs	**Cronbach's Alpha**	**N of Items**
Information sharing	.802	5
Collaborative communication	.704	5
Resource sharing	.703	6
Goal congruence	.798	5
Joint knowledge creation	.807	4
Decision synchronization	.742	4
Incentive alignment	.783	4
Supply chain flexibility	.749	3
Supply chain velocity	.711	4
Supply chain visibility	.729	5

Source: SPSS output of the survey, 2023

As indicated in the above table 3.1 The reliability analysis demonstrates that the Cronbach ‘s alpha values surpass the cut point of 0.7 for all variables. So that the results indicate that the instrument was consistently measuring what it was supposed to measure and that the structure of the scales were perfectly fit for the collected data. Darouich Chaimaa and Dhiba Youssef (2020) stated that a reliability coefficient of 0.70 and above is considered to be acceptable.

3.11 Ethical Consideration

The study conducted after obtaining ethical approval from the Addis Ababa University School of Commerce ethical review board and permission from EKGH and St Paul hospital research office as well as permission from EPSS management after given a brief explanation about the objectives of the study and the ethical issues. After an acceptance was obtained from the director data collection was performed.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. Introduction

This chapter presented the quantitative data analysis, results as well as discussion of the study on the effect of buyer supplier collaboration on supply chain resilience. The data was analyzed using descriptive statistics such as mean, frequency, and percentile. In addition to this, inferential statistics like correlation, regression were also used.

A total of 112 questionnaires were administered to 112 EKGH, SPMMC and selected two EPSS branches staffs. From the total of 112 administered questionnaires for the quantitative study, 106 were returned which showed an overall response rate of 94.6%. Among them 36.7 % of the respondents were participated from EKGH hospitals, 24.5 % from SPMMC and 38.6% were from the two EPSS branches staffs.

Prior to conducting quantitative data analysis, data were checked for completeness and also for consistency, and then entered into the Statistical Package for Social Sciences (SPSS) version 26 for analysis.

4.2. Participants' Socio-Demographic Characteristics

This section covers the sample respondents' demographic characteristics like gender, age, profession, educational background, work experience, and position of the respondent in the hospital or in the agency. (N=106)

Table 4.1. Participants' Socio-Demographic Characteristics

		Frequency	Percent
Gender	Male	74	69.8
	Female	32	30.2
Age	18-25	2	1.9
	26-35	85	80.2
	36-45	18	17.0
	above 45	1	.9
Experience	1-3 years	4	3.8
	4-6 years	42	39.6
	7-11	44	41.5
	above 11	16	15.1
Qualification	College diploma	4	3.8
	First degree	70	66.0
	Second degree	23	21.7
	Doctor of medicine	9	8.5
Profession	Pharmacist	75	70.8
	Druggist	4	3.8
	Doctor	13	12.3
	Logistic and supply chain management	4	3.8
Position	Pharmacy director	2	1.9
	Supply chain officer	26	24.5
	Pharmacist	14	13.2
	Coordinator	25	23.6
	Store man	22	20.8
	Hospital administrator	13	12.3
	Others	4	3.8

Source: SPSS output of own survey, 2023

4.1.1 Gender Distribution of the Respondent

From the finding, the gender distribution of respondents showed that 74 (69.8%) are male while 32 (30.2%) are female, the data indicating that majority of the responders are men.

4.1.2. Age Group of Respondents

Table 4.1 describes the age distribution of respondents showing that, 2 or 1.9% of the total 106 respondents were in the age group between 18-25 while majority 85 (80.2%) of the respondents were in the age group 26-35years with 18 (17%) were from 36-45 years, and only 1(0.9%) was above the age of 45. So according to the data most of the respondents (80.2%) were in the age group 26-35 years which is known as the young age group. This data demonstrated that the majority of workers are at their productive age for their respective company, and were able to comprehend the questions and provide pertinent information.

4.1.3. Year of Work Experience of Respondents in the Organization

The output in table 4.1 shows respondents work experience stating that, 3.8 % of the respondents had work experience of 1 to 3 years while 39.6% of the respondents said they had experience of 4 to 6 years and also 41.5 % of the respondents replied that they have worked for 7-11 years. 15.1 % of respondents had an experience above 11 years. From the above information, the majority of the respondents have work experience of four years and above in their respective working organization which enables the researcher to get adequate and trustworthy information to the research problems as participants have rich experiences in the study subject matter.

4.1.4. Educational Background of Respondents

From the data presented on table 4.1, 4 (3.8 %) respondents were college diploma holder, 70 (66%) hold first degree and 23 (21.7%) are second degree holders and 9 (8.5%) are holder of doctor of medicine degree. As shown in the data shows 70 (66%) of respondents had first degree which is the highest from the other. This implies that the respondents are capable of providing relevant and accurate information needed for the study and are educationally competent and qualified to perform their responsibilities.

4.1.5. Profession of Respondents

On the table above the information point out the profession of the respondents showing that 75 (70.8 %) and 4 (3.8 %) of respondents were pharmacist and druggist respectively which have frequent contact with pharmaceutical supply chain management activities in the given service department and also in similar manner 4 (3.8 %) of respondents were logistic and supply chain management MA holders, and also doctors contribute 13 (12.3 %) and others 9.4 % were, laboratory, biomedical, public health officers, quality officer and others. The variety in the respondent profession can contribute to the research output because SC can affect every part of health sectors in the provision of quality of care.

4.1.6. Respondents Position in the Organization

The respondent's occupational status at their company shown from the data indicates that 1.9 % (#2) were pharmacy directors, 24.5 % (#26) were supply chain officers, 13.2 (#14) pharmacist, 23.6% (#25) unit coordinators working in different position, 20.8% (#22) are store managers, and the remaining 12.3% (#13) are hospital administrators working in different positions like infection prevention, laboratory directorate, quality officer. Showing that this diversity is relevant in showing collaboration is not one department job but it is all stakeholders major role for the survival and continuity of SC.

4.3. Descriptive Analysis

Descriptive analysis, according to Guetterman, T.C. (2019), is the analysis of data that aids in describing, displaying, or summarizing data in a more meaningful way. As a result, descriptive statistics help the researcher display the data in a more understandable fashion, making it easier to interpret, comprehend the data in eloquent way.

Measure of central tendency like mean offers a general picture of the data by describing all responses with the average value. The mean of respondents in each dimensions suggest that the average amount that each dimension has positive or negative response. The case study organizations collaboration and their supply chain resilience dimension were measured by using Likert scale as follows: 1= strongly disagree; 2= disagree; 3= neutral; 4 = agree; 5= strongly agree. To match the result of mean score of each variable with the respondent level

agreement in Likert scale and to summarize the narrative outcomes, Likert Scale questions were analyzed by using the evaluation criteria given in Table 4.2.

Table 4.2. Evaluation Criteria for Likert Scale Questions

Score Interval (Mean)	Respondent level of agreement	Evaluation Criteria
1,00 – 1,79	strongly disagree	Very low level
1,80 – 2,59	Disagree	Low level
2,60 – 3,39	Neutral	Medium level
3,40 – 4,19	Agree	High level
4,20 – 5,00	strongly agree	Very high level

Source: Gözde and Emel (2016)

(Note: SD- strongly disagree, D -disagree, N-neutral, SA–strongly agree, F-Frequency, M-Mean, SD-Standard Deviation)

4.3.1 Descriptive analysis of independent variables

Seven buyer supplier collaboration dimensions were considered to examine whether there is collaboration between the case companies and their supplier. (N=106)

4.3.1.1 Information Sharing

Information sharing makes up the first dimension of the seven buyer supplier collaboration dimensions, hence five elements pertaining to information sharing were employed to assess whether or not collaboration in terms of information sharing existed in the case companies. The following table lists the participants' replies from the study organizations.

Table 4.3 Information sharing

	Mean	Std. Deviation
The hospitals and EPSS exchange relevant information about their supply chain	3.99	.710
The hospitals and EPSS exchange timely information	3.75	.645
The hospitals and EPSS exchange accurate information	3.57	.817
The hospitals and EPSS exchange complete information	3.67	.813
The hospitals and EPSS exchange reliable information	3.60	.789
Grand Mean	3.71	

Source: SPSS output of own survey, 2023

As shown in the above table respondents were asked five questions related to information sharing. The mean of the above variables showed high level of practicability of information sharing between the agency and the hospitals as per the suggestion of Gözde and Emel (2016) on table 4.2 evaluation criteria 3.4-4.19 is consider high level of agreement.

Respondents were asked as to whether the hospitals and their key supplier exchange relevant information about their supply chain, the majority of the respondents' responded in agree to the statement with the mean=3.99 (SD.710). Concerning the second question the hospitals and EPSS exchange timely information, the majority of the respondents with (M= 3.75, SD=.645), agreed to the statement stated. for the three questions on the hospitals and EPSS exchange accurate, complete and reliable information the responses show with mean scores of 3.57(SD=.817), 3.67(SD=.813), 3.60(SD=.789) respectively showing most of the respondents supported in agreement with all the statements.

When we see the grand mean of information sharing as shown is 3.71, so according to Gözde and Emel (2016) evaluation criteria the respondent show high level agreement for the posed questions.

From the above information it is possible to infer that there seems to be good information sharing habit between the hospitals and EPSS that can bring about good collaborative practice. Scholten and Schilder (2015) information-sharing is one of collaboration dimension that increase supply chain resilience by enhancing its velocity, flexibility, and visibility.

4.3.1.2 Collaborative Communication

Collaborative communication is the other dimension which is considered as a basic for buyer supplier collaboration, five items related to collaborative communication were used to check the existence of supply chain collaboration between the case companies.

Table 4.4 collaborative communication

Descriptive Statistics

	Mean	Std. Deviation
The hospitals and EPSS have two-way communication	4.01	.577
The hospitals and EPSS have frequent contacts on a regular basis	3.50	.707
The hospitals and EPSS have informal communication (without following formal defined path)	3.42	.660
The hospitals and EPSS have many different channels to communicate	3.58	.702
The hospitals and EPSS influence each other's decisions through discussion	3.39	.823
Grand Mean	3.58	

Source: SPSS output of own survey, 2023

In a similar fashion to information sharing, respondents agreed to the five statements stated about collaborative communication. Accordingly, 4.01, 3.50 and 3.42 respectively were the mean scores of the respondents answer to show their level of agreement about the questions

on the two-way communication between the hospitals and EPSS, regarding on their frequent contacts on a regular basis and about their informal communication.

And also M=3.58 and 3.39 scores of the respondents was grasped, in questions on having many different channels to communicate between the hospitals and EPSS and on their influences on each other's decisions through discussion. Gözde and Emel (2016) suggested that the mean interval between 3.4-4.19 is consider high level of agreement. When we see the grand mean of collaborative communication is 3.58, so based on the above evaluation criteria the respondent show high level agreement for the posed questions.

Based on the above response we can deduce that there is high level of collaborative communication between the parties that bring about good collaborative result with the exception of their influences on each other's decisions through discussion which show moderate level of agreement. Botes et al., (2017), collaborative communication can aid achieving supply chain visibility and in assisting in the early detection of tackling problems, enables flexibility by giving enough time to organize and coordinate other supply chain resources to produce the desired result.

4.3.1.3 Goal Congruence

Table 4.6 Goal congruence

Descriptive Statistics

	Mean	Std. Deviation
The hospitals and EPSS have agreement on the goals of their supply chain (delivering the right product to the right person at the right time)	3.99	.724
The hospitals and EPSS participate jointly in achieving common activities in a collaborative way across the supply chain	3.85	.701
The hospitals and EPSS have agreement on the importance of improvements that benefit the supply chain as a whole	3.39	.751

The hospitals and EPSS agree that our own goals can be achieved through working toward the goals of the supply chain	3.65	.662
The hospitals and EPSS act to pursue their own interest, they are acting at the same time in achieving the best interest of the both organizations.	3.45	.770
Grand mean	3.54	

Source: SPSS output of own survey, 2023

The majority of respondent response as indicated that they come up to an agreement with all of the facts stated in the table on the elements linked to goal congruence. As shown in the above table 4.5, for the question on hospitals and EPSS have agreement on the goals of their supply chain (delivering the right product to the right person at the right time) the majority of the respondents (M= 3.99), highly agreed to the statement given.

For the second question on participating jointly in achieving common activities in a collaborative way across the supply chain, the majority of the respondents (M= 3.85), highly agreed to the statement. While in statement on the hospitals and EPSS have agreement on the importance of improvements that benefit the supply chain as a whole, the majority of the respondents (M= 3.39) moderately agreed to the statement stated.

And also for statement that study companies own goals can be achieved through working toward the goals of the supply chain, and for query about the hospitals and EPSS act to pursue their own interest, they are acting at the same time in achieving the best interest of the both organizations the respondents' response mean scores were 3.65, 3.45 respectively, highly agreeing to the statement given. As see in the above table the grand mean of goal congruence is 3.54, so according to Gözde and Emel (2016) evaluation criteria the respondent show high level agreement for the posed questions.

Based on the data we can conclude that the EPSS and the hospitals have high level of agreement on sharing the same goal towards their supply chain for pursuing their respective objective. According to Alhanatleh,H et al.,(2021), in a system that ties reward with effort invested, supply chain partners are encouraged to operate in a way that is consistent with

their shared strategic goals and to positively contribute to the partnership in order to achieve consistent performing and uninterrupted SC.

4.3.1.4 Decision Synchronization

Decision harmonization between the case hospitals and their primary supplier was the fourth aspect of supply chain collaboration dimension that was examined in this study. Four questions were posed to the case company's replies as a result, the following table displays the replies given by the respondent.

Table 4.6 Decision synchronization

Descriptive Statistics

	Mean	Std. Deviation
The hospitals and EPSS jointly develop demand forecasts	3.74	.606
The hospitals and EPSS jointly manage inventory /goods	3.58	.660
The hospitals and EPSS jointly plan on product assortment (making the right product picks and ordering the right quantities to match market demand)	3.75	.701
The hospitals and EPSS jointly work out solution to mitigate supply chain disruptions	3.31	.709
Grand Mean	3.59	

Source: SPSS output of own survey, 2023

As indicated in table 4.6, respondents were asked if the hospitals and their key supplier jointly develop demand forecasts. Hence most respondents highly agreed to the statement as indicated by the mean score, which is 3.74. The majority of the respondents also agreed on the queries that the hospitals and EPSS jointly manage inventory /goods and on jointly plan on product assortment (making the right product picks ordering the right quantities to match market demand) with the mean scores of 3.58 and 3.75.

According to the majority of the respondents highly agreed that the case companies and their key supplier work together in various aspects of supply chain planning as well as in decision

making that help them to achieve their respective SC goal in relation to Gözde and Emel (2016) mean interval evaluation criteria. And regarding the hospitals and EPSS jointly work out solution to mitigate supply chain disruptions the respondent response showed moderate level of collaboration to mitigate supply chain disruptions with the mean scores shown as 3.31.

When we see the grand mean of decision making as shown in the table above it is 3.59, so according to Gözde and Emel (2016) evaluation criteria the respondent show high level agreement for the posed questions regarding decision making. So joint decision making has developed into a crucial strategy for modern company in order to decrease this uncertainty through plans, combine information, resolve problems and develop rules and regulation and procedures. (Shahbaz et al., 2018).

4.3.1.5 Incentive Alignment

One of the seven supply chain collaboration factors that academics recommend as being crucial to enhancing organizational performance is incentive alignment (Cao and Zhang, 2011). In order to determine if the case firms and their supplier have aligned incentives, four items were constructed. The table below shows the participants' responses.

Table 4.7 Incentive Alignment

Descriptive Statistics

	Mean	Std. Deviation
The hospitals and EPSS co-develop systems to evaluate each other's performance	3.26	.708
The hospitals and EPSS share costs (e.g. loss on order changes)	3.17	.774
The hospitals and EPSS share benefits (e.g. saving on reduced inventory costs)	3.35	.769
The hospitals and EPSS share any risks that can occur in the supply chain	3.33	.752
Grand Mean	2.77	

Source: SPSS output of own survey, 2023

According to Gözde and Emel (2016) mean interval between 2.6-3.39 is considered medium level of agreement or practice. The data obtained from the respondents as shown in the above table indicates that there is moderate level of incentive alignment exist on those study companies with grand mean of incentives alignment 2.77.

The data shows that for the first question, the hospitals and EPSS co-develop systems to evaluate each other's performance the response showed that mean score of 3.26, while for queries on hospitals and EPSS share costs, benefits and share any risks that can occur in the supply chain accordingly, 3.17, 3.35 and 3.33 respectively were the mean scores. Inferring from the data the hospitals and their key supplier moderately align their incentives to achieve their goals but the need of aligning their incentive to achieve collaborative relationship is not in acceptable range.

4.3.1.6 Resource Sharing

Resource Sharing is the other dimension of buyer supplier collaboration dimensions, hence six elements pertaining to information sharing were employed to assess whether or not collaboration in terms of resource sharing existed in the case companies. The following table lists the participants' replies from the study organizations.

Table 4.8 Resource Sharing

Descriptive Statistics

	Mean	Std. Deviation
The hospitals and EPSS use cross-organizational teams frequently for process design and improvement	3.68	.763
The hospitals and EPSS dedicate personnel to manage the collaborative processes	2.47	1.131
The hospitals and EPSS share technical supports	3.62	.762
The hospitals and EPSS share equipment (e.g. computers, networks, machines)	3.61	.738
The hospitals and EPSS pool non-financial resources (e.g. time, training)	3.67	.686
The hospitals and EPSS pool financial resources	3.18	.913
Grand Mean	3.37	

Source: SPSS output of own survey, 2023

As shown in the above table 4.8, respondents response concerning the hospitals and EPSS use cross-organizational teams frequently for process design and improvement, the majority of the respondents provided their opinion that they agree on the statement provided, which has mean score of 3.58. The same is true as for the hospitals and EPSS share technical supports, share equipment and pool non-financial resources (M= 3.62, 3.61,3.67).

while for the query on the hospitals and EPSS pool financial resources the majority of the respondents had undecided response, which has mean score of 3.18 and the respondent disagreed on the statement the hospitals and EPSS dedicate personnel to manage the collaborative processes (M=2.47). The grand mean of resource sharing is 3.37 inferring that there is moderate level of agreement among the respondent regarding resource sharing practice of the hospitals and EPSS.

4.3.1.7 Joint Knowledge Creation

The final buyer supplier dimension was joint Knowledge Creation and sharing that is used to assess the collaborative aspect of the companies. Here are the responses provided by the staff members of the case companies.

Table 4.9 Joint Knowledge Creation

Descriptive Statistics

	Mean	Std. Deviation
The hospitals and EPSS jointly explore new relevant knowledge	3.34	.803
The hospitals and EPSS jointly assimilate and apply relevant knowledge	3.30	.758
The hospitals and EPSS jointly identify customer needs	3.79	.891
The hospitals and EPSS jointly discover new or emerging markets	3.14	.844
Grand Mean	3.39	

Source: SPSS output of own survey, 2023

Accordingly, from the table the respondents were asked to quantify their level of perception regarding joint knowledge creation. The mean for the questions on the hospitals and EPSS

jointly explore new relevant knowledge, assimilate and apply relevant knowledge and jointly discover new or emerging markets was found to be in a with a mean score as shown here (M=3.34,3.30,3.14) respectively, the mean score indicates there is moderate level practice of joint knowledge creation between the hospital and the agency.

While for the question on the hospitals and EPSS jointly identify customer needs the mean score was 3.79 showing there is high level of practice to jointly identify customer needs and to take appropriate answer. We can conclude that according to Gözde and Emel (2016) evaluation criteria the grand mean 3.39 of joint knowledge creation fall in moderate level of agreement to the posed questions. From the data we can infer that between the hospital and the agency there is moderate level of practice in relation to joint knowledge creation. According to Christopher and Peck (2004), the degree of collaborative activities grows as a result of accumulation of jointly created knowledge over the years and in tandem with the supply chain's resilience.

4.3.2 Descriptive Analysis of Dependent Variables

Three supply chain resilience elements were considered to examine whether the supply chain system of the hospitals and EPSS are resilient to disruptions. The dependent variables were statistically analyzed with SPSS version 26 and the mean values of the above dimensions are presented below for identifying how well prepared the hospitals and EPSS supply chain if there is supply chain disruptions occurrence.

4.3.2.1 Supply Chain Flexibility

Supply chain flexibility is the first dimension of supply chain resilience that show the presence of easy configuration in the organizations in order to meet the needs of its consumers

Table 4.10 Supply chain flexibility

Descriptive Statistics

	Mean	Std. Deviation
Our supply chain (SC) has the capacity to adjust to changing needs or demand	4.04	.742
Our supply chain has the ability to reconfigure current structure if supply chain disruption occurs	3.94	.754
Our supply chain has the capacity to quickly change product purchases if SC disruption occur	3.65	.817
Grand Mean	3.87	

Source: SPSS output of own survey, 2023

Respondents were asked about their company supply chain flexibility and the statistics on table 4.10 showed the mean value 4.04, 3.94 and 3.65 for queries on supply chain capacity to adjust to changing needs or demand, ability to reconfigure current structure if supply chain disruption occurs and the capacity to quickly change product purchases if SC disruption occur respectively. Based on Gözde and Emel (2016) stated evaluation criteria we can deduce that the hospital and EPSS supply chain is highly flexible with grand mean of 3.87 in order to respond to the disruption and can highly configure in order to meet the needs of its consumers.

4.3.2.2 Supply Chain Velocity

Supply chain velocity is the other SCR element that determine the agility of the supply chain towards disruptions. The table below summarize SC velocity respondent responses.

Table 4.11 Supply chain velocity

Descriptive Statistics

	Mean	Std. Deviation
Our supply chain reacts faster to make supply chain decisions	3.92	.902
Our supply chain react quickly to the disturbances if SC disruption occur	4.00	.862
Our supply chain can quickly launch new products to meet customers' demands	3.47	.842
Our supply chain can quickly deliver products to customers before the product is stock out	3.89	.929
Grand Mean	3.82	

Source: SPSS output of own survey, 2023

As table 4.11 shown the mean values for Supply chain velocity questions range between 3.47 and 4.00. for question on our supply chain reacts faster to make supply chain decisions (M=3.92, SD=0.902). Next, our supply chain reacts quickly to the disturbances if SC disruption occur (M=4.00, SD=0.865) which is the highest from the rest.

The last two questions about supply chain ability to quickly launch new products to meet customers' demands and quickly deliver products to customers before the product is stock out have a score of ((M=3.47, SD=0.842 and 3.89, SD=0.929)) respectively. concluding that the respondent agrees that there is high level of SC velocity in the case companies in their supply chain phases and process with grand mean of respondent response 3.82, in order to respond to disruptive events while there is moderate level of agreement about supply chain ability to quickly launch new products to meet customers' demands.

4.3.2.2 Supply Chain Visibility

The last element of supply chain resilience that is used to examine the hospitals and their key supplier ability to react as well as to take reactive and proactive measures before disruption occurs is supply chain visibility. The table below summarize the participants' replies from the study organizations regarding their SC visibility.

Table 4.12 Supply chain visibility

Descriptive Statistics

	Mean	Std. Deviation
Inventory levels are visible throughout the supply chain	4.06	.766
Our hospital and supply chain partners have frequent communications to respond to supply chain disruptions	3.87	.829
Demand levels are visible throughout the supply chain	3.73	.889
In our company, shared information was up-to-date to make timely decisions regarding supply chain disruptions	3.75	.817
In our company, shared information was accurate enough to make decisions regarding supply chain disruptions	3.63	.919
Grand Mean	3.80	

Source: SPSS output of own survey, 2023

The above table indicates the mean value of each of the items SC visibility. Accordingly, the mean value of each item is scored between 3.63 and 4.06. Respondents were asked as to whether the Inventory levels are visible throughout the supply chain, the majority of the respondents' response in agree to the statement with the mean=4.06.

Concerning the second question hospitals and supply chain partners have frequent communications to respond to supply chain disruptions, the majority of the respondents (mean= 3.87), agreed to the statement stated. for the question on demand levels are visible throughout the supply chain, shared information was up-to-date to make timely decisions regarding supply chain disruptions and shared information was accurate enough to make decisions regarding supply chain disruptions the responses show with mean scores of 3.73, 3.75, 3.63 respectively showing most of the respondents supported all the statements highly.

The grand mean of SC visibility is found to be 3. 80 showing high level of agreement among respondents to the posed questions. Based on the results shown above the track ability or traceability of products and services of the hospitals and the agency is high helping to bypass impeding disruption problems.

4.3.3 The Hospitals and EPSS Responses Comparison

Table 4.13: hospitals and EPSS average mean responses

Descriptive Statistics

	N	Hospitals response Average Mean	N	EPSS response Average Mean
Information Sharing	65	3.65	41	3.80
Collaborative Communication	65	3.49	41	3.71
Goal Congruency	65	3.56	41	3.82
Decision synchronization	65	3.53	41	3.68
Incentive Alignment	65	3.25	41	3.32
Resource Sharing	65	3.27	41	3.52
Joint knowledge creation	65	3.24	41	3.62
Supply chain Flexibility	65	3.81	41	3.98
Supply chain velocity	65	3.64	41	4.09
Supply chain visibility	65	3.70	41	3.95
Valid N (list wise)	65		41	

Source: SPSS output of the survey, 2023

As we can see from the above table 4.13 there is deference between the response of the supplier and hospitals regarding the posed question on collaboration and supply chain resilience. As we can see the respondents' response mean average about information sharing, it was shown to be 3.65 and 3.8 for the hospitals and the EPSS respectively showing they are highly agreed to the statements of information sharing stated believing that there is good information sharing practice between the two companies. Similar to this they believe there is good collaborative communication (3.49 and 3.71), goal congruence (3.56 and 3.82), decision synchronization (3.53 and 3.68) habit between the hospitals and the EPSS respectively.

While in relation to incentive alignment, resource sharing and joint knowledge creation the hospitals responded agreeing moderately with average mean of 3.25, 3.27, 3.24 respectively

to the posed statements, while EPSS staffs highly agreed to the statements with average mean of 3.52, 3.62 to incentive alignment and resource sharing but moderately to joint knowledge creation (3.32).

Although for supply chain resilience questions both the hospitals and EPSS answered agreeing highly to the statements with the mean average of 3.81 and 3.98 for supply chain flexibility respectively of the hospitals and EPSS and for supply chain velocity 3.64 and 4.09 also for supply chain visibility 3.70 and 3.95 indicating that there is high level agreement to the statements given believing that they are agile regarding to the supply chain under disruptive conditions.

4.4 Inferential Statistics

4.4.1 Multiple Linear Regression

A regression analysis allows for investigating the relationship between variables (independent variables and dependent variable). Regression analysis can be useful for predicting the impacts of independent (or explanatory) variables on a dependent variable. Among the types regression our study contains more than one explanatory variables, which makes the regression analysis multiple regression that tests using two or more independent variables to predict the outcome of a dependent variable. (Ali, P. and Younas, A. 2021).

Assumption tests for the model is given below ahead of running multiple linear regression analysis.

4.4.1.1 Assumptions of Multiple Regression

1. Normality Distribution Test

In regression, variables are assumed to have normal distributions. Significant tests and correlations can be distorted by non-normally distributed variables (highly skewed or kurtose variables, or variables with significant outliers). For the researcher to test this assumption, the following information is helpful: Skew, kurtosis, and P-P plots can be used to visually analyze data plots and provide information on normalcy. (Osborne et al, 2022)

Skewness refers to the “measure of symmetry or asymmetry of data distribution; If a distribution or data set appears the same to the left and right of the center point, it is said to be symmetric.,” and Kurtosis refers to the “measure of the distribution's peakedness or flatness in comparison to a normal distribution” (Hair et al., 2010).

Table 4.14 skewness and kurtosis

Descriptive Statistics

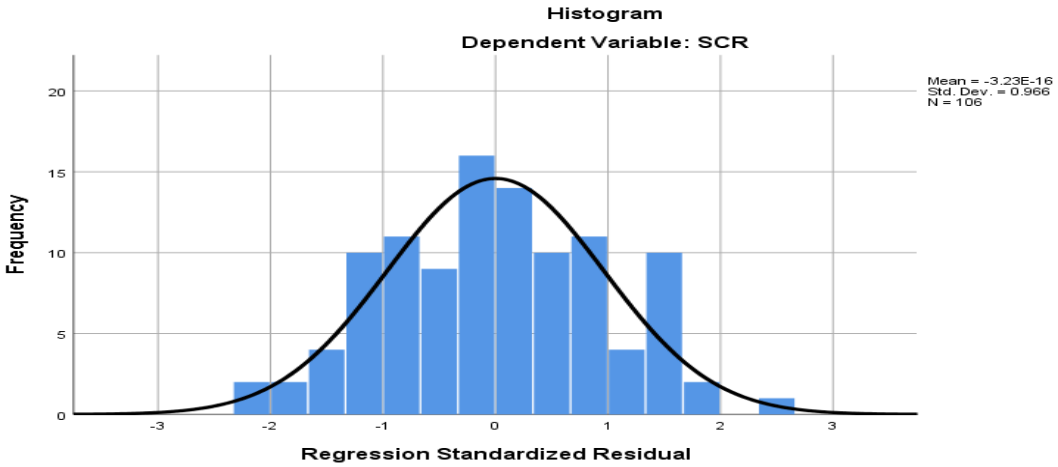
	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
IS	106	18.5849	2.83135	-.219	.235	.580	.465
CC	106	17.8962	2.36212	-.090	.235	.801	.465
GC	106	18.3302	2.68584	-.423	.235	2.499	.465
DS	106	14.3868	2.01220	-.253	.235	1.379	.465
IA	106	13.1132	2.33940	-.667	.235	1.484	.465
RS	106	20.2358	3.21767	-.137	.235	-.358	.465
JKC	106	13.5755	2.62932	-.218	.235	.170	.465
SCR	106	45.9434	6.13473	-.557	.235	.481	.465
Valid N (listwise)	106						

Source: SPSS output of own survey, 2023

The ideal value for asymmetry and kurtosis between -2 and +2 are considered acceptable in order to show normal univariate distribution (George & Mallery, 2010). From the table 4.20, all variables for both of skewness and kurtosis statistics fall in the acceptable range of normality (-2 and +2) with the exception of goal congruence but when we consider Hair et al. (2010) ideal value of skewness is between -2 to +2 and kurtosis is between -7 to +7 the value is in normal range.

The normality assumption distribution present graphically below:

Figure 4.1 Normality distribution figure



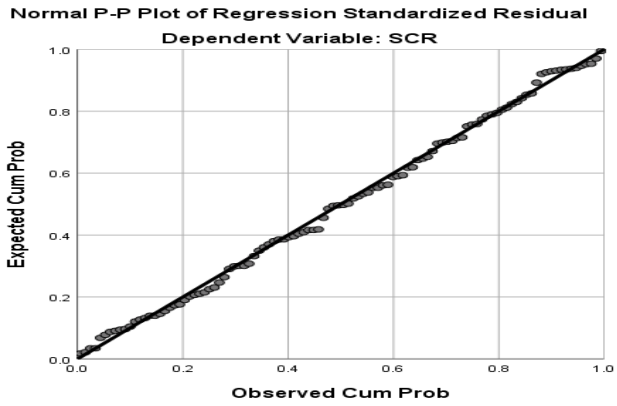
Source: SPSS output of own survey, 2023

The normal distribution describes a symmetrical plot of data around its mean value, where the width of the curve is defined by the standard deviation. It is visually depicted as the "bell curve."

2. Linearity of the relationships

The other point is to see if there is linear relationship between response variable and the explanatory variables. As illustrated in the scatter plot diagram below, it is seen that there is a linear relationship between response variable (SCR) and the explanatory variables (buyer supplier collaboration).

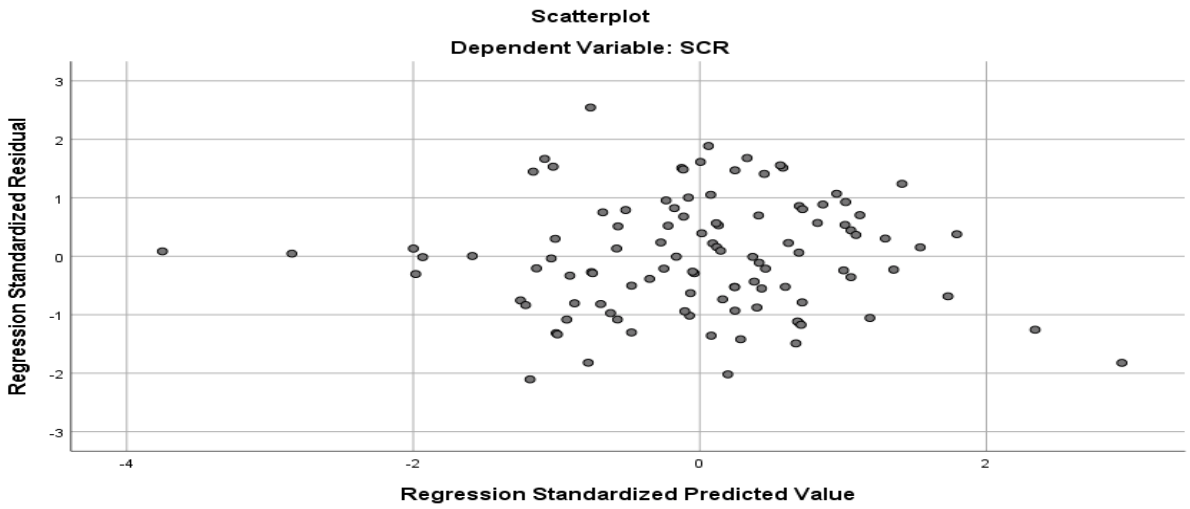
Figure 4.2 P-P plot



Source: SPSS output of own survey, 2023

The data are plotted against a theoretical normal distribution in such a way that the points to form an approximate straight line. A straight, diagonal line means we have normally distributed data. Multiple linear regression assumes that there is a linear relationship between each predictor variable and the response variable.

Figure 4.3 scatter plot



Source: SPSS output of the survey, 2023

Multiple linear regression assumes that the residuals have constant variance at every point in the linear model.

3. Multicollinearity Test

When two or more independent variables in a data frame have a strong association with one another in a regression model, multicollinearity arises. This implies that in a regression model, one independent variable may be predicted from another (Hair et al., 2010). Multicollinarity test can be conducted and checked using tolerance or VIF (variance inflation factor) and by rule of thumb, VIF ≤ 10 and tolerance > 0.2 are acceptable to say there is no multicollinearity problem showed (Kim JH, 2019).

Table 4.15 Multicollinearity Test Table

Coefficients

Model		Collinearity Statistics	
		Tolerance	**VIF**
1	**(Constant)**		
	Information sharing	.467	2.141
	Collaborative communication	.410	2.438
	Goal congruence	.474	2.108
	Decision synchronization	.406	2.465
	Incentive alignment	.656	1.524
	Resource sharing	.511	1.959
	Joint knowledge creation	.523	1.912

a. Dependent Variable: SCR

Source: SPSS output of own survey, 2023

The tolerance (t) statistics values for the information sharing, collaborative communication, goal congruence, decision synchronization, incentive alignment, resource sharing, joint knowledge creation .467, .410, .474, .406, .656, .511 and .599 respectively, from the result we can conclude that all are within the normal range (t > 0.2). And also the VIF values which are shown in the table 4.20, they were all less than three. as a result, there were no issues with multicollinearity. Multiple linear regression assumes that none of the predictor variables are highly correlated with each other.

4.4.3 Model Summary

According to Azami M, et al; (2020), the value of a variance of the dependent variable that is explained by the independent variables is expressed as the coefficient of determination, or R-squared. It shows the level of alteration explained by the model; which indicates how the supply chain resilience varies with variation in buyer supplier collaboration seven dimensions (Information sharing, collaborative communication, goal congruence, resource sharing, joint Knowledge Creation, Incentive Alignment, Decision Synchronization). A complete linear relationship between the predictors and dependent variable exists if R-

squared is 1 (100%). In vice versa there is no linear relationship when the R-squared value is 0.

Table 4.16 Model Summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Durbin-Watson
1	.919[a]	.845	.834	1.756

a. Predictors: (Constant), JKC, IA, CC, RS, GC, IS, DS

b. Dependent Variable: SCR

Source: SPSS output of own survey, 2023

The value of R-Square (percent of variance) from the above table 4.16 specifies that the model accounts for 84.5% of the variation in supply chain resilience can be predicted by the linear combination of all the independent variables (Information sharing, collaborative communication, goal congruence, resource sharing, joint Knowledge Creation, Incentive Alignment, Decision Synchronization) the remaining 15.5% of variation is not explained by these factors therefore, further research should be conducted to investigate the other factor that are account for the variation. So we can infer that there is a strong positive relationship of between SCR and the seven independent variables, the independent variables of the model could justify about 84.5% of the changes in SCR.

Here, the adjusted R square value exceeds the threshold of 0.5, making sufficiently explainable enough for the regression model. A high adjusted R square value indicates that the independent factors in the study have a significant impact on the dependent variable. The dependent variable and independent variable are 83% correlated, accordingly to R's value of 0.834 or 83.4% implying there was variation of 83.4% SCR due to the independent variables.

According Azami M, et al; (2020), The Durbin-Watson test was used to determine whether the residuals were independent (i.e., there was no serial correlation between the residuals or error). It can be said that the residuals have relative independence and there is no serial

correlation between them because the value of this test in our study, 1.75, is in the allowed range (1.5 to 2.5).

4.4.4 ANOVA Model Fit

Table 4.17 ANOVA Model Fit

ANOVA[a]

Model		Sum of Squares	Mean Square	F	Sig.
1	**Regression**	3339.604	477.086	76.389	.000[b]
	Residual	612.056	6.245		
	Total	3951.660			

a. Dependent Variable: SCR

b. Predictors: (Constant), JKC, IA, CC, RS, GC, IS, DS

Source: SPSS output of own survey, 2023

Analysis of variance (ANOVA) can determine whether the means of three or more groups are different. ANOVA uses F-tests (a ratio of two variances) to statistically test the equality of means in order to know the independent variables reliably predict the dependent variable. The F-statistic examines the overall significance of the model, and shows if our predictors as a group provide a better fit to the data than no predictor variables. If the p-value is less than the significance level (typically 0.05), the sample data provide adequate evidence to conclude that our regression model fits the data better than the model with no independent variables. if the p value were greater than 0.05, we would say that the group (joint) of independent variables do not demonstrate a significant association with the dependent variable.

From the above table 4.17, the F-value 76.389 indicates that the joint effect of the variables is significant at 99 percent confidence level. Thus the model is statistically significant for predicting the effect of information sharing, collaborative communication, goal congruence, resource sharing, joint Knowledge Creation, Incentive Alignment, Decision Synchronization on the supply chain resilience of the hospitals and EPSS, so we can rely on buyer supplier collaboration dimensions to predict SCR. To conclude, the data obtained from the table

demonstrate that model attained goodness of fit for the data and hence it was appropriate in predicting the dependent variable.

4.4.5 Regression Coefficient

The estimated average change in standard deviation units is represented by the beta coefficient. Beta coefficient allows direct comparisons between independent variables to determine which has the most influence on the dependent variable. Beta coefficient of 0.5 means that every time the independent variable changes by one standard deviation, the estimated outcome variable changes by half a standard deviation, on average.

Therefore, the standardized coefficient refers to how many standard deviations the dependent or outcome variable will change per a standard deviation increase in the independent or predictor variable (Nieminen P, 2022). The higher the absolute value of the beta coefficient, the stronger the effect.

The unstandardized regression coefficient (b) describe how the independent variable affects the values of the dependent variable. the interpretation is that for every 1-unit increase in the predictor variable, the outcome variable will increase by the beta coefficient value (Nieminen P, 2022).

Table 4.18 Regression table

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.444	2.089		-.212	.832
	IS	.454	.126	.209	3.600	.001
	CC	.611	.161	.235	3.789	.000
	GC	.438	.132	.192	3.320	.001
	DS	.579	.190	.190	3.045	.003
	IA	.144	.129	.055	1.118	.266
	RS	.126	.106	.066	1.186	.239
	JKC	.459	.128	.197	3.578	.001

a. Dependent Variable: SCR

Source: SPSS output of own survey, 2023

The above regression coefficient's table 4.18 compare the strength of the effect (the significance) of each individual independent variable on the dependent variable. From the result five of the explanatory variables are significant with p-value ($P<0.05$) for predicting supply chain resilience.

The rest two factors namely incentive alignment and resource sharing have a p-value >0 .05, and so these factors are not statistically significant to predict the supply chain resilience. So from the total variation occurred in supply chain resilience (dependent variable), (20.9%) results from information sharing, (23.5%) from collaborative communication, (19.2%) accounts for goal congruence, decision synchronization, and is joint knowledge creation account for (19.7 and 19.0%) respectively.

The higher the absolute value of the beta coefficient, the stronger the effect, based on that collaborative communication has the higher value followed by information sharing, decision synchronization, goal congruence and decision synchronization respectively (at <0.05 significant level) significantly affects supply chain resilience. Showing the significance of the contribution of individual predictors

The statistics for unstandardized beta which represents the change caused by the variable, for every unit increase in information sharing will lead to a 0.454 increase in supply chain resilience or 0.454-unit increase in SCR is predicted the same for others collaborative communication, goal congruence, decision Synchronization, and joint knowledge creation with the coefficient will lead to 0.611, 0.438, 0.579 and 0.459 respectively increase in supply chain resilience. The above table shows that the y-intercept for the model is -.444 which is arithmetically calculated by giving zero value for all the independent variables, so if the predictor variable collaboration is zero, the regression equation predicts the SCR is -.444.

4.5 Hypotheses Testing

Table 19: Hypothesis test summery

Hypotheses	P-value	Remark
H1: *Information sharing has significant positive effect on supply chain resilience*	.001	Accepted
H2: *Collaborative communication has significant positive effect on supply chain resilience*	.000	Accepted
H3: *Resource sharing has significant positive effect on supply chain res*ilience	.239	Rejected
H4: *Goal congruence has significant positive effect on supply chain resilience*	.001	Accepted
H5: *Joint knowledge creation has significant positive effect on supply chain resilience*	.001	Accepted
H6: *Decision synchronization has significant positive effect on supply chain resilience*	.003	Accepted
H7: *Incentive alignment has significant positive effect on supply chain resilience*	.266	Rejected

In this study, the researcher tried to investigate the effect of buyer supplier collaboration on the supply chain resilience of selected federal hospital. Based on this the following hypothesis tested and the result is shown below. According to Azami M, et al; (2020), if the p value is less the significant level 0.05, reject the null hypothesis and accept the alternative hypothesis.

H1: Information sharing has significant positive effect on supply chain resilience

From the above results we can conclude that information sharing has significant positive effect on supply chain resilience measures with R=. 754 (P<0.01) showing positive and strong relationship. So, increase information sharing will lead to increases supply chain resilience of the hospitals as well as the EPSS. Information sharing is a statistically

significant predictor of supply chain resilience since its beta coefficient is .209 at significance level of .001. This means, supply chain resilience is statistically dependent on information sharing.

Thus, when the hospitals and EPSS shares accurate, reliable and complete information on time, this contributes to the increase in SC flexibility, visibility and velocity therefore, hypothesis H1 can be accepted.

Botes et al., (2017), Scholten and Schilder (2015), also states that, the degrees of visibility, velocity, and flexibility increase as more businesses engage in information sharing, eventually results in a more robust supply chain. Christopher and Peck (2004) also stated, information sharing and the application of collective knowledge serves as a means for enhancing responsiveness of strategic threats and opportunities, operational disruptions in supply and demand.

Relationships between supply chain participants are dependent on information exchange that is visible across the supply chain. Specific information (about interruptions or changes in the supply chain) may be obtained by communicating with other supply chain participants; these actions offer visibility and flexibility in supply networks to adapt to tough conditions (Umar, M. and Wilson, M. 2021).

H2: collaborative communication has significant positive effect on supply chain resilience.

Collaborative communication has beta coefficient of .235 at significance level of .000 and the relationship is positively strong relationship with R=. 781 ($P<0.01$) therefore, hypothesis H2 can be accepted. So, the increase collaborative communication increases supply chain resilience of the hospitals as well as the EPSS. Thus, when the hospitals and EPSS create effective channel of communication will lead to increase supply chain resilience measures.

Scholten and Schilder (2015), State that, as businesses engage in information sharing, collaborative communication, the degrees of SCR increase. Also, Botes et al., (2017), says collaborative communication have impact in achieving supply chain visibility and in

assisting in the early detection of tackling problems to disruptions. According to Umar, M. and Wilson, M. (2021) communication is one way of obtaining specific information with other supply chain participants; offering visibility and flexibility in supply networks to adapt to disruptive conditions (Umar, M. and Wilson, M. 2021)

H3: Resource sharing has significant positive effect on supply chain resilience

Resource sharing, does not statistically predict SCR with beta coefficient of .066 and significant level 0.239. $p > 0.05$, implying that we reject the hypothesis of resource sharing.

H4: Goal congruence has significant positive effect on supply chain resilience

Regarding goal congruence, the study shown that there is a statistically significant positive relationship between goal congruence and supply chain resilience. The value of R is .747 and the p-value is .000, < .05 in this scenario, the relationship is stronger. Basically, the significance value is also at .001 and beta is 0.192 so goal congruence is a statistically significant predictor of supply chain resilience. Therefore, the model is statistically significant in predicting supply chain resilience so we accepted hypothesis H3.

In a system that ties reward with effort invested, supply chain partners are encouraged to operate in a way that is consistent with their shared strategic goals and to positively contribute to the partnership in order to achieve consistent performing and uninterrupted SC (Alhanatleh,H et al.,2021).

H5: knowledge creation has significant positive effect on supply chain resilience

The correlation study of this research illustrated that there is a positive relationship between knowledge creation and supply chain resilience. And also this independent variable is a predictor of supply chain resilience of the case company with beta coefficient of .197 and significant level 0.001. Therefore, hypothesis H7 can be accepted.

Christopher and Peck, (2004); Scholten and Schilder, (2015) state that the more jointly knowledge created when the companies have been working together longer and the likely of

a disruption occurs independent of the level of collaborative activities will be lower. And can serves as a means for enhancing responsiveness of strategic threats and opportunities, operational disruptions in supply and demand.

H6: Decision synchronization has significant positive effect on supply chain resilience

Like the above variables decision synchronization is statistically significant predictor of supply chain resilience with beta coefficient of .190 at significant level of .003, p= < .05. Decision synchronization is also strongly and positively correlated with supply chain resilience with its correlation coefficient R=.766 and P-valueless .000. consequently, joint demand forecasts development, joint inventory management, working solutions, involve in planning enhances the performance of the SCR. So we accept the hypothesis. According to Maklan and Juttner (2011), Effective system-level disruption responses depend on factors such as decision synchronization which is one of the architectural components of supply chain collaboration.

H7: Incentive alignment has significant positive effect on supply chain resilience

Incentive alignment, founded to positively moderately correlated with SCR with R=.555 and P-value less than 0.01. Nevertheless, incentive alignment has beta coefficient of 0.55 at significance level of .266, p= > 0.05 implying that incentive alignment does not statistically predict SCR. So we reject the hypothesis of incentive alignment with significance level of .266.

CHAPTER FIVE

SUMMARY OF MAJOR FINDINGS, CONCLUSION, AND RECOMMENDATION

5.1. Introduction

This chapter presents the summary of the findings, conclusions, recommendations and suggestion for future research

5.2. Summary of Major Findings

According to the quantitative result of the respondents of EPSS and the two hospitals staffs, the group average mean score for information Sharing, collaborative communication, goal congruence, decision Synchronization, incentive alignment, resource sharing, and knowledge creation, was found to be 3.71, 3.58, 3.54, 3.59, 2.77, 3.37 and 3.39 respectively. Based on the evaluation criteria presented by Gözde and Emel (2016), the mean score of information Sharing, collaborative communication, goal congruence and decision synchronization is in the range between (3,40 – 4,19) suggesting, the respondents highly agreed on the posed independent variable questions.

Average mean score of responses about resource Sharing, incentive alignment and knowledge creation is medium/moderate. The group average mean score of the dependent variable (SCR) is 3.8, implying that the respondents highly agreed to the dependent variable questions about their supply chain disruption responsiveness.

The correlation analysis indicated that, there is strong and statistically significant positive correlation is found between information sharing and SCR with (r =0.754), collaborative communication (r =0.781), goal congruence (r =0.747), decision synchronization (0.766) as well as joint knowledge Creation (r =0.716) and SCR with calculated p –value 0.000 which is p= < 0.01 level of significance, the positive correlation results indicate that one variable increases so does the other and vice versa. Hence the value of correlation coefficients of

incentive alignment, resource sharing and SCR is (r =0.0.555 and r=0.659) showing moderate degree of relationship, the result showed that they are positively related to each other.

The value of R-Square is 84.5%, showing that 84.5% of the variation in SCR can be predicted from the independent variables while the remaining 15.5% of variation is not explained by these factors therefore, further research should be conducted to investigate the other factor. And correspondingly, the adjusted R square value exceeds the threshold of 0.5, showing that the dependent variable and independent variable are 83% correlated, and demonstrating that the variation of 83.4% SCR account due to the Independent variables.

From analysis of variance (ANOVA) the sample data provide adequate evidence to conclude that the regression model fits the data better than the model with no independent variables. Thus the model is statistically significant for predicting the effect of independent variable on the dependent variable. From regression coefficient's result five of the explanatory variables (information sharing, collaborative communication, goal congruence, decision Synchronization, and joint knowledge creation) are significant with p-value ($P<0.05$) for predicting supply chain resilience with higher to low absolute value of the beta coefficient having lower to stronger positive effect. The rest two factors namely incentive alignment and resource sharing have a p-value >0 .05, and so these factors are not statistically significant to predict the supply chain resilience.

Finally, from the findings the hypothesis test results show that:

H1: *Information sharing has significant positive effect on supply chain resilience*

H2: *Collaborative communication has significant positive effect on supply chain resilience*

H3: *Resource sharing do not have significant positive effect on supply chain re*silience

H4: *Goal congruence has significant positive effect on supply chain resilience*

H5: *Joint knowledge creation has significant positive effect on supply chain resilience*

H6: *Decision synchronization has significant positive effect on supply chain resilience*

H7: *Incentive alignment do not have significant positive effect on supply chain resilience*

5.3. Conclusion

The aim of the current study was to examine the effect of supply chain collaboration on supply chain resilience, the case of selected federal hospitals in Addis Ababa, Ethiopia. On the basis of the findings of the study, the following conclusions have been made.

The study disclosed that information Sharing, collaborative communication, goal Congruence and decision synchronization is showed to be in good state between EPSS and the hospitals. The resource sharing, incentive alignment and knowledge creation between EPSS and the hospitals is found in moderate stage needing improvement. One of the biggest hindrance for this problem were hospital and EPSS does not have systems to evaluate and publicize each other's performance, poor habit of sharing risks that can occur in the supply chain and the unavailability of dedicate personnel to manage the overall collaborative processes.

The result showed that buyer supplier collaboration dimensions (information sharing, goal alignment, decision synchronization, collaborative communication, joint knowledge creation, resource sharing, and incentive alignment) are applied at EPSS and the hospitals at moderate to high level. The mean value of supply chain resilience variables that determine the agility indicated that there is relatively high supply chain resilience ability observed in the organizations which needs further improvement. This is due to high to moderate level of implementation of collaborative dimensions.

Regression analysis and correlation coefficient indicate that there is a statistically significant relationship between buyer supplier collaboration and supply chain resilience of EPSS and the hospitals. The five dimensions of buyer supplier collaboration account for about 84.5% of the variation of the supply chain resilience of the companies under study. Indicating improvement in this collaboration dimension has direct impact for the improvement of the supply chain resilience at the hospitals and the EPSS. While deteriorating in the collaboration dimension has direct impact for the decrement of the supply chain resilience ability of the hospitals and the EPSS leading to disruptive event increment.

Consequently, our study provides further support to the resource-based View theory, dynamic capability theory and Resource dependence theory by identifying the key SCR element to rely on in order to enhance SC resilience and robustness as dynamic capabilities. Indeed, as the results indicate, collaboration plays a major role in SC resilience and robustness.

5.4 Recommendations

Based on the findings, the following recommendations are made.

- The supply chain collaboration practice between the EPSS and the hospitals is generally in the acceptable range but it has not reached at its desired level as it is shown from the quantitative data obtained. An effective pharmaceutical supply chain relies on collaboration among independent parties to pursue the shared objective in the face of shifting market conditions rather than one participant's autonomous effort, so working towards collaboration must is inevitable for the success of sustained supply chain.

- As the study provides new insights demonstrating that collaboration is essential for building resilience and reducing the impact of possible inevitable disruptions. The hospitals and EPSS must improve supply chain resilience of their respective companies by facilitating the sharing of real-time data, enabling joint knowledge creation, providing scalable solutions through decision harmonization, promoting collaborative practices, and sharing goals that make the two one.

- Collaboration between supply chain participants needs a change from old commercial conventions toward the exchange of inventory, demand, planning, and financial information. Since it increases visibility and lowers ambiguity leading to improved SC ability to react to disruptions as the relationships between supply chain participants are dependent on quality of information exchange that is visible across the supply chain that can be obtained by creating effective communicating channels with supply chain participants.

- The EPSS and the hospitals has to make an effort to take action to increase the identified collaboration dimensions through creating system to evaluate and publicize each other's performance, by improving poor habit of sharing risks that can occur in the supply chain.

- Supply chain collaboration empowers the advancement of synergies among partners, encourages joint planning and forecasting as well as energizes real-time data exchange that are significant for prepare, respond to and recover from supply chain disturbances while reducing their impact understanding and incorporating of those dimension can lead to better SCR system of the hospitals and EPSS.

- Visibility, flexibility, and shorter lead times are just a few of the advantages of supply chain collaboration, even if this advantage have been there it may not always be feasible to build long-term working relationships with all supply chain partners so at least focusing on buyer and supplier relation mitigate the cons effect. Since generating and maintaining resilience is a process in itself rather than a one-time occurrence, working towards them needs high effort.

- Creating and allowing buyers and suppliers evaluate stock-level data, via Electronic Data Interchange (EDI), and take the compulsory replenishment action must be the focus point. Since the ability to make decisions quickly depends on having proper preparations, gathering enough information, and solving issues quickly for both parties.

- The hospitals and their suppliers should take reminder of the fact that knowledge sharing has a significant bearing on both business competitiveness and customer satisfaction. However, this sharing of knowledge should be extended beyond the organizational boundaries, and managers should take steps in exploiting their knowledge assets that can realize significant potential resilient advantage.

- Trust, focus, top management support and commitment are highly required in order to bring the required level of supply chain collaboration in the supply chain of the case

companies. Through trust and dedication, collaboration may keep disparate businesses together and help them develop the skills needed for resilience.

- Further research is needed on the effect of resource sharing and incentive alignment effect on the supply chain resilience because supply chain is built on shared risk and reward, although empirical studies conducted by scholars support its effect, this was not confirmed in this research.
- As we can see from the average mean response of the respondents of the hospitals and the EPSS respondents there is gap of believe about their collaborative dimensions so both actors must play pivot role in minimizing collaborative gap for better supply chain response.
- Last but not least, it is advisable that hospitals must focus in building an emergency response supply chain for future, as it may be difficult to handle the supply chain of pharmaceuticals with only one main supplier like EPSS.

5.4 Suggestion for future research

As the study focused on the effect of buyer supplier collaboration on supply chain resilience in selected federal hospital. The researcher suggested additional research on supply chain collaboration by comprising manufacturers, wholesalers and the end customer to identify its impact on supply chain resilience. It can help to find out the importance and the effect of collaboration for sustaining pharmaceuticals which main theme is saving life finding and identifying the main disruptive factors by involving each sectors can improve the lifesaving process since collaboration is not one-time process that involve parties of the supply chain.

The research also suggests further research on the supply chain resilience in the health sector. This emerging topic is the new focus of the world mainly to the health sector after the emerging of COVID-19. This might give additional insights into why and how the level of resilience between supply chains differ and to answer to how to sustain endless flow of pharmaceuticals that save life. Finally, the researcher recommends for the researchers for further empirically test the propositions with qualitative data, so that generalizability and validity of the findings can increase.

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ANNEX

ANNEX–I: QUESTIONNAIRE TO BE FILLED BY THE RESPONDENTS

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGENMENT GRADUATE PROGRAM

Dear respondents, my name is Asrar Hassen Mohammed, I'm a student at Addis Ababa University, School of Commerce in the Department of Logistics and Supply Chain Management. The purpose of this questionnaire is to collect the necessary data regarding to the thesis on the effect of buyer supplier collaboration on supply chain resilience: the case of selected federal hospitals in Addis Ababa Ethiopia, as a partial fulfillment of the University's requirement for a Masters Degree in Logistics and supply chain Management. Thus, the success of the study highly depends on your genuine response for the items in this questionnaire. Therefore, I kindly request you to fill the questionnaire honestly and completely. We assure that the data gathered will remain confidential and will be only used for research purposes. The study is purely for academic purpose..

General Instructions

- ✓ There is no need of writing your name
- ✓ Indicate your answer with a check mark (✓) on the appropriate block/cell given under section I, II and Section III given below.

Code No……...

Name of the organization…….

SECTION I: <u>GENERAL INFORMATION OF THE RESPONDENTS</u>

1. Sex:
   ☐ Male ☐ Female
2. Age:
   ☐ 18-25 years ☐ 26-35 years ☐ 36-45 years ☐ Above 45 years
3. Year of work experience in the organization:
   ☐ 1 -3years ☐ 4- 6 years ☐ 7-11 years ☐ Above 11 years
4. Educational Qualification:
   ☐ Certificate ☐ College diploma ☐ First Degree
   ☐ Second Degree ☐ PHD and above
5. Your Profession
   ☐ Pharmacist ☐ Druggist ☐ Doctor ☐ Logistic and supply chain manager
   ☐ Others, specify_____
6. Your current position in the organization
   ☐ Pharmacy director ☐ Supply chain officer ☐ Pharmacist
   ☐ Coordinator ☐ Store man ☐ Hospital administrator
   ☐ Others, specify _____

SECTION II: QUESTIONNAIRS ABOUT BUYER SUPPLIER COLLABORATION

INSTRUCTION:

Below is a list of statements. These items measure your hospital collaboration with your supply partners, and your hospital ability regarding supply chain resilience using a 5-point Likert-type scale to indicate the extent to which you agree or disagree to each statement as applicable to your firm: by putting *"√" mark, 1 = strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree.* There is no right or wrong answers. Please give honest answers; otherwise the result would not be valid.

	Buyer supplier collaboration dimensions	**5-point Likert-type scale**				
A	Information sharing	1	2	3	4	5
1	The hospitals and Ethiopian pharmaceutical supply service (EPSS) exchange relevant information about their supply chain					
2	The hospitals and EPSS exchange timely information					
3	The hospitals and EPSS exchange accurate information					
4	The hospitals and EPSS exchange complete information					
5	The hospitals and EPSS exchange reliable information					
B	Collaborative communication					
1	The hospitals and EPSS have two-way communication					
2	The hospitals and EPSS have frequent contacts on a regular basis					
3	The hospitals and EPSS have informal communication (without following formal defined path)					
4	The hospitals and EPSS have many different channels to communicate					
5	The hospitals and EPSS influence each other's decisions through discussion					
C	Goal congruence / share the same goal					
1	The hospitals and EPSS have agreement on the goals of their supply chain (delivering the right product to the right person at the right time)					
2	The hospitals and EPSS participate jointly in achieving common activities in a collaborative way across the supply chain					
3	The hospitals and EPSS have agreement on the importance of improvements that benefit the supply chain as a whole					
4	The hospitals and EPSS agree that our own goals can be achieved through working toward the goals of the supply chain					
5	The hospitals and EPSS act to pursue their own interest, they are acting at the same time in achieving the best interest of the both organizations.					
D	Decision synchronization / engage in decision making					
1	The hospitals and EPSS jointly develop demand forecasts					
2	The hospitals and EPSS jointly manage inventory /goods					

3	The hospitals and EPSS jointly plan on product assortment (making the right product picks and ordering the right quantities to match market demand)					
4	The hospitals and EPSS jointly work out solution to mitigate supply chain disruptions					
E	Incentive alignment					
1	The hospitals and EPSS co-develop systems to evaluate each other's performance (e.g. key performance index, scorecard, and the resulting incentive)					
2	The hospitals and EPSS share costs (e.g. loss on order changes)					
3	The hospitals and EPSS share benefits (e.g. saving on reduced inventory costs)					
4	The hospitals and EPSS share any risks that can occur in the supply chain					
F	Resource sharing					
1	The hospitals and EPSS use cross-organizational teams frequently for process design and improvement					
2	The hospitals and EPSS dedicate personnel to manage the collaborative processes					
3	The hospitals and EPSS share technical supports					
4	The hospitals and EPSS share equipment (e.g. computers, networks, machines)					
5	The hospitals and EPSS pool non-financial resources (e.g. time, training)					
6	The hospitals and EPSS pool financial resources					
G	Joint knowledge creation					
1	The hospitals and EPSS jointly explore new relevant knowledge					
2	The hospitals and EPSS jointly assimilate and apply relevant knowledge					
3	The hospitals and EPSS jointly identify customer needs					
4	The hospitals and EPSS jointly discover new or emerging markets					

Adopte from - Cao, M., Zhang, Q., 2011),

SECTION III: QUESTIONNAIRS ABOUT SUPPLY CHAIN RESCILIENCE

INSTRUCTION: Below is a list of statements. These items measure your hospital collaboration with your supply partners, and your hospital ability regarding supply chain resilience using a 5-point Likert-type scale to indicate the extent to which you agree or disagree to each statement as applicable to your firm: by putting *"√" mark, 1 = strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree.* There is no right or wrong answers. Please give honest answers; otherwise the result would not be valid.

	Supply chain resilience elements	**5-point Likert-type scale**				
A	Supply chain flexibility	1	2	3	4	5
1	Our supply chain (SC) has the capacity to adjust to changing needs or demand					
2	Our supply chain has the ability to reconfigure current structure if supply chain disruption occurs					
3	Our supply chain has the capacity to quickly change product purchases if SC disruption occur					
B	Supply chain Velocity					
1	Our supply chain reacts faster to make supply chain decisions					
2	Our supply chain react quickly to the disturbances if SC disruption occur					
3	Our supply chain can quickly launch new products to meet customers' demands					
4	Our supply chain can quickly deliver products to customers before the product is stock out					
C	Supply chain Visibility					
1	Inventory levels are visible throughout the supply chain.					
2	Our hospital and supply chain partners have frequent communications to respond to supply chain disruptions					
3	Demand levels are visible throughout the supply chain					
4	In our company, shared information was up-to-date to make timely decisions regarding supply chain disruptions					
5	In our company, shared information was accurate enough to make decisions regarding supply chain disruptions					

Adopte from - (Juan et al., 2022), Madhavika, N et al., 2022)

Contact Address

If you have any query, please do not hesitate to contact me and I am available as per your Convenience at (Mobile: 0912-64-42-15 or e-mail: *asrliv@gmail.com*)

Thank you in advance for scarifying your precious time

ANNEX–II: Bivariate Pearson Correlation between Variables

Correlations

		IS	CC	GC	DS	IA	RS	JKC	SCR
(SCR)	**Pearson Correlation**	.754**	.781**	.747**	.766**	.555**	.659**	.716**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	106	106	106	106	106	106	106	106

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

Source: SPSS output of the survey, 2023