THE EFFECT OF PUBLIC - PRIVATE COLLABORATION ON THE PERFORMANCE OF SUPPLY OF ESSENTIAL PHARMACEUTICALS: THE CASE OF ETHIOPIAN PHARMACEUTICAL SUPPLY SERVICE.

By

Leul Elias

(GSE/9757/12)

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS - ABABA UNIVERSITY SCHOOL OF COMMERCE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Advisor: Dr. Tariku Jebena

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ADDIS ABABA, ETHIOPIA

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Approved by Board of Examiners

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Advisor	Signature	Date
_____	_____	_____
Internal examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date

Declaration

I, Leul Elias, hereby announce this research paper entitled “The Effect of Public – Private Collaborations on the Performance of Supply of Essential Pharmaceuticals: the case of Ethiopian Pharmaceutical Supply Service.” is my own work and I shall say that this research paper is original. To this end, I acknowledge all sources of information that I used to produce the study appropriately.

Leul Elias	_____	_____
Researcher	Signature	Date

Letter of Certification

This is to certify Leul Elias has carried out his thesis work on the topic entitled “The Effect of Public - Private Collaborations on the Performance of Supply of Essential Pharmaceuticals: the case of Ethiopian Pharmaceutical Supply Service.” under my guidance and supervision. Accordingly, I hereby assure that his work is appropriate and standard enough to be submitted for the award of Master of Arts degree in Logistics and Supply Chain Management.

Tariku Jebena, (PhD)	_____	_____
Research Advisor	Signature	Date

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The Researcher,

Leul Elias.

Abstract

The purpose of thisstudywas to assess the role of public – private collaboration practices, namely; information sharing (IS), decision synchronization (DS) and incentive alignment (IA) onthe performance of supply of essential pharmaceuticals (PSEP) in Ethiopian Pharmaceutical Supply Service (EPSS).

A quantitative approach alongside explanatory design was applied. Primary data was collected through a survey using a pre validated 34 items, (9 IS, 9 DS, 7 IA and 9 PSEP), containing structured electronicquestionnaire.The study employed purposive sampling technique. Accordingly 104 actual respondents were obtained from public and private suppliers.All were collected for subsequent analysis.

The reliability was checked to be at Cronbach's α of .894; proving the internal consistency isappropriate and highly acceptable. 75% of respondents were from EPSS.73%were male, 52% had bachelors' and 48% masters' degree.40% were at administrative level while 60%were department officers.Pearson's Correlation showed significant and positive relationwith PSEP. The regression, $R^2$was .328. While β value was .264, .238 and .215 respectively for IS, DS and IA, with a P- value < 0.05; All the practices summed up to improve the supply of essential pharmaceuticals by 33%. Meanwhile, IS, DS and IA contributed for this effect in an orderly manner of magnitude respectively.

In conclusion, IS, DS, and IA,although a relatively lower adjusted R^2, being a baseline study, they have an appreciableand significant effect on PSEP.Consequently stakeholders might exploit the studiedfactors while seeking supply performance improvement. Else, further studies could treat the scenario from public and private supplier's perspectivesindependently in qualitative manner for each factor.

Key Words: *Public – Private, Collaboration,Supply,Pharmaceuticals, Ethiopia.*

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List of Acronyms and Abbreviations

CBHI – Community Based Health Insurance

DS – Decision Synchronization

EMs – Essential Medicines

EPs – Essential Pharmaceuticals

EPSA – Ethiopian Pharmaceutical Supply Agency

EPSS – Ethiopian Pharmaceutical Supply Service

FDRE - Federal Democratic Republic of Ethiopia

FMHACA – Food Medicine Health Administration and Control Authority

FMOH – Federal Ministry of Health

GDP – Gross Domestic Product

GTP – Growth & Transformation Plan

IS – Information Sharing

IA – Incentive Alignment

PFSA – Pharmaceutical Fund and Supply Agency

PLMP – Pharmaceutical Logistics Master Plan

PSCP- Pharmaceutical Supply Collaboration Practice

PSEP – Performance of Supply of Essential Pharmaceuticals

PSTP - Pharmaceutical Sector Transformation Plan

PSEP – Performance of Supply of Essential Pharmaceuticals

RDF – Revolving Drug Fund

SC – Supply Chain

SCC – Supply Chain Collaboration

SCM – Supply Chain Management

SDGs – Sustainable Millennium Development Goals

UHC- Universal Health Coverage

USD – United States Dollar

WHO – World Health Organization

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CHAPTER ONE

INTRODUCTION

This chapter addresses the Background of the study, Statement of the problem, , Research Questions, Research objectives, Significance of the study, Scope of the study, Limitations of the study, Definition of terms, and Organization of the thesis report.

1.1. Background of the study

Although national data from recent census are lacking, according to the world population review, Ethiopia's current population reaches about 115 million. This makes the country Africa's second-most populous, tenth-largest country and the seventh highest gross domestic product (GDP), (IndoAfrican.Org). With such an average real GDP increment of 10.9 % during the last ten years (2004-2015), the country has experienced outstanding economic growth,Moller, (2017). According to the reports, the country's GDP in 2021 has reached 95.97 Billion USD. It has spent about 3.30 % of this GDP on health care, World Bank, (2019). This is an estimate of health expenditures including healthcare goods and services consumed during the year. If we took the estimates of the pharmaceutical expenditure out of this, it will take 31%, Revised PSTP, (2020). This expenditure is expected to grow in a remarkable swiftness by 25 % per annum, Personal communication, PFSA, (2015).According to parliament sources, this figure is eminent as it is also implicated by the country's appraisal of 2022/23 fiscal year budget, Writer, S. (2022).

In 1993, Ethiopia created a national medicine policy to manage the country's pharmaceutical industry. One of the policy's main objectives is to standardize pharmaceutical supply and distribution while also guaranteeing that essential medicines are available. New pharmaceutical plants, advantageous circumstances and incentives for private investors; importers and manufacturers, and the formation of government-owned pharmaceutical supply firms were also listed as options for achieving policy objectives in the strategy, Health Policy, Transitional Government of Ethiopia, (TGE), (1993).

The pharmaceutical supply chain (SC) is the system that distributes drugs to patients. Due to the enormous number of stakeholders involved, it is extensively regulated and extremely complex. Some of these actors in Ethiopia include the Federal Ministry of Health (FMOH), specifically the Pharmaceutical Logistics Management Unit, the regulatory authority, developmental partners, local manufacturers and importers (Public and Private), wholesalers, retailers, regulatory authority, customs authority, bank and insurance, Ethiopian shipping lines, Ethiopian airlines, and freight forwarders.

In 2006, the country developed a comprehensive Pharmaceutical Logistics Master Plan (PLMP) with the assistance of stakeholders as part of the process of implementing pharmaceutical policy. The goal of this plan was to consolidate the health commodities management of multiple straight down programs into a single supply chain, FMOH, (2006). Following that, the Pharmaceutical Fund and Supply Agency (PFSA, now, by the year 2022, renamed to Ethiopian Pharmaceutical Supply Service(EPSS) was established by proclamation (Proclamation No. 553/2007) to ensure the ongoing and uninterrupted supply of essential health commodities to all public health facilities. It also supplies critical health commodities to commercial and non-governmental health facilities, with a serious guidance of the agency's board of directors.

EPSS is in charge of the entire health commodity supply chain, including forecasting, procurement, storage, and distribution. It meets roughly 70% of the country's standards. Meanwhile, the rest of the country's demand is expected to be met by the private sector, National Strategy & Plan, (2015).

Although such a blend of effort between this public supplier and private manufactures and importers is anticipated to meet the national health supplies demand; there is a palpable deficit of the actual performance, SA, (2020). This discrepancy is expected to worsen even in a double intensity when community based health insurance (CBHI) is at a full-fledged level. Besides, the country's second and third GTP have set goals, and are interested in exploiting the benefits obtained through such public – private partnerships or collaborative efforts in solving the country's pharmaceutical recurrent stock outs.

Thus the proposed study aims at assessing the practices of pharmaceutical supply service collaboration happening between these stakeholders.

1.2. Statement of the Problem

Access to essential medicines (EMs) is at the heart of the initiative because they are a necessary component of service delivery and a requirement for high-quality health care, World Health Organization, (WHO), Department of essential drugs and medicines policy, (2005). Universal Health Coverage (UHC) initiatives aim to provide users with access to high-quality health services based on their needs while imposing minimal financial hardship, Cameron et al., (2009). EMs meets the population's most pressing health-care needs, Niëns and Brouwer, (2013).

EMs are intended to be available in adequate amounts, in appropriate dosage forms, with assured quality, and at a price that the individual and community can afford at all times within the context of functioning health systems, FMHACA, FDRE, National Essential Drug List, (2014). Lack of financial resources or information can create barriers to accessing essential medicines in many developing countries, contributing to an increase in morbidity and mortality (Desalegn, 2013). In addition to the scarcity of EMs, the high cost of medicines is posing a challenge in the delivery of healthcare. The cost of medicines is a concern in low- and middle-income countries, where up to 90% of the population pays for medicines out of pocket, Wubetu et al., (2018). This has a significant impact on the affordability of medicines and the outcome of disease treatment, EFMoH, Fifth national health accounts, (2014).

Hence availability and affordability are the two dimensions of access to EMs,Melis and Nougier, (2010). Access to affordable, high-quality EMs is critical for lowering the financial burden of care, preventing additional pain and suffering, shortening the duration of illness, and preventing unnecessary disabilities and deaths worldwide, IMS Institute Global Use of Medicines: Outlook Through, (2013). However, one-third of the global population does not have regular access to EMs, resulting in a cascade of avoidable misery and suffering, Management Science for Health, Managing Access to Medicines and Health Technologies, (2012). Despite the issuance of legislation supporting the implementation of UHC by the countries, this estimate rises to more than 40% in low-income countries and more than 50% in Asia and Africa's poorest countries, DFID, Human Development Resource Center, Availability of Essential Medicines, (2012).

Being one of the developing nations, Ethiopia is facing the dire consequences of lack of access to these EMs. In accordance with the SDGs and in response to the challenges, WHO has developed a framework to assist policymakers in improving access to EMs in order to achieve universal health coverage by the year2030. Access is consists of four major components: rational medicine selection, use, availability and affordability, long-term healthcare financing, and a dependable supply system of quality products, Hussien and Tafese, (2015).

The availability, affordability and integration of the previously undertaken vertical programs of supply of pharmaceuticals have been a focus for many of the researchers and academicians in the field. However, the factors affecting dependable supply systems so as to the RDF scheme and finally Access of EMs in a correlational perspective hasn't been as such researched, Mathewos Oridanigo, BeyeneSalgedo and GebissaKebene, (2021).

The current collaborative practice of the integrated public supplier with other private partners in the supply arena hasn't been paid any significant attention so far. Since evidence based scrutinization of the supply partners' collaboration practice is or at least a contributing factor for the continuously faced demand supply incongruity as witnessed in the health and essential medicines accessibility, SA, (2020), & Abraham B.et.al, (2020). Apart from loss of economies of scale as a nation, the country and its citizens will be deprived of the basic health services, which basically is a moral as well as legal obligation for the nation to fulfill. Moreover, it's a universal charter to be observed for, SA, (2020), Abraham B.et.al (2020), and United Nations, (1948).

1.3. Research Questions

- What is the effect of information sharing on the performance of supply of essential pharmaceuticals?
- What is the effect of decision synchronization on the performance of supply of essential pharmaceuticals?
- What is the effect of incentive alignment on the performance of supply of essential pharmaceuticals?

1.4. Research Objective

1.4.1. General Objective

The general objective of the research was to assess the effect of public - private collaboration practices on the performance of supply of essential pharmaceuticals in the case of EPSS.

1.4.2. Specific objectives

Reliant on the general objective, the following points were the specific objectives of the research paper;

To examine the effect of information sharing practice on the performance of supply of essential pharmaceuticals

To examine the effect of decision synchronization on the performance of supply of essential pharmaceuticals

To examine the effect of incentive alignment on the performance of supply of essential pharmaceuticals

1.5. Significance of the Study

The study adds to the knowledge of the public pharmaceutical supplier, local commercial pharmaceutical producers, and importers about how to organize, implement, and evaluate national pharmaceutical supply collaboration. Furthermore, the study recommends policies for public and private pharmaceutical supply chain collaboration planning, execution, and investment as effective management tools for improving the contentment of national, public and private pharmaceutical suppliers, this in turn further drives institutional capabilities build up.

The ultimate success of the above achievements is expected to improve the national essential medicines availability and affordability for the public thus improvement and savings of citizens lives. Similarly this will create national capacity of creation of economies of scale while halting redundant medication availability and subsequent disposal and generation surpassing environmental costs. Besides, the study also serves as a nucleus for more in-depth inquiry of similar topics and sheds light on future related investigations as well as academic inputs.

1.6. Scope of the Study

The current study has about four delimitations; namely geographic, temporal, conceptual and methodological.

Geographically, EPSS has a federal level head office in Addis Ababa, where such collaborative activities with supplying private partners are undertaken dominantly and centrally. So the study is geographically limited to Addis Ababa were study units are concentrated. Thus, all the private pharmaceutical manufacturers and suppliers included in the study are only those found in the capital Addis Ababa.In order to maintain the recency and quality of respondents' responses, temporally,the research activities were accomplished between the periods of May 15 to 31, 2022.

Conceptually, the collaboration practice of; information sharing, decision synchronization and incentive alignments on the performance of supply of pharmaceuticals; which can be viewed from the perspective of better fulfillment, optimal inventory and responsiveness relationships are addressed explanatorily from the perspective of public and private suppliers.

In order to accomplish this conceptual intent of the study, the research methodologically involved partners; EPSS and those private local pharmaceutical manufacturing companies and suppliers which only have been engaged in such a practice. Thus EPSS's, and 10 other private companies' responsible departments and staff which are currently working together on the supply of essential pharmaceuticalsof RDF scheme are carefully targeted and assessed quantitatively, and entertained in descriptive and explanatory manner.

1.7. Limitations of the Study

The following study has suffered from lack of well-documented practices of collaboration among partners hence the quality data collection has been difficult and laborious. Besides, the collaboration efforts of other private pharmaceutical importers, although playing their individual effort in supplying essential medicines, are left out since they are lacking consistent presence with EPSS.

1.8. Operational Definition of Terms and Concepts

Accessibility

According to the WHO definition for the word accessibility to health service or pharmaceutical necessitates both the availability and at the same time affordability of the provisions of health and / or pharmaceutical services up to the accepted standard for the community at large. And this definition of the word holds steadfast throughout this research.

Essential Pharmaceuticals

Essential pharmaceuticals are those that satisfy the priority health care needs of the population. Disease prevalence, efficacy and safety proof, and comparative cost-effectiveness are all factors in the selection of essential pharmaceuticals. According to WHO definition of the term, essential medicines are intended to be available at all times in adequate amounts, in appropriate dosage forms, with assured quality, and at a price that individuals and communities can afford within the context of functioning health systems. For the purpose of this study essential pharmaceuticals means essentially essential medicines and thus the two terms can be interchangeably stated,Seuba X, (2006).

Public

Means any public sector entities in this study; this fully implies to EPSS.

Private

Any institution that is not directly under the administration of the government is considered to be in the private sector. However, it is a division of a nation's healthcare system. It often consists of non-public ownerships, such as for-profit businesses, non-profit organizations, and religious institutions, in our case, this fully implies private suppliers & manufacturers; USAID, (2015).

Public – Private Supply Collaboration

This basically refers activities taken such as data transferring or information sharing, decision synchronization and incentive alignment practicestaking place between these entities or parties,Darden Ideas to Action. (n.d.).

Revolving Drug Fund

The revolving drug fund, or RDF, is a system in which a sum of money contributed by the government, donors, or the community is used to purchase an initial stock of essential and commonly used medicines, which is then sold repeatedly, ideally at a price adequate to replace the stock of medicines, guaranteeing uninterrupted supply (Management Science for Health, Policy and Legal Framework).

Performance of Supply Chain

The measures made by the extended supply partners to satisfy end-customer demands are referred to as "supply chain performance." This entails ensuring that the supply chain has all the stock and ability it requires to fulfill its responsibilities in a timely manner, as well as that the products are available and deliveries are made on time. Taking this in mind, the present paper measures the supply performance from these perspectives of better fulfillment, optimal inventory, and responsiveness with in the essential pharmaceuticals supply system,Hausman, W.H. (2004).

1.9. Organization of the Study

Chapter one contains introduction, background, statement of the problem, purposes of the investigation, research questions,general and specific objectives of the study, significance, scope, and limitations of the study. The second chapter (Review of Related Literature) First, the concept, characteristics, and players of supply management will be defined. Second, supply collaboration will be discussed, as well as the supply collaboration framework. Third, the concept of a pharmaceutical supplier, as well as pharmaceutical supply management, supply chain collaboration in the pharmaceutical business, pharmaceutical supply issues, and pharmaceutical supply performance, are going to be reconnoitered. Finally, a conceptual framework has been established, as well as,the research hypothesis was proposed.The third chapter discusses research methodology, including the topic, research approach, research design, population and samples, data sources and types, data collection techniques, validity & reliability of the scales, and ethical concerns. The fourth chapter discusses data analysis. This includes presenting, interpreting, and discussing the findings. The fifth chapter has the study's summary, conclusion, recommendations,and future research areas.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter presented us the review of theoretical / conceptual and empirical literatures; the conceptual framework & the research hypothesis generated from these reviews for this study are presented.

2.1. Theoretical Literature Review

2.1.1. Supply Chain Management

In the most economical way, supply chain management (SCM), is the array of actions for planning, controlling and getting products from materials to production, and finally to distribution. Integrated planning and performance of procedure is essential to improve the flow of materials, data and capital; therefore, they are included under the shadow of SCM. More Widely, SCM covers the sourcing, production, inventory management, demand planning and logistics/transportation and storage of the various types of business catalogs. To gain a competitive advantage over the rivals, companies utilize both specific software and business plans to develop an overall structure for efficient supply management practices both in local and international environments, Supply Chain Management and Its Influence on the Performance of Pharmaceutical Companies (2020).

2.1.2. Supply Chain Collaboration

In today's globalized and highly competitive business era, organizations have begun to realize that in order to gain and sustain competitive advantage; they have to deliver the best customer value at the lowest possible cost. The customer is increasingly becoming highly demanding with respect to faster response time, shorter product cycle time, customized products and services. In the past decade, firms are looking outside their organizational boundaries for opportunities to collaborate with supply chain partners to ensure efficiency and responsiveness of supply chain, so as to leverage the resources and knowledge of their suppliers and customers (Cao and Zhang, 2011). With respect to this nature, supply chain is such a dynamic process and involves the constant flow of information, materials and funds across multiple functional areas both within and between chain members Jain, Wadhwa, &Deshmukh, (2009). The business goal might seem to be difficult to achieve by individual organizations, but can be easily achieved through collaborative supply chain relationships.

Due to this very nature, there is a greater need for the supply chain partners to be dynamic and responsive to add value for the customers in the form of extended business organization. The business goal might seem to be difficult to achieve by individual organizations, but can be easily achieved through collaborative supply chain relationships. Collaborative relationships between organizations have received considerable attention in recent times,Samaddar and Kadiyala, (2006). Collaboration in the supply chain also results in performance improvement in the supply chain,Vereecke and Muylle, (2006). In demand chain management, the supply chain structure when aligned as per the needs of the customer would result in better performance. Despite the fact that several collaboration initiatives have been identified as important in improving supply chain performance and collaboration being a part of most organizations' value structure, it appears that few companies are actually engaged in the level of integration that collaboration proposes, Fawcett, S.E. and Magnan, G.M., (2004).The scholarly related views have been dealt with as follow.

2.1.2.1. Transaction Cost Economics View

Transaction Cost Economics, (TCE), is a very potent theory, created by Williamson in 1975, can be used to describe relationships between organizations (firms) to a greater extent. Markets and hierarchies are two ways to arrange connections between firms, according to Williamson, (1975). According to Kaufman, Wood, and Theyel, (2000), the monitoring costs associated with bounded rationality, as well as self-interest and opportunistic behavior uncertainties, determine whether to use market processes or hierarchies (vertical integration). Additionally, Williamson, (1975) lists the following factors as determinants of transaction costs: frequency, specificity, uncertainty, limited rationality, and opportunistic behavior. Out of these, uncertainty is frequently regarded as a crucial characteristic, with frequency being the least likely.

2.1.3. Resource Based View

Rendering to this resource based view (RBV) theory, a firm's resources, including its financial, legal, human, organizational, informational, and relational assets, are heterogeneous and imperfectly mobile. The management's primary responsibility is to comprehend these characteristics and arrange assets for long-term competitive advantage, Prahalad and Hamel, (1990); Barney, (1991). The following qualities of valuable, rare, inimitable and not substitutable, usually referred to as the VRIN criteria in short form, are

fundamentally required for resources to have the potential to serve as sources of sustainable competitive advantage.This RBV idea provides management (strategists) with guidance on how to assess prospective relatively sustainable resources that might be structured to gain a competitive edge.

2.1.3.1. Relational View

Although RBV have contributed greatly to understanding firms achieving above normal returns, they overlook the important fact that the (dis)advantages of an individual firm are often linked to (dis)advantages of the network of relationships in the firms. Dyer & Singh, (1998), argues the critical resources may span firm boundaries and Relation View will complement RBV. In a firm, relations rents and internal rents both can be earned. The super normal profits which a firm in isolations cannot create, can be created only through joint contributions of the partners in collaboration is called relational rent, Dyer &Singh, (1998); Lavie, (2006). Combining idiosyncratic assets, knowledge and capabilities through relation specific investments, inter firm knowledge sharing routines, complementary resource endowments, and through driving effective governance mechanisms results in creation of relational rents. The relational view stresses common profits that collaborative partners cannot generate independently.

2.1.3.2. Social Capital View

Social capital in the supply chain was defined by Min, Kim, and Chen, (2008), as a collection of social assets woven within the web of connections that makes up a supply chain network.When social capital is effectively established in the supply chain, collaborative behaviors will be fostered by partners. Social capital theory describes three types of capital:structural, relational, cognitive. The overall network of relationships' impersonal arrangement of linkages is related to structural capital. The resources that provide common meaning are cognitive capital, defined as understanding among network participants that enables people to gradually share their interactions, similar viewpoints, and language, Wasko, &Faraj, (2005). This cognitive capital has two facets: a shared culture and shared goals, Inkpen, & Tsang, (2005). The extent to which behavioral rules are shared a society impose rules on how members should interact. Partners frequently list the shared guidelines set forth in a formal network contract. They apply and conventions provide a calm environment and lessen the likelihood of opportunistic behaviors, resulting in lower monitoring, more involvement and costs.A network member's degree of agreement on a task's objectives and a

strategy for achieving them is reflected in the shared goals they have. Despite having different interests in mind, supply chain partners typically cooperate to achieve a similar objective established by the focal firm, Krause et al., (2007). In essence, a supply chain is not a chain of enterprises whose participants do business one to one. According to Petersen, et al., (2008), SCC presents chances to capitalize on the synergy of intra- or inter-firm integration and the management to provide shared advantages. The four theories mentioned above make an effort to describe the nature of these integrations' behaviors in terms of the social and economic sectors with regard to the SCC. The impact of supply chain collaboration on prospective performance enhancements will then be examined in the study, with a particular emphasis on public - private collaboration on the supply of pharmaceuticals perspective.

2.1.4. Pharmaceutical Supply Chain

Pharmaceuticals are now a crucial component of every healthcare system in the world. By enhancing life quality and cutting down on hospital stays, drugs have historically contributed significantly to the advancement of humanity. Today, practically almost all epidemics and chronic diseases are curable because of the pharmaceutical industry's outstanding research and development. The pharmaceutical business is crucial to the growth of a healthy and productive nation because of its direct connection to human welfare and well-being. The pharmaceutical industry is one of the biggest and most quickly expanding industries in the world today, PHARMACEUTICAL INDUSTRY IN OIC MEMBER COUNTRIES, (n.d.). The pharmaceutical supply chain management is complex one requiring the participation of different stakeholders such as pharmaceutical manufacturers, wholesalers, distributors, health facilities and/or customers, information service providers, and regulatory agencies, Kapoor et al., (2018), Singh &Goh, (2019), Settanni et al., (2017),Zahiri, et al., (2017), Cullen & Taylor, (2009),and, Silva &Mattos, (2019). Its proper implementation ensures to avail medicines in the right quantity, with the acceptable quality, to the right place and customers, at the right time and with optimum cost to be consistent with a health system’s objectives, Kaufmann et al., (2005) and,Muhia et al., (2017).

2.1.5. Pharmaceutical Supply Chain Collaboration

The pharmaceutical industry involves a wide range of logistical and supply chain operations that could provide the basis for excellence. The industry as a whole uses some standard benchmarking metrics, such as months of on-hand inventory and inventory turns, but the

current measures do not take into account the specifics of the industry or provide enough in-depth understanding of the critical components of a successful pharmaceutical supply chain. Unlike other industries, the pharmaceutical supply chain, although being matured, is suffering from the constraints between high tradeoffs of manufacturers markup and associated either dramatic increase in inventory holding costs or stock outs at distributors end. Measures taken to tackle these problems like increasing inventory by either manufacturers, suppliers or distributors, incurs a huge sum of capital. Besides, these inventories are further frightened by the issue of shelf lives in association with store conditions deeming a high cost to maintain standard storage and the other is the inevitable expiry issue, in which most is spent across the supply chain stream. In order to address the industry's complex supply chain management issues, several companies in the pharmaceutical sector are also considering cutting-edge research and development strategies that create collective collaboration agreements between two or more parties, Mukherjee, G.N. (2005).

2.1.6. Public – Private Collaboration in the Health Sector

The 2030 Agenda for Sustainable Development serves as a road map for global development and encourages private sector participation in a variety of sectors. Indeed, the past 20 years entertained enormous private sector's involvement.Since accomplishing the Sustainable Development Goals, it calls for immediate measures to strengthen the relationship between the government and the private sector, including civil society, corporate business, and others (SDGs). In this sense, the health sector needs to develop efficient methods for utilizing and expanding the capacity of integrated health systems that render both products and services. To promote healthy lives and attain universal health coverage, nations must make sure that all providers - public and private - are actively involved (UHC). The objective of private sector involvement in the healthcare sector is to increase non-state actor participation in a variety of complex sectors, WHO, (2018),& UN, 2030 Agenda for sustainable development, (2016),with an overall goal of relieving the burden on the public sector, leveraging the financial resources and capacities from the private sector, and reducing inequalities in access and use of healthcare services. Various countries have made some effort to strengthen the engagement of the private sector in health. An efficient private health sector can reduce the burden on the public sector and free up more funds to be allocated to the most vulnerable members of society. For instance making expensive medications available at more affordable prices, as in the case of GOR, where treatments costs are reduced, such as hepatitis C medications, Whyle, E.B., & Olivier (2016).The importance of companies from the private

sector in health supply chain management have been significant especially in the availability and accessibility of medicines, medical supplies and medical equipment in health facilities and henceforth ensuring continuous supply and quality services delivery.

2.1.7. Pharmaceutical Supply Chain Management and Collaboration in the Ethiopian Context

EPSS, initially PFSA, was established as a semi-autonomous public institution in 2007 to supply quality assured and affordable essential pharmaceuticals to all public health facilities in Ethiopia. EPSS has been working on the achievements that have been made in the health sector regarding the reduction of morbidity and mortality associated with both communicable and non-communicable diseases. Since its establishment EPSA has sought to build its capacity in terms of human resource and supply chain systems at all levels. As a result, EPSA's capacity in procuring, storing and distributing pharmaceuticals through the RDF and other programs has noticeably increased.

In 2015, EPSS developed and commenced implementing a five year Pharmaceutical Sector Transformation Plan (PSTP), covering all aspects of the end-to-end supply chain (Pamela Steele., et. al., 2020). At the heart of this PSTP, the agency strives to excel in customer relations management, supply chain workforce development and management, and information management and usage with the ultimate goal of achieving the continuous supply of quality assured and affordable essential pharmaceuticals to health facilities through partnering with multiple stakeholders, both public and private entities, within the sector, Tilahun, A., Worku, F. and et al (2018).Therefore, it is the highest intention of the researcher to examine this phenomenon in the country. As a result the following study will consider the above literatures as a basis for studying the public – private collaborations from the perspective of information sharing, decision synchronization and incentive alignments factors while examining effects on the supply of essential pharmaceuticals.

According to Simatupang, and Sridharan (2002), among the other perspectives, supply chain collaboration is frequently a product of two or more chain participants collaborating to gain a competitive advantage by exchanging information, making joint choices, and sharing gains that emerge from better profitability of serving end consumer needs than acting alone. The following research, therefore, has taken three independent variables or factors that can affect the dependent variable, performance of supply of essential pharmaceuticals.

2.1.7.1. Information Sharing

The act of recording and disseminating timely and relevant information for decision makers to plan and oversee supply chain activities is known as information sharing. Managing the flow of information is a critical aspect for both efficiency and effectiveness within the supply chain, with the main attribute of sharing information about flow and demand requirements up and down the supply chain.

2.1.7.2. Decision Synchronization

Joint decision-making in planning and operational situations is referred to as decision synchronization. The planning context incorporates long-term planning decisions and measures aspects such as target market selection, product assortments, customer service level, promotion, and forecasts. Order generation and delivery procedures are integrated in the operational context.

2.1.7.3. Incentive Alignment

The degree to which chain participants share costs, risks, and gains is defined as incentive alignment. These three characteristics are critical for enabling participating members to improve the speed with which items are delivered to end users.

2.1.7.4. Supply Chain Performance

According to Neely, et al., (1995), Performance is generally efficiency and effectiveness of action. While effectiveness is the extent to which customer's requirements are met, and efficiency is how economically a firm's resources are utilized to achieve a predetermined level of customer satisfaction. Taking these considerations, performance embraces two components, namely; customer fulfillment and running cost optimization.

2.1.7.5. Supply Chain Collaboration and Supply Chain Performance

SCC is either tactical or strategic decision where two or more autonomous enterprises build long-term relationships and work closely to plan and execute supply chain activities toward common goals, yielding more benefits than operating alone. SCC has numerous advantages for supply chain partners in the supply chain network. Numerous studies have been undertaken by researchers and academicians to support the benefits of the SCC (Ralston, 2014).

Firms form inter-firm collaboration relationships in order to share risks and profits among partners. The goal of collaboration is to produce higher performance than would be possible if each company operated independently (Lambert et al., 1999). Another reason why companies are seeking outside their organizational boundaries for possibilities to engage with supply chain partners is to assure supply chain efficiency and responsiveness by leveraging their suppliers' and customers' capabilities and knowledge (Cao and Zhang, 2011). According to Crook et al. (2008), when independent enterprises collaborate and share expertise with others, they can gain benefits that are not possible in an arm's length transaction.

2.2. Empirical Literature Review

2.2.1. Information Sharing

According to Simatupang&Sridharan, (2004), information sharing has been operationalized in their research as a duty of acquiring and disseminating soundly applicable information for partners in order to help make the proper planning and controlling decisions of supply chain activities.

According to one study done in Turkey industries, by Doganay, A. and Ergun, S. (2017), has found a direct positive causality between SCC practices namely SCC Information Sharing and goal congruence (SCCISGC), SCC resource sharing (SCCRS), SCC Decision synchronization, joint knowledge creation and incentive alignment (SCCDSJKCIA) and SCC collaborative communication (SCCCC) and Supply Chain Performance, (SCP), in terms of both speed and cost with a standardized β value of [0.636, 0.523, 0.395, 0.269 and 0.633, 0.547, 0.562, 0.170] respectively and these regression tests were all significant, with a p values 0,000 (< 0.05).

In a another broad study done in the pharmaceutical industries of Malaysia by Haque, M. and Islam, R. (2018), in university of Malaysia, the practices of knowledge sharing and SCC, which has a component of information sharing, altogether has increased customer satisfaction, which in turn affected business performance positively at a significant level of 0.6.

2.2.2. Decision Synchronization

On the same work of Simatupang&Sridharan, (2004), decision synchronization operationalized as a cooperative process between supply chain partners of aligning or making decisions in a joint manner with a sense of once again planning and controlling supply chain tasks. Based on their priority assessment, it has gained an overall weight of 0.34.

2.2.3. Incentive Alignment

The authors contend that a supply chain can only function effectively if the risks, expenses, and benefits of conducting business are evenly divided throughout the network. In reality, unbalanced incentives frequently result in too much inventory, stock-outs, inaccurate estimates, insufficient sales efforts, and even subpar customer service. All supply chain participants have a stake in one another's outcomes; if businesses cooperate to serve customers, everyone benefits. But they can only do it if their incentives are in line. NarayananV.,& RamanAnanth. (2004). on the other hand although this parameter was ranked third in the work of Simatupang&Sridharan, (2004), it has gained a significant weight of 0.21.

2.2.4. Supply Performance

It has been found that unpredictable or opaque demand patterns can produce artificial demand amplification, often known as the "bullwhip" or "whiplash effect," in a variety of situations. As a result, stock-outs are frequent, inventories are huge, and service standards are low. According to Holweg, et al., (2005), the reduction of uncertainty through open information exchange is a core aim of external supply chain collaboration.

According to Frohlich, M.T., and Westbrook, R., (2001), a research done in England, amongst 23 countries worldwide, on supply chain cooperation has shown a progressive development on customer service, satisfaction, and on timely delivery, among other variables, by a mean average of 23.5 % with significance level of 0.05.

Another study done in Ethio - Eritrea refugee camps, by a student called Weldezgina, A. (2020) has revealed that SCC among humanitarian organizations has brought around 0.98 R square variations on the humanitarian supply chain. In other words the positive result of humanitarian supply chain performance is resulted from a variation of practices of SCC.

The other supplementary study done in Hyderabad, by Chakraborty, S., Bhattacharya, S. and Dobrzykowski, D.D. (2014), in the context of healthcare (hospital supply chain system), using a Service Dominant Logic (SDL) model, has made its conclusion as follows; SCC (IA, IS, DS, CC, GC, Relation Transparency) has positive and significant impact in coo-value creation andfirm performance, a composite of both finance and clinical. The clinical aspect encompasses the length of stay, when we correlate with the SC term that would be lead time, and subsequently related issues like mortality.

Another study done in Ethiopia on tour operators SCC by Birehanu, T. and Belayneh, T.

(2017) has a β value result of 0.281, 0.335, and 0.032 for SCCIS, SCCDS, and SCCIA respectively with a p-value less than 0.05. While the impact of the overall SCC practices; IS, DS and IA has a 32.8 percent improvement impact on the overall tourism industry SC performance.

And finally nonetheless most important and foundational work of Simatupang, T.M. and Sridharan, R. (2004), brings as a result of 0.45, 0.34 and 0.21 of isolated R square on the realized SC performance parameters of fulfillment, inventory and responsiveness respectively with a significant p-value less than 0.05, 0.001.

2.3. The Ethiopian Pharmaceuticals Supply Challenges

In order to serve the country, EPSA during the period of this study has renamed itself Ethiopian pharmaceutical supply service (EPSS), has clustered its central and regional hub into seven clusters. Each cluster is led and coordinated by a most senior hub. All the public healthcare facilities (HCFs) in Ethiopia have been receiving essential pharmaceutical supplies from EPSS. There are currently 19 EPSA hubs, with the capital serving as the main branch, and they are all distanced by between 160 and 300 kilometers radius.The report and requisition forms (RRF) are used by HCFs every two months to report t heir consumption and request refill quantities. HCFs typically use this method to get health pr ogram and budget (RDF) pharmaceuticals, *EPSA* IPLS, (2019),& Gudina EK, Gobena D, Debela T, &et al.,(2020).

The nation does, however, confront obstacles like a widespread shortage of essential drugs, inefficient stock management, and a drawn-out procurement process. This is a key issue in the nation's aim to modernize its healthcare system, which calls for enhancing healthcare product management systems to guarantee continuous accessibility and availability to address health issues, FMoH(2015),&Gudina EK, Gobena D, Debela T, & et al., (2020).

In contemporary study done by YohannesBirhanu, TafesseGizaw, et.al., on EPSS has identified customer and internal integration, information sharing have influenced operational performance positively through a coordination among units of the agency, however, there was lack of communication and information sharing among partners. They have confirmed that information sharing has a mediating role between customers, and operational performance, with ($\beta = 0.270$, $p < 0.001$), YohannesBirhanu, TafesseGizaw,TadesseGudeta et.al, (2022).

This is so the researcher was interested in finding out the role of supply chain collaboration practices of information sharing, decision synchronization and incentive alignments taking place between EPSS and other privately run suppliers as external partners in the supply of essential pharmaceuticals. Meanwhile, it is this central hub, leading the central cluster, role to coordinate the activities of all other cluster and hubs centrally and vertically downward. In doing so it represents all coordination and collaborations taking place between other local and international manufacturers, suppliers or agents. For this very substance, the analysis and findings of the following research plausibly reflects the country's situation confidently.

2.4. Conceptual Framework

According to the reviewed literature, a conceptual framework has been proposed; supply chain collaboration practices have an effect on the supply performance of both individual pharmaceutical manufacturing and supplying firms as well as EPSS, thereby affecting the accessibility of essential pharmaceuticals supply in the chain. Collaboration is viewed as a three-dimensional construct in the pharmaceutical supply chain. The dimensions are information sharing, decision integration, and incentive alignment. The framework, which consists of these three dimensions, is based on previously published literature. Using literature support, the expected relationships between supply chain collaboration parameters, supply chain performance in the context of pharmaceutical supply chain operations are conceptualized. Hypotheses about the relationships between these variables have also been developed.

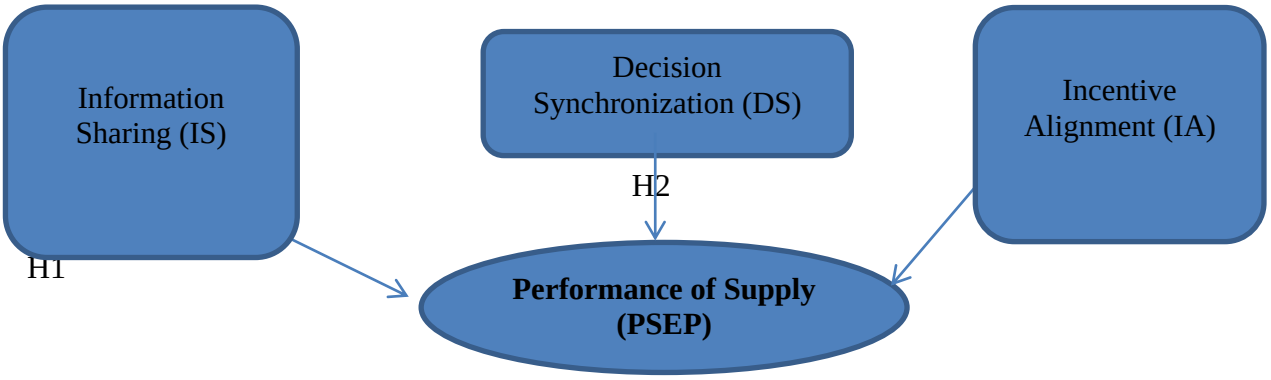

Figure 1. Conceptual framework, Adopted: Li, et al. (1995)

2.5. Research Hypothesis

The following hypotheses were formulated and tested in the thesis;

Hypothesis 1–Information sharing practice significantly affects the performance of supply of essential pharmaceuticals.

Hypothesis 2–Decision synchronizationpractice significantly affects the performance of supply of essential pharmaceuticals.

Hypothesis 3–Incentive alignment practice significantly affects the performance of supply of essential pharmaceuticals.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter is designated for the study's area, approach, design, as well as data types and sources used, population and sample design, issues related to data collection tools and technique. Moreover, scales reliability and validity of data collection tools. And finally the chapter outlines the approaches to how the collected data was analyzed for the purpose of testing hypotheses. Nonetheless, ethical concerns in relation to the research are presented.

3.1.Description of the Study Area

This study has been carried out at Addis Ababa in the Capital of Ethiopia. For a country of close to 115 million populations, most get its health care service from health care setups instituted in the government structure. Meanwhile, only one public owned agency provides the pharmaceutical supply services solely for all health care service providers within the government structure, otherwise, gaps are tried to be bridged by other local private manufacturers, suppliers, supplier agents and health institutions. It’s for this fact that the investigator has been triggered selecting the sector and starts the research to arrive at certain findings and potential interventions to be applied for the whole country.

3.1.1. Brief Descriptions of the Organizations Participated in the Study

Ethiopian Pharmaceutical Supply Service (EPSS)

It was with in accordance to the Proclamation No. 553/2007, the Ministry of Health formed EPSS as a governmental entity. The proclamation's Article 9 lists the responsibilities and authority of the Agency. The following are some of the Agency's responsibilities and powers: Establish and implement effective methods for procuring and distributing pharmaceuticals to public health institutions, utilizing the Drug Fund and concentrating on the nation's major health issues in order to assure a continuous supply of pharmaceuticals, create a contemporary storage management system that provides ample and suitable storage facilities.

EPSS is thus a nationwide organization with its nineteen branches that are all connected by a main office at Addis Abeba, the nation's capital. It musters a sizable workforce because it provides medications, chemical reagents, medical supplies, and equipment to more than 4,000 HCFs countrywide. There are currently 314 contract workers and 2,535 permanent ones working there. There are 2,849 people in total.

The Services have a unique fondness for various occupations, as one might imagine. In light of this, 409 of EPSS's staff members are pharmacists; 220 of them have bachelor's degree or above while 189 are diploma holders. There are 26 laboratory technologists who hold a bachelor's degree. A bachelor's degree is the bare minimum requirement for the 14 biomedical engineers in EPSS. The administrative personnel as a whole numbers 620; 304 of them have bachelor's degrees or above, while 316 have diplomas. Several directorates, including those for finance, human resources, public relations, and IT, are part of the administrative department. Including nurses and druggists, there are 30 health-related professionals. While 6 of them hold diplomas, 24 of them have bachelor's degrees or above. EPSS was previously managed by a Director General and two Deputy Director Generals, but it has just begun to introduce a new organizational structure that should improve the efficiency of the services it provides. A Director General, four Deputy Director Generals, and twenty directorates make up the new organizational structure.

Ethiopian Pharmaceutical Manufacturing (EPHARM)

An innovator in Ethiopia's pharmaceutical manufacturing sector is Ethiopian Pharmaceuticals Manufacturing Sh. Co. (EPHARM). The Nifas Silk Lafto sub-city of Addis Ababa is where its headquarters situated. For more than 50 years, EPHARM has produced high-quality, reasonably priced medicines that have addressed the serious health issues facing Ethiopians. Unlike many of the regional pharmaceutical producers, EPHARM today produces a variety of dosage forms. There are eight production lines, fully furnished labs, and utilities available to the company enable it to produce a variety of dosage forms, including capsules, tablets, vials, sachets (oral powders), and liquids(syrup), ampoules, large volume infusions, and ointments.

Near Addis Ababa, EPHARM has leased 40,000 square meters of land. On the green field, preparations are being made to construct a brand-new, GMP-compliant pharmaceutical facility. The goal of the new facility is to greatly enhance its manufacturing capacity while concentrating on producing high-quality, demand-driven, and competitively priced pharmaceuticals. To this purpose, EPHARM S.C. is currently making great efforts to incorporate cutting-edge manufacturing technologies and a creative production system into the newly envisioned plant.

East African Pharmaceutical PLC

Founded in 1996 GC by British and Sudanese investors with the goal of producing human and veterinary medications, East African Pharmaceuticals PLC (EAP) is one of the first privately owned joint venture direct foreign investment pharmaceutical plants. A single production line was used at first, but after 2004 three lines were added. It is situated close to housing for Jakrose in the Gourd Shola Industrial District of Addis Ababa.

Cadila Pharmaceuticals PLC

It was in a joint venture between Cadila Pharmaceutical Limited in India and AlmetaImpex PLC in Ethiopia, Cadila Pharmaceuticals (Ethiopia) PLc. was founded to manufacture tablets, capsules, and liquids in state-of-the-art facilities in Gelan town, close to Addis Ababa. The aforementioned Plant is one of Ethiopia's best manufacturing facilities and the nation's first Pharmaceutical Formulation Manufacturing Plant to be recognized under EU guidelines, in order to meet with the WHO-led regulatory criteria of Good Manufacturing Practice (GMP).

Sanshing Pharmaceuticals PLC

Located in the Eastern Industry Zone in Dukem, Oromia, Ethiopia, Sansheng Pharmaceutical PLC (SSP) is a pharmaceutical factory according to EU GMP standards. With an initial investment of 85 million USD, it is owned by Sansheng Share and occupies a 16.67 hectare plot of land.SSP is the first indigenous pharmaceutical manufacturer to receive EFDA GMP approval.It has more than 70 medications in its phase I project, including anti-infectives, anti-pyretics, analgesics, gastro-intestinal, cardiovascular, and anti-hypertensive compounds, among others. A total of 10 million high volume parenterals, 300 million injectables, and 5 billion tablets and capsules can be produced annually.

HumanWell Pharmaceuticals PLC

The Chinese-owned company Humanwell Pharmaceutical Ethiopia Plc constructed a new pharmaceutical factory in Hagerie-Mariam, Amhara Regional State, with a 20 million dollar investment. A Chinese provider of healthcare solutions made a 100 million USD investment in the industrial plant, which is located on a 7-hectare parcel of land. In the first stage of the endeavor, four dosage forms—tablets, capsules, injections, and syrup—are created, amounting to about 30 commodities. The organization needs more than 300 personnel to operate at full capacity.

Julphar Ethiopia PLC

With the intention of creating high-quality, reasonably priced medications for the people of Ethiopia and its neighbors, Julphar Pharmaceuticals PLC was founded in 2013 as a joint venture between Gulf Pharmaceuticals Industries and MedTech Plc.It produces a variety of medications that are made in Ethiopia utilizing technology that was transferred from our parent firm.

Gulf Pharmaceuticals

Gulf Pharmaceutical Industries is situated in Ras Al Khaimah, United Arab Emirates. One of the biggest pharmaceutical manufacturers in the Middle East and Africa, the industry is also a major producer of insulin globally. It has also as an agent here in Ethiopia, Addis Ababa.

EstroPharma PLC

Estro Import and Export Pvt. Ltd. were motivated by Ethiopia's recent phenomenal expansion. Ltd Co., hereafter known as EstroImpex, was founded in Ethiopia by the two brothers Mr. Daniel Waktole and Mr. Samuel Waktole in 2011 with the key motto "Rebuilding Ethiopian Business" or simply "Rebuilding Business." The company's head registered office is located at ESTRO HOUSE, Geferssa, Burayou, Oromia Surrounding Fininfine Special Zone, and its marketing office is located at AB Zone Building, Kazanchis, in front.Yoha International Pharmaceuticals Pvt ltd Co., which was founded in 2007 (Certified granted by Ministry of Trade) and had an annual revenue of USD 1.15 million in 2012/13, is the main parent company that gave rise to EstroImpex. In addition to supplying the entire nation and international tenders in Africa, Yoha Pharmaceuticals imports and distributes a number of high-quality medications and medical supplies.

Kilitch Pharmaceuticals PLC

KilitchEstro Biotech PLC (KEBPLC) is a joint venture between an Indian pharmaceutical firm and KilitchEstro Biotech. Ethiopian firm and Indian LTD,Kilitch medicines. Antiseptics, disinfectants, and completed pharmaceutical formulations are produced by Estro Import and Export PLC.

Droga Pharmaceutical PLC

DrogaPharma PLC is a privately owned company based in Addis Ababa, Ethiopia. It works on importing and supply of pharmaceuticals throughout the country while offering a competitive price.

3.2.Research Approach

Research methodology refers to the steps taken by a researcher to begin a research endeavor and come up with a certain explanation or conclusion on a topic. The following study adopted a quantitative approach. According to Goldman, R.N., Aliaga, M. and Gunderson, B. (1998); quantitative research method is used for the explanation of an issue or event through the collecting of numerical data and its analysis using mathematical approaches, notably statistics.

Quantitative research aims to create and use mathematical models, ideas, and hypotheses to explain natural occurrences. It usually begins with a broad statement that proposes a broad link between variables. Quantitative researchers prefer survey and experiment approaches, and will attempt to test hypotheses or statements in order to extrapolate from the specific to the general (Bhattacherjee, 2012). As a result the following research approach is quantitative so that the researcher is able to make a proper explanation of the studied variable and make a conclusive measure of the impact and extent of the study factors on the dependable variable. Since the practices between the study units aren't naïve or hasn't been measured.

3.3.Research Design

Due to the nature of the topic being investigated, the researcher has applied an explanatory research design. As a result, the technique helped to examine how to construct effective service supply chain collaborations between EPSS and private suppliers, as well as how variables were associated in a specific context. Furthermore, the explanatory research approach was adopted since the chosen topic had appropriate background that can be empirically attributed for the considered study variables.

Confirmatory to Kothari (2004), social research can be classified into three categories based on its objectives. Exploratory research; most social research is done to begin to acquaint a researcher with a topic. This method is commonly used when a researcher investigates a fresh interest or when the subject of inquiry is new. Descriptive research: the researcher observes and then describes what he or she sees. Scientific descriptions, on the other hand, are usually more accurate and exact than casual ones since scientific observation is meticulous and intentional. Explanatory research is utilized to look at the connections between causes and outcomes. To reject or support the relationship, hypotheses are generated. Meanwhile, Descriptive research answers the questions of what, why, and how. Explanatory studies look into why something is the way it is.

3.4.Population of Study

Population of the study covered EPSS and all other private suppliers/agents, and manufacturers whichareworking in the supply of essential pharmaceuticals with EPSS.According to Ethiopian government official reports there are a total of 22 pharmaceutical suppliers in Ethiopia, which 9 are directly involved in the manufacturing either in full or limited capacity,Embassy of Ethiopia, London, (2021).

3.5.Sample Design

The sampling frame has taken from all responsible departments and directorates level managers and decision makers of EPSS and private suppliers and manufacturers, by considering its unit of analysis being EPSS- Supplier link, during the study year, (See Table-1). Purposive sampling design has been used to choose important and an up to date informants for electronic questionnaire based surveys. In doing so it was possible to maintain the latest possible data. Thus a total census was made to pick those who have served in that particular service area, thus have a good knowledge and experience, and can make decisions on many subjects in the study area. In addition, the researcher had picked suppliers using once again a purposive method. Such a design is exploited when there is an endeavor to collect data from or about every member of a population.

Table (1) Enumerates participants source where the census accounted from.

Table - 1. Respondents Census Data

No.	**Company's Name**	**No. Participants**
1	Ethiopian Pharmaceutical Supply Service (EPSS)	78
2	Ethiopian Pharmaceutical Manufacturing (EPHARM)	6
3	East African Pharmaceutical PLC	2
4	Cadila Pharmaceuticals PLC	2
5	Sanshing Pharmaceuticals PLC	2
6	Human Well Pharmaceuticals PLC	2
7	Julphar Ethiopia	1
8	Gulf Pharmaceuticals	1
9	EstroPharma PLC	2
10	Kilitch Pharmaceuticals PLC	2
11	Droga Pharmaceutical PLC	6
Grand Total		104

3.6.Variables of the Study and Measurements

The questionnaire used a five-point Likert scale to code the study variables for Pharmaceuticals Supply Collaboration Practices (PSCP) in terms of information sharing, decision synchronization, and incentive alignment; and Performance of Supply of Essential Pharmaceutical (PSEP) in terms of better fulfillment, optimal inventory, and responsiveness. On this scale, severely disagree was classified as 1, and strongly agree as 5. In the interim responses were divided into 2, 3, and 4.

3.7.Data Types, Source and Collection Techniques of the Study

To make the study complete and meet its specified objectives primary data were collected from primary sources using the data collection questionnaire as a tool. All sample respondents were indeed the primary source of data, while secondary information were obtained from books, publications, agreements, EPSS tender and contract archives, previous literature reviews, and pertinent articles from websites.

The primary source respondent groups were governmental and private suppliers. In addition to the primary data acquired, the researcher has assimilated literatureabout supply chain collaboration from a range of publications and studies on the subject area. Otherwise, data have been gathered through an active dissemination of authenticated questionnaires.

First the principal investigator identified all potential respondents who have a direct involvement in the studied topics from the respective organizations and departments, i.e. EPSS, Suppliers and Manufacturers. Then, in the quantitative data collection procedure, the questionnaires were administered after properly addressing participants about the objective of the survey. The organization's principal is approached first for ethical concerns by delivering the proper letter obtained from AAU, College of Business and Economic, School of Commerce, and then an informed consent is obtained. Following that the investigator and coworkers prepared the list of individual respondents along with their mobile phone number and email address. On wards the prepared electronic survey tool, the questionnaire, had been sent through either of the convenient mode; email or telegram addresses to each participant or potential respondent, through expressing gratitude for their consideration and time for the research. The questionnaires were then collected on a Google form database. The data have been checked for completeness. Finally, the activities had been completed by expressing gratitude to the respondents once again through the same platform.

The research time had been made to be a cross-sectional one since it covered a single event at a specific time. The final result obtained has been entertained using descriptive texts, frequency tables, figures and inferential statistics once the data have been collected via the predefined technique.

3.8.Scale Reliability and Validity

To establish correlations between observable variables and factors, the research has used a well-established tool for its scale reliability and validity. However, the researcher used SPSS to generate Cronbach's alphas for each variable in order to assess the study's reliability. As a result, a Cronbach's alpha score of > 0.7 denotes a high level of reliability. Reliant to Kothari (2004), reliability is a measure of a test's stability, dependability, trustworthiness, and consistency in measuring the same thing every time. Most essentially, the data analyzed by the researcher should correspond to the study questions that the researcher was attempting to answer. This may seem self-evident, but it is frequently neglected or ignored because it is bothersome. In the best-case scenario, this means that the outcome measure appropriately reflects the phenomenon of interest; the model should include all important predictors; and the model should generalize to the circumstances to which it will be applied.

The scales' reliability was verified after coding and entering data into SPSS version 23.0. Cronbach's alpha coefficients were determined for all scale to determine the structural consistency& reliability of the instruments used in the study. A Cronbach's alpha score of 0.60 is considered to be in the lower limit of acceptance, according to,Malhotra& Birks, (2007). All of the variables in this study have Cronbach's alpha values greater than 0.60, and the overall alpha value is 0.894, indicating that the measurement scales used are highly acceptable, (Table -2).

The extent to which a measuring instrument adequately covers the issue under research is referred to as content validity. The content validity of an instrument is good if it contains a representative sample of the universe. It makes decisions based on intuition and judgment. It can also be determined by a panel of people who will judge howwell the measuring device satisfies the standards, but there is no way to express it numerically (Kothari, 2004). As it has been covered well in the literature review, the validity of the scale used in this study is verified based on the fact that all the variables and measuring scales were taken from previous prototypical and tool development intended researches. Moreover, the validity of the scale used was verified by the consulting Advisor.

Table (2) – Scale Reliability of Study Variables

Variables	Cronbach's Alpha (α)	No. of Items
Scale Items	0.894	34

3.9.Data Analysis

The coding step was followed after the data file was validated and modified, and the variables' reliability and validity of the constructs were established. SPSS version 23 software was used to examine the study's findings. As a result, the respondents' demographic data were coded first. Gender of respondents was the first to be coded as 1 and 2 for Male and Female respectively. Other demographic factors were coded from 1 up to 4 in the case of age, educational level, Position of responsibility and experience in work. From 1 to 11 in the case of the name of the organization where respondents were coded, and 1-5 in the case of the department where they're assigned to work, were coded.

The variables of Pharmaceuticals Supply Collaboration Practices (PSCP) in terms of information sharing, decision synchronization, incentive alignment; and that Performance of Supply of Essential Pharmaceutical (PSEP) in terms of better fulfillment, optimal inventory, and responsiveness were coded using a five-point Likert scale in the second section of the questionnaire. Strongly disagree was coded as 1 on this scale, while strongly agree was scored as 5. In between, the responses were categorized as 2, 3, and 4. Finally, descriptive statistics for quantitative data were entertained, both univariate; frequency, and multivariate analysis, correlation, followed by linear regression analysis to assess the interdependence between dependent and independent variables using BIM SPSS 23 version was computed since study variables assume a continuum of values.

3.10. Ethical Considerations

An official letter from AAU, college of business and economics, school of commerce, logistics and supply chain management department was received and submitted for the general directors and/or managers of the respective organizations of the study units. Furthermore, all study participants were told of the study purpose and verbal consent was received before the questionnaires were administered. Besides, each respondent's personal information was kept confidential and was only utilized in aggregate for research purposes. Generally, ethical issues and protocols were observed throughout the research process.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

As a result the present chapter will take us to the response rate,results of the analysis performed using SPSS version 23. These include the computation and determination of the reliability of measures based on a Cronbach's α value of greater than 0.60. Moreover, it has incorporated different descriptive analysis, and inferential ones; correlation and regression, which were important in answering the researcher's questions and the following discussions.

4.1.Response Rate

Since the study used a deliberate sampling technique,104 prospective respondents were collected through censuses from both public and private suppliers. All 104 surveys were gathered, for later descriptive and inferential analysis via SPSS version 23, making the response rate of the study 100 %.

4.2.Demographic Information of Respondents

The following study incorporated the responses of 78 respondents from different responsibilities from the public sole supplier and 26 similarly from different levels of responsibilities from private manufacturers and local suppliers/agents.

As it has been stated above respondents from EPSS were 78 and from private companies were 26. These figures represent 75 and 25 percent of respondents respectively, making the survey to be a representative of both groups generally. When we further look into the details, (see - Table 3), 76 are male and 28 are female taking an almost closer percentage with the above information. In relation to their relevant work experience in terms of years were also assessed and most, about 84.6 percent of respondents fall within the category of 1 to 10 years of service within the supply chain area of responsibility. While the rest of 16.4 percent has a well-advanced supply chain area work experience within the range between 11 to 20 years. In these regard the research maintained a good representations of gender, experience and at the same time a good opportunity for the utilized method of electronic data collection procedure and at the same time the produced information of the research can have a good serve input for such a potential productive age or population in the future.

Table 3. Demographic Information of Respondents

(*)	Category	No.	Percent (%)
Age (in years)	20 – 35	80	76.9
	36 – 50	20	19.2
	51 – 65	04	3.8
Gender	Male	76	73.1
	Female	28	26.9
Educational Level	Degree	54	51.9
	Masters	50	48.1
Organization	Public	78	75
	Private	26	25
Department	Tender	28	26.9
	Quantification	24	23.1
	Contract	20	19.2
	Warehouse & Inventory	12	11.5
	Marketing & Sales	20	19.2
Responsibility	Director	14	13.5
	Manager	06	5.8
	Coordinator	22	21.2
	Officer	62	59.6
Experience (in years)	1 – 5	46	44.2
	6 – 10	42	40.4
	11 – 20	16	15.4

Table 03; Demographic information of respondents, (Source: Survey Result; 2022)

4.3.Descriptive Analysis of Pharmaceutical Supply Chain Collaboration Practices

The descriptive statistics based on respondents' responses on the pharmaceutical supply collaboration practice (PSCP) and subsequent results on the performance of supply of essential pharmaceuticals (PSEP) was assessed based on a five point (5pt) Likert scale of 34 standardized questionnaire based questions. These questions were # 26 from PSCP and # 9 from PSCP. Further the questions from PSCP are categorized into three parameters, namely; information sharing (IS), decision synchronization (DS), and incentive alignment (IA). IS has

09 well defined items, DS similarly # 09 items and IA # 07 items. While PSEP has # 09 defined outcome measures items. The following Table 4 - shows the frequency of responses on a likert scale base for all of the 34 items in the PSCP and PSEP area.

Table – 4 Descriptive Summaries of Study Variables

No.	Variables	No. of Items	Mean	Std. Deviation
1	Information Sharing (IS)	09	3.48	.562
2	Decision Synchronization (DS)	09	3.32	.608
3	Incentive Alignments (IA)	07	3.20	.385
4	Performance of Supply of Essential Pharmaceuticals (PSEP)	09	3.27	.584

As presented above in the table the grand average of all the 9 items served under the information sharing practice was found to be 3.5. While the grand mean of the items served under decision synchronization practice scored to be 3.3. The items displayed under the incentive alignment practice have obtained a grand mean of 3.2, as it is seen on the table.

4.4.Descriptive Analysis of Performance of Supply of Essential Pharmaceuticals

On the other hand, the grand mean of all the 9 items served under the assessment of performance of supply of essential pharmaceuticals have turned out to be 3.27.

While paying a careful look at the above descriptive table, we will take the assumption that mean scores of below 3 considered either under practice of collaboration activities or the resultant supply performance, and result of =3 is a border of the two, which can be said neutral, whereas results above 3 considered either the practice or the performance is high.

In the detailed description table, Annex 2(a), of IS, DS, IA, and PSEP we find the below 3 results, IS-5 “Sharing of inventory holding costs information” has a mean respondent score of 2.87. Denoting the practice is below normal. This is true that such practices are infrequent between the parties. We find IA1 “Conduction of regular partners’ award” and IA2 “sharing from reduced SC costs” are below average scoring 2.77 and 2.38 respectively, revealing the activities are practiced under normal, Annex2 (c). When we get into the dependent variable sectionof the finding, PSEP 4, “Optimal inventory turn around” scored the least value of 2.98, indicating that the PSEP 4 has not been fulfilled;Annex 2 (d).

Among the highest results obtained, we find IS9 “Delivery schedule information sharing ahead” is high scoring having a mean score of 4.06, Annex 2 (a).

Otherwise, the overall descriptive analysis of both dependent and independent factors is tabulated accordingly here in Table 5.

Table 5; Whole Variables, (N=104)

	Mean	Std. Deviation	Skewness		Kurtosis	
Factors	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
IS	3.48	.562	.069	.237	-.078	.469
DS	3.32	.608	-.297	.237	-.120	.469
IA	3.20	.385	.698	.237	.713	.469
PSEP	3.27	.584	-.380	.237	-.744	.469

Table 5: Descriptive Analysis of the whole variables; Source (Survey Result, 2022)

4.5.Testing Effect of Collaboration on Performance of Supply of Essential Pharmaceuticals

In contrast to descriptive statistics, which often define the structure of variable distributions, another important task of explanatory statistics is to analyze and explain the relationships or associations between variables. Among these regression is one.In basic linear regression, we predict scores on one variable from scores on a second variable. The predictor variable is the variable we're basing our assumptions on, whereas the criterion variable is the variable we're predicting. When there is just one predictor variable, simple regression is employed, but multiple regression is used when there are two or more predictor variables.

4.5.1. Correlation Analysis as a Prerequisite of Regression Analysis

The most fundamental and practical measure of relationship between two or more variables is correlation. Correlations provide information about the direction of the association (positive or negative) and the intensity being high to the extreme tips of the relationship [–1.0 to +1.0] when expressed in a unit value called a correlation coefficient (r).

Consequently to examine the link between the independent variables; Information Sharing (IS), Decision Synchronization (DS), and Incentive Alignment (IA), with the dependent variable (Performance of Supply of Essential Pharmaceutical/ PSEP), the researcher used correlation analysis and Pearson correlation were computed. And the obtained result, as shown in Table 6, revealed that all the independent variables are significantly and positively associated with the dependent variable. [IS ($r = .512$, $p<.01$), DS ($r = .492$, $p<.01$), and IA ($r = .443$, $p<.01$)].

Among the closest and highest values, IS ($r = .512$, $p<.01$), and DS ($r = .492$, $p<.01$) are leading independent variables mediating the pharmaceutical supply performance positively and significantly. While IA, $r = .443$, $p < .01$, is a growing factor contributing to the development of pharmaceutical supply performance.

Information Sharing (IS)	Pearson Correlation	1			
	Sig. (2-tailed)				
Decision Synchronization (DS)	Pearson Correlation	.610**	1		
	Sig. (2-tailed)	.000			
Incentive Alignment (IA)	Pearson Correlation	.476**	.430**	1	
	Sig. (2-tailed)	.000	.000		
Performance of Supply(PSEP)	Pearson Correlation	.512**	.492**	.443**	1
	Sig. (2-tailed)	.000	.000	.000	

Table 6: Correlation, Source (Survey data, 2022)

Thus the overall construct of the correlation between the dependent and independent variables confirm the existence of a positive relationship.

4.5.2. Other Assumption Tests for Multiple Regressions

1. Multi-colinearityTest

The appropriateness of the sample size and the absence of correlation among the independent variables are the two most critical conditions to meet before conducting regression analysis. The statistical power of significance testing in multiple regressions is directly proportional to the size of the sample, which refers to the chance of finding statistically significant R-square or a regression coefficient at a certain significance level. As a general rule, the sample size should be at least 20 times the number of independent variables in order to achieve the appropriate degree of statistical power. Given this, the 104 respondents used in this study make it optimum.

The "Tolerance" and "Variance Inflation Factor (VIF)" values for each predictor can be used to verify for multi-colinearity, according to HO (2006). The tolerance value is the percentage of variance in one predictor that can't be explained by the other predictors. A tolerance of more than 0.10 indicates the non-existence of multi-colinearity, while a number less than that indicates the absence of multi-colinearity. VIF is calculated as "1/tolerance," and a VIF number greater than 10 indicates multi-colinearity (Saunders, Lewis, &Thornhill, 2009).

Table 7. Multi-colliniarity Test, (N=104).

Model		Colliniarity Statistics	
		Tolerance	VIF
1	(Constant)		
	IS	0.572	1.75
	DS	0.602	1.66
	IA	0.742	1.347

Table 7. Multicollinearity Test among Independent Variables; IS, DS, and IA; (Source: Survey 2022)

As it can be seen from Table 7, both the tolerance and VIF derived for each independent variable on both regression analyses meet the conditions described above, indicating that multi-colinearity does not exist in this study.

2. Linearity Test

According to Hair et al. (1998), the degree to which the change in the dependent variable is related with the independent variable is measured by the linearity of the relationship between the two variables. In a nutshell, linear simulations anticipate values falling in a straight line when the dependent variable changes by a constant unit for a constant unit change in the independent variable. As a result, the underestimate of total variances due to non - linearity phenomenon by conventional regression, as well as the underestimation of the relevance of variables implicated in non - linear relationships by beta, are reduced (Malhotra, and Birks,

	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
IS	3.48	.562	.069	.237	-.078	.469
DS	3.32	.608	-.297	.237	-.120	.469
IA	3.20	.385	.698	.237	.713	.469
PSEP	3.27	.584	-.380	.237	-.744	.469

2007).

Figure 2. Scatter plot of dependent variables

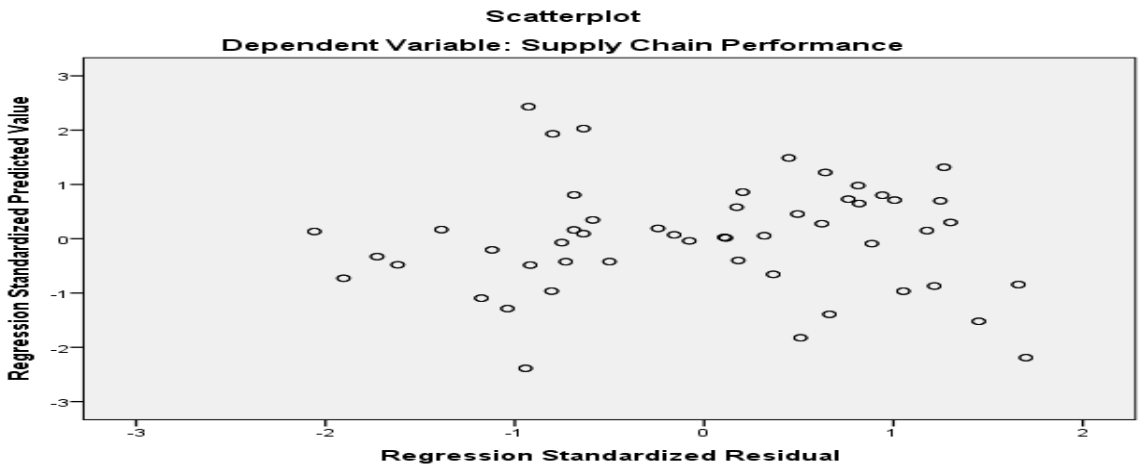

Figure 2. Scatter plot of dependent variables; (Source, survey result, 2022)

For the regression models, a scatter plot of standardized residuals versus fitted values is shown above.

3. Error Term Distributions Normality

The shape of a data distribution for a single variable node, as well as its relationship to thenor mal distribution, is described by the term normality. Skewness and kurtosis information values were measured, as well as probability plots, to estimate normalcy. Skewness offers information about the distribution's symmetry, whereas Kurtosis provides information about the distribution's height (Pallant, 2001). All values of skewness and kurtosis for the transformed and standardized data are shown in Table 8.

Table 8. Normality Measures; (Source, Survey Result)

As it is shown on the table all the measures of skewness and Kurtosis are within the acceptable ranges of ±2.58, Hair (2010). This is further guaranteed by the observed P-P plot; hence it follows the normal diagonal straight line curve (Figure 3).

Figure 3. Normal P-P Plot of Regression Standardized Residual.

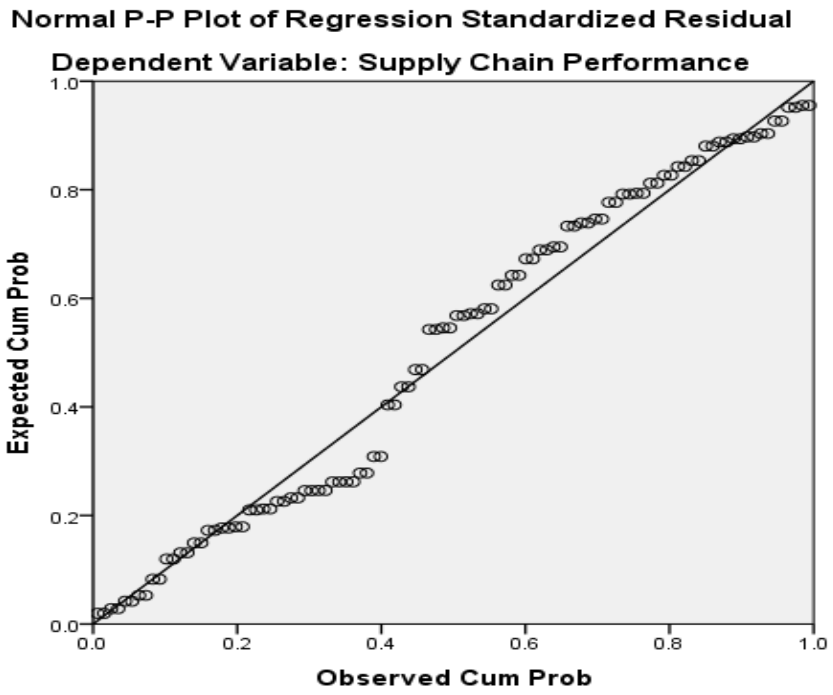

Figure 3. Normal P-P Plot of Regression Standardized Residual; (Source, Survey Result 2022)

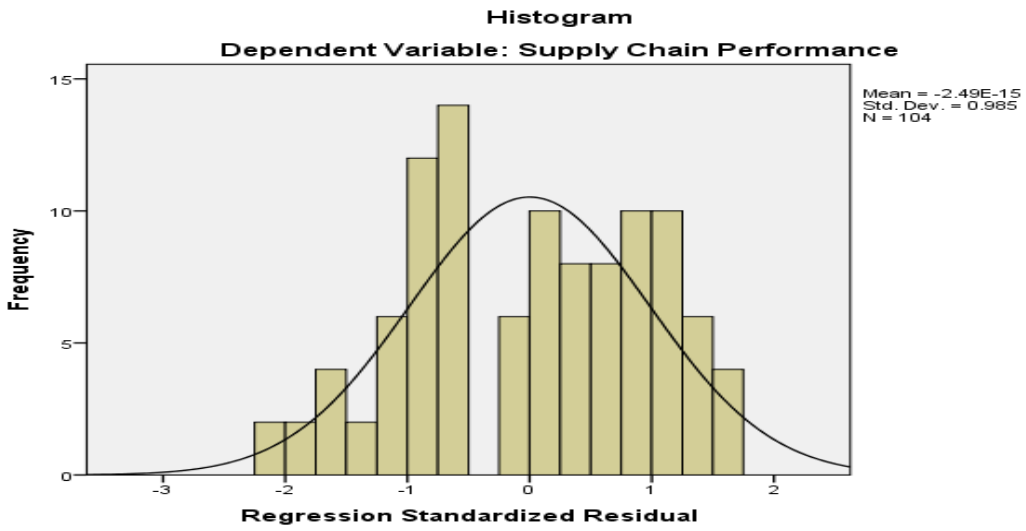

Figure 4: *Histogram plot for regression standardized residual (Source, Survey Result 2022).*

4.5.3. The Multiple Regression Model Fit

Multiple regression analysis is an exceptionally important derivative of linear regressions where several quantitative metrics, called predictors, in combination than a unit variable foretell or expound the value of quantitatively measured dependent outcome called criterion. Most scholars believe such is more important than giving a linear explanation of how a certain system works. This is so, that the earlier approach has a higher probability than the later, in giving a clear and complete sense and picture.

Multiple regressions (R), is the correlation between the observed values of the dependent variable (Y), while predicting on the values of Y multiple times through a regression model. As a result, large multiple R values suggest that the expected and actual outcome values are highly correlated. Thus in this study, the percentage of variance in the dependent variable explained by the independent factors was calculated using the adjusted R square. The standard regression coefficient, beta weight, was calculated using the multiple regression equation to compare the effect of each independent variable on the variability of the overall pharmaceutical supply chain performance. A model summary of the overall regression is displayed on the following table, Table 9. An autocorrelation has been tested with Durbin Watson, (DW), and it has turned out to be 1.54; it is generally accepted if in between 1.5 to 2.5 In the event when auto correlation occur it may undervalue the standard error. And lead us to feel that determinants are relevant when actually they are not, unlike our study, Help.sap.com.,(n.d.).

Table 9. Model Summary of Standardized Regression

Model Summary, (N=104)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
1	.589[a]	.347	.328	.479	1.54

a. Predictors: (Constant), IA, DS, IS

Table 9. Model Summary of Standardized Regression; (Source, Survey Result 2022)

From the regression result obtained through the regression model we can learn that an R^2 has turned out to be .328. Thus we can predict from this that about 33 per cent of the variation for the PSEP is obtained from the SCC practices, i.e. the criterion variable, is credited for the summation effect of each independent variables (IS, DS, and IA), i.e. predictors together. However, to buffer between these estimates of impact in the real world we may prefer using the adjusted R^2, .328. In general, it might be taken as a weak predictive value if we were in a pure science considering the higher level of predictability of study variables like that of atoms, molecules or cellssince the probability of change is minimal in the world of matters. But, according to Ozil P.K., (2022), the result is acceptable as we are dealing with an unpredictable human behavior through time in social empirical studies as long as the statistical significance of the predictors is ensured. Hence the modeling of human behavior factors isimperfect ones to be accommodated within a single model, rather the intention here, will be assessing whether independent variable has affected the dependent or criterion variable significantly. Moreover, considering the phenomenon under study is of a kind of baseline assessment, it makes the final result at a stake.

The analysis of variance (ANOVA) approach, an important extension of doubled tailed tests, is used to determine whether or not there are any statistically significant differences between the means of three or more independent groups. Table-10 depicts the ANOVA Model summary. Looking into it, we can learn that the regression model better fits the data sets than the model without the independent variables with an F=17.74 and P <.0001. Consequently, one can conclude that the regression model resulted in a better and significant prediction of the PSEP than the mean values of PSEP.

Table 10. ANOVA Model Summary

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	12.203	3	4.068	17.740	.000[b]
	Residual	22.930	100	.229		
	Total	35.134	103			

a. Dependent Variable: PSEP

b. Predictors: (Constant), IS,DS, IA.

Table 10. ANOVA Model Summary; (Source, Survey Result 2022)

4.5.4. Hypotheses Testing

Complimentary to the above results, β- Beta value is derived from the regression. These coefficients tell us how each of the independent variables affect the study variable. (See – Table 11 below).

Table 11: The Independent and Dependent Variable Regression Analysis

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.516	0.415		1.244	0.216
	IS	0.275	0.111	0.264	2.473	0.015
	DS	0.229	0.1	0.238	2.286	0.024
	IA	0.326	0.142	0.215	2.29	0.024

a. Dependent Variable: Performance of Supply of Essential Pharmaceuticals

Table 11. TheIndependent&Dependent Variable Regression Analysis; Source;(Survey, 2022).

This gives us a measure of magnitude caused by each independent variable, in other words the share of impact contributed by each predictors on the overall impacts assessed on the

changes on the criterion variable. In doing so, once again we opt using the standardized β value of each, our regression tells us that IS, DS and IA have a coefficient factor of .264, .238 and .215 respectively, with a significant P- value < 0.05. Thus all are significantly accepted factors. However, being high and closer to each other in their β value, IS and DS share the highest magnitude on the studied variable, i.e. PSCP.

The following table summarizes the overall outcomes of the research and tested hypothesis;

Table 12. Research Overall Outcomes and Hypothesis results

Tests Run	**Hypothesis**	**Remarks**	**Justifications**
H1:	Information sharing practice significantly affects the performance of supply of essential pharmaceuticals.	Accepted	β =.264 P< 0.05
H2:	Decision synchronization practice significantly affects the performance of supply of essential pharmaceuticals.	Accepted	β =.238 P< 0.05
H3:	Incentive alignment practice significantly affects the performance of supply of essential pharmaceuticals.	Accepted	β =.215 P< 0.05

*Table 12. Research Overall Outcomes and Hypothesis results***; (**Source, Survey Result 2022**)**

Finally, the overall regression leads us to equation formulation, and the equation takes the following form;

$Y = \alpha + \beta 1\ (IS) + \beta 2\ (DS) + \beta 3\ (IA)$.

Now ……> $Y = \alpha + .264\ (IS) + .238\ (DS) + .215\ (IA)$

Where;

Y = Performance of Supply of Essential Pharmaceuticals, (PSEP).

4.6.Discussions

The research is believed to highly answer its prior question which has led to the conduction of the actual research. As it is evident in the chapter 2; the research had raised three important research questions, to be reminded; (1) what is the effect of information sharing on essential pharmaceuticals supply performance?, (2) what is the effect of decision synchronization on essential pharmaceuticals supply performance? And (3) what is the effect of incentive alignment on essential pharmaceutical supply performance?

Consequently, the result of the research revealed that all the three independent variables has proven to affect positively and significantly the study variable, i.e. supply performance that potentially have the capacity to improve the national efforts of supplying essential pharmaceuticals throughout the country at large via an effective practices of SCC of supply chain partners in the sector.

Regarding the predictors of study variables, this research has confirmed information sharing practice of SCC partners takes the leading score of the impact among the three studied SCC practice parameters. The result of this parameter, β-value of .264, is in higher resemblance with that of a research done by; Doganay, A. and Ergun, S. (2017) in Turkey's chamber of industries of SC, having a β score of SCCIS .636. The other typological empirical work of Simatupang, T.M. and Sridharan, R. (2004) also conforms to IS as a leading practice with a .45 score. This finding is also theoretically supported by Manthou et al, (2004), &Strader, (1999), emphasizing that information sharing has an irreplaceable role of creating a conducive environment for businesses and it is core of SCC. This is evident that the current pharmaceutical supply of the country is majorly run by consolidating the available or shared information than the other schemes of collaboration practice which the researcher believes most yet to be developing. The second studied variable was decision synchronization; the result of the research shows us that it is the second powerful factor impacting the pharmaceutical SC scoring a β value of .238. This result is still in line with that of Doganay, A. and Ergun, S. (2017), β value of .395 for the parameter, ranking the second highest factor. This is more plausible for our country that shared information and communications perhaps leads to an alignment of decision by the parties.

The last parameter studied was incentive alignment. Although, being the last and least among the above two, it is significantly and positively associated with the obtained SC performance scoring a β value of .215. In fact, in the real scenario, the government and its public service institute is at infancy initiating the scheme of IA between SC partners or actors performing in the sector. This is also theoretically supported by Callioni G., &Billington C., (2001), that SCC practices always assume and emphasize on information sharing and decision synchronization before fully practicing an incentive alignment scheme.

Concerning the overall SCC model of the research, it has been found that all the SCC practices altogether impacts the performance of supply of essential pharmaceuticals by about 33 percent this was derived from the allover regression model having a R^2 of .328. This result is empirically plausible by the works of Simatupang, T.M. and Sridharan, R. (2004), in which identical to this research work found that the SCC practice impacted about 74 per cent of the SC performance. and this also theoretically supported by Spekman et al., (1998) that the higher the level of SCC practices among supply chain partners would impart an enhanced SC performance.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The following chapter presents a summary of major findings, conclusions, recommendations, and as well as suggestions for future studies.

5.1.Summary of Major Findings

This research was done having a general objective of examining the impact of public private supply chain collaboration on the supply of essential pharmaceuticals. While its specific objectives were geared at assessing the impact of information sharing, IA, decision synchronization, DS, and incentive alignment, IA, on the pharmaceutical supply chain performance.

In order to assess this; the researcher has made its investigation on the national sole pharmaceutical supplier, EPSS, and other actual private actors. After identifying potential respondents from the pool of partners through purposive census, the researcher administered a reliable, and based on prior studies done, a valid digital questionnaire for 104 participants. Once again, after the assessment was actualized, the researcher conformed the internal consistency of the research tool to be reliable at an overall Cronbach's α value of .894.

This study, demonstrated a significant and positive correlation among studied variables as explained with its Pearson's Correlation, Pearson's **r;** IS ($r=.512$, $P< .0001$), DS ($r=.492$, $P< .0001$), and IA ($r=.443$, $P< .0001$).

Regarding the regression analysis, factors standardized coefficient, β value confirmed there is positive and significant impact by each of the individual studied factors on the dependent variable. IS ($\beta =.264$, $P<.01$), DS ($\beta = .238$, $P<.01$) and IA ($\beta =.215$, $P<.01$).

Finally,the general regression model also showed that the pharmaceutical supply chain is impacted by 33 percent from the above studied factors altogether. I.e. the regression model resulted in an R^2 of .33.

5.2.Conclusions

Pertinent to this study the concept of Supply Chain Collaboration; namely information sharing, decision synchronization and incentive alignment, have been adopted to characterize and study the effect of the collaborating partners on the performance of supply of essential pharmaceuticals of the country's only public pharmaceutical supplier, EPSS, and other supplying partners whose primary goal is oriented on the return of the business yet instantaneously envisioning EPSS objectives particularly from the point of better order fulfillment, optimal inventory and responsiveness.

In doing so the researcher approached relevantand responsible departments and officials from private manufacturers and suppliers including EPSS in order to make its cross sectionalsurvey using a 34 items containing pre validated,and conformed reliability digital questioner entertaining the study variables.

As per findings of this research work, information sharing, decision synchronization, and incentive alignments have an appreciated significant effect on the overall performance of supply of essential pharmaceutical generally in an orderly manner from the first to the last factor in terms of magnitude.

5.3.Recommendations

A supply chain partnership is a relationship formed between at least two independent members in the supply channels through majorly knowledge, in a nutshell information, sharing in order to achieve specific objectives and benefits either in terms of reducing total cost and inventories, likely both yet to meet service level requirements to the optimum, U, Z., Yan, H. and Edwin Cheng, T.C., (2001).

Since among the studied factors, the first being information sharing, across the supplying partners, which commonly assume vertical, seldom looks horizontal mode, between manufactures or suppliers and EPSS, in which all could get benefited, Dagnino, G. &Mariani, M., (2010).Hence the existence of critical information conveying products/plans in the production lines, pipelines, inventories, and deliverable items could either reach the country's central medical storemindfully or sent directly to service deliver points or in business term, point of sale. In doing so such monitored acts meet service level requirements, yet simultaneously spare time, redundant efforts, and costs of transportation, inventory

management. Thus accessibility of such supply chain information leads us to joint decision makings and fair sharing of savings among partners.

One of the other strategic areas where such delineate measures could take place in EPSS's operation in its history is quantification and forecasting of pharmaceuticals. It could be done in such a proactive manner between reliable partners, Wang et. al., (2014), &Jeng (2015), using point of service data of a certain single fiscal year ahead,would help the sourcing of pharmaceuticals including assessed viable alternatives from global market in a synchronized decision making proceedings and cost saving at the national level,as a result reliability of supply couldbe guaranteed.

Once again, based on the findings, the researcher confers the following important recommendations for stakeholders in the pharmaceutical supply chain sector.

- Since it has been proved that IS, DS, and IA affects the positive improvements of the supply, most of the pharmaceutical supply chain partners could capitalize on the studied factors to further positively and significantly impact the national essential medicine supply. These most possibly could be realized through projects and technologies aimed at on the sharing and synchronizations of operational information and decisions. One important tool could be ERP systems or software institutionand utilization either in each of the organization's instituted as independent departmentor in any formof public private partnership ventures in an automated manner, BluugoOy. (n.d.), andRELEX Solutions, (2022).
- Recognitions, rewards and sharing of gain between public and private parties, suppliers, must be instituted and assume formalized approaches.
- In this regard, the government could also intervene and facilitate for stakeholders on these parameters ofsupply of essential pharmaceuticalson behalf of the community at large for such pharmaceutical supply disrupting and frequent stock out entertaining nation.
- Furthermore organizations' managers could act in a manner that requires little investment and effort to exploit the practice of IS and DS since these accounts for the highest impact but fairly minimal resource and investment.

5.4.Suggestions for Future Researches

- This study didn't make its assessment and analysis on public and private stakeholders independently. Therefore, further studies could treat the scenario from both perspectives independently.
- Qualitative study could be done to further unleash the reality regarding the incentive alignment strategies taking place between the public institute and private supplying partners.

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Annex

Annex 1: Questionnaire

Assessment of Public-Private Collaboration Practices Affecting the Performance of Supply of Essential (RDF) Pharmaceuticals

(In the Case of Ethiopian Pharmaceutical Supply Service/EPSS)

This questionnaire is designed to measure the current status of pharmaceutical supply collaboration practice between the national sole public supplier (EPSS) and private suppliers, and its effect on the national essential (RDF) pharmaceuticals supply.

With regard to Supply Chain Collaboration Practices scales, please circle the appropriate number that indicates the extent to which you agree or disagree with each statement.

The item scales are five-point Likert type scales with;**1** = Strongly Disagree (**SD**), **2** = Disagree (**D**), **3** = Neutral (**N**), **4** = Agree (**A**), **5** = Strongly Agree (**SA**).

In answering this questionnaire, please note that:

- Your answers are STRICTLY KEPT CONFIDENTIAL and intended for academic research only. Study result will be exhibited in aggregate form.
- Your contribution toward the successful outcome of this study is INVALUABLEsince improving the current status of national pharmaceutical supply;
- Please answer all questions as honestly as possible. There is no right or wrong answer, just answer according to your candid observation and Practice.

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Candidate, Master of Art in Logistics and Supply Chain Management

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I. Respondents Demographic Information

DI1. Age:1. 20 - 35 2. 36-50 3. 51- 65 4. Above

DI2. Sex: 1. Male 2. Female

DI3. Literacy Level 1. Diploma 2. Degree 3. MA/MSc 4. PhD

DI4. Organization: 1. Public (EPSS) 2. Private (11 Private Companies)

DI5. Department: 1. Tender 2. Quantification 3. Contract 4. Warehouse 5. Marketing

DI6. Position: 1. Director 2. Manager 3. Coordinator 4. officer

DI7. Experience in the Supply Chain: 1. 1-5 yrs 2. 6-10 Yrs 3. 11-20 yrs 4. 21-35 yrs

With Regard to Area of Public – Private Supplier Collaboration Practices, Please Select the Number That Best Deserves the Current Practice With Suppliers

Item	**Information Sharing Scales (IS)**	**SD**	**D**	**N**	**A**	**SA**
IS1	We share demand forecasts data each other	1	2	3	4	5
IS2	We share Point of consumption (POC) data each other	1	2	3	4	5
IS3	We formally share price changes information each other	1	2	3	4	5
IS4	We share on hand inventory level data each other	1	2	3	4	5
IS5	We share inventory holding costs	1	2	3	4	5
IS6	We share inventory policies information formally	1	2	3	4	5
IS7	We share supply disruption incidences instantly	1	2	3	4	5
IS8	We share order status & tracking information instantly	1	2	3	4	5
IS9	We regularly share delivery schedules	1	2	3	4	5
Item	**Decision Synchronization Scales (DS)**	**SD**	**D**	**N**	**A**	**SA**
DS1	We jointly make decisions regarding product assortments	1	2	3	4	5
DS2	We jointly plan distribution schedules	1	2	3	4	5
DS3	We jointly work on demand forecasting	1	2	3	4	5
DS4	We jointly work on resolutions of demand forecast exceptions	1	2	3	4	5
DS5	We together consult on pricing policies	1	2	3	4	5
DS6	We jointly make decisions on availability level of products	1	2	3	4	5
DS7	We jointly make decisions on inventory requirements	1	2	3	4	5
DS8	We reach joint agreement on optimal order quantity	1	2	3	4	5

DS9	We jointly work on resolutions of order exceptions	1	2	3	4	5
Item	**Incentive Alignment Scales (IA)**	**SD**	**D**	**N**	**A**	**SA**
IA1	We conduct regular joint regular partners award programs	1	2	3	4	5
IA2	We share savings from reduced inventory costs	1	2	3	4	5
IA3	We place delivery guarantees during high demand seasons	1	2	3	4	5
IA4	Allowance schemes are in place for product defects	1	2	3	4	5
IA5	We have agreement on order changes	1	2	3	4	5
IA6	We arrange advance payments on signed contracts	1	2	3	4	5
IA7	We arrange loan from banks for signed contracts in advance	1	2	3	4	5

II. With Regard to the Supply Performance Affected by the Partners' Collaboration Practice, Please Circle the Number That Accurately Reflects Your Firm's Present Status

Item	**PSP**	**SD**	**D**	**N**	**A**	**SA**
PSEP1	We are able to meet destination delivery due dates	1	2	3	4	5
PSEP2	We are able to accurately delivery orders	1	2	3	4	5
PSEP3	We have improved fill rates	1	2	3	4	5
PSEP4	We have significantly reduced price of products	1	2	3	4	5
PSEP5	We have achieved optimal inventory turnaround rate	1	2	3	4	5
PSEP6	We have decreased inventory days of supply	1	2	3	4	5
PSEP7	We have decreased inventory holding cost	1	2	3	4	5
PSEP8	The current practice positively affects lead time	1	2	3	4	5
PSEP9	The current practice enhanced flexibility to accommodate demand changes	1	2	3	4	5

Annex 2

(a): Information Sharing, IS, (N=104)

Information Sharing (# 09 Items)	Mean	Std. Deviation
We share demand forecasts data each other	3.44	1.032
We share Point of consumption (POC) data each other	3.42	.992
We formally share price changes information each other	3.54	1.070
We share on hand inventory level data each other	3.42	1.031
We share inventory holding costs information	2.87	.925
We share inventory policies information formally	3.38	.928
We share supply disruption incidences instantly	3.65	.810
We share order status & tracking information instantly	3.54	.913
We regularly share delivery schedules	4.06	.822
Grand Mean	**3.48**	**.562**

Descriptive Analysis IS, (Source: Survey Result; 2022)

(b): Decision Synchronization, DS, (N=104)

Decision Synchronization (# 09 Items)	Mean	Std. Deviation
We jointly make decisions regarding product assortments	3.38	.928
We jointly plan distribution schedules	3.31	1.015
We jointly work on demand forecasting	3.27	1.007
We jointly work on resolutions of demand forecast exceptions	3.29	.910
We together consult on pricing policies	3.21	1.030
We jointly make decisions on availability level of products	3.42	.952
We jointly make decisions on inventory requirements	3.06	.993
We reach joint agreement on optimal order quantity	3.44	.868
We jointly work on resolutions of order exceptions	3.48	.800
Grand Mean	**3.32**	**.608**

Descriptive Analysis, Decision Synchronization, (Source: Survey Result; 2022)

(c): Incentive Alignment, IA, (N=104)

Incentive Alignment (# 07 Items)	Mean	Std. Deviation
We conduct regular joint regular partners award programs	2.77	.916
We share savings from reduced inventory costs	2.38	.816
We place delivery guarantees during high demand seasons	3.27	.862
Allowance schemes are in place for product defects	3.54	.896
We have agreement on order changes	3.71	.692
We arrange advance payments on signed contracts	3.63	.860
We arrange loan from banks for signed contracts in advance	3.10	.852
Grand Mean	**3.20**	**.842**

Descriptive Analysis, Incentive Alignment, (Source: Survey Result; 2022)

(d): Performance of Supply of Essential Pharmaceuticals, PSEP, (N=104)

Performance of Supply of Essential Pharmaceuticals(# 09 Items)	Mean	Std. Deviation
We are able to meet destination delivery due dates	3.42	.932
We are able to accurately delivery orders	3.15	1.050
We have improved fill rates	3.48	.870
We have significantly reduced price of products	2.98	.935
We have achieved optimal inventory turnaround rate	2.90	.865
We have decreased inventory days of supply	3.23	.937
We have decreased inventory holding cost	3.19	.837
The current practice positively affects lead time	3.60	.865
The current practice enhanced flexibility to accommodate demand changes	3.50	.848
Grand Mean	**3.27**	**.584**

Descriptive Analysis, PSEP, (Source: Survey Result; 2022)