ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

THE EFFECT OF INBOUND LOGISTICS ON THE LOGISTICS PERFORMANCE OF MEDICAL DEVICES: THE CASE OF ETHIOPIAN PHARMACEUTICALS SUPPLY AGENCY

A THESIS SUBMITTED TO COLLEGE OF BUSINESS AND ECONOMICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

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January 2022

Addis Ababa Ethiopia

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THE EFFECT OF INBOUND LOGISTICS ON THE LOGISTICS PERFORMANCE OF MEDICAL DEVICES: THE CASE OF ETHIOPIAN PHARMACEUTICALS SUPPLY AGENCY (EPSA).

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Declaration

I hereby declare that the work entitled "THE EFFECT OF INBOUND LOGISTICS ON THE LOGISTICS PERFORMANCE OF MEDICAL DEVICES: THE CASE OF ETHIOPIAN PHARMACEUTICALS SUPPLY AGENCY (EPSA)", is the outcome of my effort and study and that any other contributors or sources of materials used for the study have been duly acknowledged. I have produced it independently except the guidance and suggestion of my Thesis Advisor, Tariku Jebena (Ph.D.). Moreover, this study not done and submitted to this particular company for any degree in this university or any other university for the award of Degree or Diploma Program. Here, offered for the partial fulfillment of a master's Degree in logistics and supply chain management.

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Statement of Certification

This is to certify that the study made by Sintayehu Silas, entitled: "THE EFFECT OF INBOUND LOGISTICS ON THE LOGISTICS PERFORMANCE OF MEDICAL DEVICES: THE CASE OF ETHIOPIAN PHARMACEUTICALS SUPPLY AGENCY (EPSA)". Submitted in partial fulfillment of the requirements for the Degree of Masters of Arts in Logistics and Supply Chain Management complies with the regulations of the University and meets the accepted standards concerning originality and quality in his original work.

_____

Advisor: Dr. Tariku Jebena (PhD)

_____

Date

Acknowledgments

First, I am immensely grateful to Almighty God for giving me the strength, diligence, courage, patience, and inspiration for the accomplishment of the study. The task of conducting the study could not achieved without the contribution of others. I would like also to express my gratitude to all those who assisted me to complete this study.

My special appreciation and respect go to my advisor Dr. Tariku Jebena (Ph.D.), a very responsible intellectual. My advisor has read all the parts of the thesis right from the manuscript stage to the final output and has provided considerable professional, technical, and ethical assistance throughout all stages. To this end, I should say, his willingness to devote his time and use his expertise at every point of discussion needs to be appreciation.

I also like to express my deepest gratitude to the staff of Ethiopian Pharmaceuticals Supply Agency; inbound logistics stream who help me obtain the required data for the study. My gratitude also owed to all respondents for providing me with the required data.

Abbreviation and acronyms

BPT: Business Process Transformation

EFDA: Ethiopian Food and Drug Authority

EPSA: Ethiopian pharmaceuticals supply agency

FMOH: Federal Ministry of Health

HCMIS: Health Commodity Management Information System

HSPT: Health Sector Transformation Plan

LIAT: Logistics Indicator Assessment Tool

LIS: Logistics Information System

LSAT: Logistics System Assessment Tool

M&E: Monitoring and Evaluation

ICB: International Competitive Bid

JSI: John Snow, Inc.

HSTP: Health Sector Transformation Plan

KPI: Key Performance Indicators

PFSA: Pharmaceuticals Fund and Supply Agency

SCM: Supply Chain Management

SOH: Stock on Hand

TMS: Transport Management System

PSTP: Pharmaceuticals supply transformation plan

CIPS: The Charted Institute of Purchasing and Supply

SPSS: Statistical packages for social science

UNFPA: United Nations Population Fund

UNICEF: United Nations Children's Fund

USAID: United States Agency for International Development

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ABSTRACT

The main objective of this study was to assess the effect of inbound activities on medical device logistics performance in the case of the Ethiopian pharmaceuticals supply agency. The inbound activities incorporated product selection, forecasting, supply planning, procurement, shipment, and receipt practices. The study applied descriptive and explanatory research designs as well as a quantitative research approach. The target population for this study constituted all employees who work at the inbound logistics stream in EPSA and decided to employ a census technique to gain insight into logistics performances. The primary and secondary data sources used for this study.

The logistics indicator assessment tool (LIAT) administered a questionnaire used to collect relevant information from the total population of 100 respondents. Ninety-Four valid questionnaires were analyzed using Statistical Package of Social Science (SPSS) version 28. The percentage, mean and standard deviation, Pearson correlation and multiple linear regressions used during the analysis. The study indicated that inbound logistics activities practice level is occasionally practicing in Ethiopian pharmaceuticals supply agency. The study showed that inbound logistics practice contributed in the form of availing affordable quality medical devices to the Ethiopian Pharmaceuticals Supply Agency logistics performance largely. The investigation also brought out that there was a significant and positive effect of inbound activities on the medical device logistics performance in the Agency. The study further revealed that practices of product selection, forecasting, supply planning, procurement, shipment, and receipt practices have to predict power on logistics performance of the Agency.

The study recommended the agency to implement medical device essence based product selection, forecasting, supply planning, procurement, shipment, and receipt practice to ensure the availability of the affordable quality medical device.

Key words: *Inbound logistics practices (product selection, forecasting, supply planning, procurement, shipment, and receipt) and Logistics performance*

CHAPTER ONE

INTRODUCTION

This chapter consists of the background of the study, statement of the problem, research hypothesis, and objectives of the study, significance of the study, scope and limitations, definition of terms and organization of the paper.

1.1 Background of the Study

Logistics is a component of supply chain management that plans, implements, and regulates the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the site of consumption. Logistics management is a function that coordinates and optimizes all logistics activities, as well as integrating logistics with other departments such as marketing, sales, finance, and information technology (CSCMP 2011).

Product selection, forecasting, supply planning, procurement, inventory management, transportation and fleet management, data collecting, and reporting are activities of logistical tasks in supply chain management (Aronovich, 2010). A health logistics system's objective is far more than ensuring that a product gets to where it needs to go. Ultimately, the purpose of any public health logistics system is to assist ensure product security for every client. When everyone can get and use high-quality necessary health items whenever they need them, product security exists (MSH, 2012).

Product selection based on the clinical service to be provided, forecasting, supply planning, procurement, transportation, warehousing, and inventory management are all part of inbound logistics activity. (John Snow, 2017). Product selection, which defines what items procured and used in the health system, as well as the range of products that a client can obtain (Rao, 2006).

Forecasting is the process of predicting product quantities and costs for a certain clinical service, as well as establishing when products should arrive at the health institution to ensure a steady supply. Globally supply-planning activity examines questions such as whether we have enough quantities of each product in the pipeline from suppliers; whether we need to reschedule deliveries based on facility demand trends; and whether we need additional resources or suppliers to fill unexpected supply gaps (Chaman, 2006).

Procurement is an important aspect of the logistics process. Procurement practices the planning and execution for critical operations that ensure the right products are on hand in the country and ready to distribute when needed. It would be unable to meet the six rights without procurement, which are the right items in the right quantities in the right condition delivered to the right place at the right time for the right price.

The good procurement practice ensures that the goods shipped and received at specified location. This comprises the shipment of goods from the supplier's warehouse, through the port of entry, customs clearance, receipt and inspection at the designated site of shipment, and resolution of any insurance or damage claims for international shipments. Inadequate or erroneous documentation might cause unnecessary delays in clearance, resulting in charges that the buyer is accountable for (Akoko, 2017).

Ethiopian pharmaceuticals supply agency (EPSA), is a governmental pharmaceuticals supply agency established by proclamation number 553/2007 with a mission to supply quality assured pharmaceuticals to public health facilities at an affordable price in a sustainable manner (EPSA, 2021).

The agency is managing all categories of pharmaceuticals required for the prevention, diagnosis, and treatment of diseases. Since 2018, the Agency has been undertaking its operations with a focus on key pharmaceuticals as per the pharmaceuticals procurement List (PPL) developed through a consultative process, which enabled the agency to define its product portfolio. The medical device procurement list of the agency is 225 from the total pharmaceutical list of 839 (EPSA, 2021).

1.2 Problem Statement

Inbound logistics is a strategy for gaining and maintaining a competitive advantage, as well as improving the organization's and supply chain's logistics performance (Li et al., 2006; Mentzer et al., 2001, AlMadi, 2017; Al-Shqairat, et al., 2020; Zulfiqar, et al. 2020).

Inbound logistics performance has a significant impact on a firm's capacity to meet customer expectations, reputation, and overall financial success (Ambe, 2006), while logistics inefficiency is the single most significant source of operational inefficiencies in any organization (Feldman, 2003). The public, professionals, and other stakeholders have been increasingly vocal about the poor logistics performance of public organizations (WB, 2011). Many people believe that public-sector logistics are well below the expectations of stakeholders (Doreen, 2014). Many public health service delivery points in Ethiopia have experienced stock outs on multiple occasions, causing needy clients to be unable to afford pharmaceuticals and making them vulnerable to counterfeits, which have resulted in many deaths and mismanagement due to an increase in low-quality or counterfeit pharmaceuticals on the Ethiopian market (Kazi, 2012).

Ethiopian pharmaceutical supply agency expenditure in medical devices procurement is $130 million with an annual growth rate of up to 15% (EPSA, 2020). World Health Organization (WHO) estimates that around 95% of the medical devices in low-income countries imported whereas this can go higher in our context, much of which does not meet the needs of national healthcare systems and not used effectively and efficiently.

Ethiopian pharmaceuticals supply agency-faced a challenge in product selection, which is defining what products are procured and used in the health system and the range of products that a customer can receive.

An assessment of the quantification process conducted by consultants from SmartChain revealed that the annual forecasting and supply planning exercise by EPSA is a labor-intensive, expensive, and bottom-up process that takes more than 6 months to generate a forecast. The average procurement lead-time starting from the request time to product Shipment time is 296.5 days but the target was 160 days (EPSA, 2021).

EPSA is the organization that has mandated to carry out the logistics function for the ministries of health. There have been numerous complaints from the public health facilities regarding erratic supplies of the medical device.

Practically the effect of medical device inbound activities on medical device logistics performance is significant specifically in forecasting, supply planning, procurement lead-time including the shipment, and receipt of goods at the required destination.

As a result, this study intended to analyze the effect of inbound logistics practice on Ethiopian pharmaceuticals supply agency logistics performance.

1.3 Research Objectives

1.3.1 General Objective

The general objective of this study is to assess the effect of inbound activities on logistics performance of medical device in the Ethiopian pharmaceutical supply agency (EPSA).

1.3.2 Specific Objectives

The specific objectives of this study are:

1. To assess the medical device inbound logistics practice of the Ethiopian pharmaceutical supply agency.
2. To explain the effect of medical device product selection practice on the logistics performance of Ethiopian pharmaceutical supply agency.
3. To analyze the effect of medical device forecasting and supply planning practice on the logistics performance of Ethiopian pharmaceutical supply agency.
4. To explain the effect of medical device supply planning practice on the logistics performance of Ethiopian pharmaceutical supply agency.
5. To investigate the role of medical device procurement practice in the logistics performance of the Ethiopian pharmaceutical supply agency.
6. To analyze the effect of medical device shipment and receipt practice on the logistics performance of Ethiopian pharmaceutical supply agency.

1.4 Research Hypothesis

According to Kothari (2004), a hypothesis is a tested assertion that expresses a logical conjectured link between two or more variables. It is a formal statement of an unverified but experimentally testable hypothesis (Zikmund, et al., 2009). Hypothesis testing also used to explain variance in the dependent variable or forecast organizational outcomes (Sekaran, 2000).

As a result, the following 5 (five) hypotheses were generated and tested for this study, based on past research findings from the literature.

These are, therefore, the proposed overall effect of inbound logistics practices on logistics performance, which described by the following hypotheses:

Hypothesis 1: Product selection practice has a significant and positive effect on the logistics performance of EPSA.

Hypothesis 2: Forecasting and supply planning practice has a significant and positive effect on the logistics performance of EPSA.

Hypothesis 3: Supply-planning practice has a significant and positive effect on the logistics performance of EPSA.

Hypothesis 4: Procurement practice has a significant and positive effect on the logistics performance of EPSA.

Hypothesis 5: Shipment & receipt practice has a significant and positive effect on the logistics performance of EPSA.

1.5 Significance of the Study

The study aimed to analyze the relationship between the practical experience of the medical device inbound logistics on Ethiopian pharmaceuticals supply agency logistics performance. The findings and recommendations in this study will help the agency to analyze the effect of existing inbound logistics practices on performance. The study also gives baseline data for further in-depth study on a similar topic and gives an insight for other related studies intended to done.

1.6 Scope of the Study

The scope of the study is analyzing the impact of medical device inbound logistics practice on Ethiopian pharmaceuticals supply agency logistics performance at head office. The conceptual scope of the study is medical device inbound logistics activity associated with product selection based on the clinical service to be provided, forecasting, supply planning, procurement including shipment and receipt. The study did not include Hubs, health facilities, and external stakeholders' practice due to time and budgetary constraints.

In carrying out the study, challenges were encountered, for instance, the study only be focused to head office located in Addis Ababa city by excluding other hubs in the city and outline which was directly related with proximity, largest staff number, time and budget availability.

1.7 Limitation of the Study

In carrying out the study, limitations encountered, for instance, there was lack of willingness of the employees regarding filling out the questionnaires and being unable to return the questionnaire on time basis. The research was dependent on the perception of employees. The Time and budget constraint limited the study to the head office, where inbound activities affected by agency hub and external stakeholders' performance. Thus, the result of the study was not inclusive of the branch offices and external stakeholders so that limited to give the full range image of the agency.

1.8 Definition of Terms

Medical device: An article, equipment, apparatus, or machine that is employed in the prevention, diagnosis, or treatment of illness or disease, or in the detection, measurement, restoration, correction, or modification of the structure or function of the body for some health purpose (WHO, 2011).

Product selection: a critical component of the logistics cycle that directly tied to serving consumers by specifying what items are acquired and used in the health system, as well as the variety of products that can received by a customer. The supply chain can made more controllable by limiting the variety of products used and available at public sector facilities (JSI, 2014).

Quantification. After products selection, the required quantity and cost of each product must be determined. Quantification is the process of estimating the quantity and cost of the products required for a specific health program (or service), and, to ensure an uninterrupted supply for the program, determining when the products should be procured and distributed (Logistics Handbook, 2014).

Forecasting: It is the process of estimating the quantities of products used to meet the health needs of the targeted health facility during a specific period (MSH, 2012).

Supply Planning: used to estimate the total commodity requirements and costs for the program based on the forecast generated from the forecasting step. To ensure a continuous supply of products, and maintain stock levels between the established maximum and minimum levels, developing the supply plan entails coordinating the timing of funding disbursements from multiple funding sources with procurement lead times and supplier Shipment schedules (JSI, 2014).

Procurement. After a supply plan developed as part of the quantification process, quantities of products procured. Health systems or programs can procure from international, regional, or local sources of supply; or they can use a procurement agent for this logistics activity. In any case, procurement should follow a set of specific procedures that ensure an open and transparent process that supports the six rights (USAID|DELIVER, 2014).

Shipment is the act of transporting items from one location to another, including the transfer of goods from the supplier's warehouse, clearance through customs, receipt, and inspection at the scheduled delivery location, and resolution of any insurance or damage claims (WTO, 2014).

Receipt: It's a function encompassing the physical material, the inspection of the shipment for conformance with the purchase order (quantity and damage), the identification and delivery to destination, and the preparation of receiving reports (WTO, 2014).

Inbound logistics: is the process of integrating materials from suppliers and vendors into manufacturing or storage processes. It's a type of logistics that refers to a set of processes related to the movement of materials, products, and information from the point of origin to the point of entry into the organization (CSCMP, 2011).

Logistics performance: It is the process of moving inventory or supplies from one location to another in the most efficient manner possible. Manufacturers, merchants, and distributors all engage in logistics work and evaluate their performance to ensure that their efforts are effective (CSCMP 2011).

1.9 Organization of the Study

The organization of this thesis proposal has three chapters: The first chapter contain the introduction, which covers the background of the study, the statement of the problem, the hypothesis of the study, the research objectives, the significance of the study, the scope of the study, the limitations of the study, and the definitions of terms and organization of the study.

Chapter Two examines literature in the area of medical device inbound logistics, which includes the theoretical literature review and empirical literature review to draw the conceptual framework of the study.

The third chapter contains the research methodology that focuses on the description of the study area, the research approach, the search design, the populations, study populations and samples, the data sources and types, instruments and data collection procedures, ethical considerations, and data analysis.

The fourth chapter includes the data presentation, data interpretation, and discussion, and the fifth chapter contains the summary, conclusion, recommendation, and further study areas of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

INTRODUCTION

This chapter has a purpose of literature review on medical device inbound logistics specifically theoretical and empirical studies on medical device product selection, forecasting, supply planning, procurement, and the conceptual framework are also enclosed at the end of this chapter.

2.1 Review of Theoretical Literature

A health logistics system's objective is far more than ensuring that a product gets to where it needs to go. Ultimately, the goal of public health logistics system is to assist ensure product security for every client. When everyone can get and use high-quality necessary health items whenever they need them, product security exists. A well-functioning supply chain is essential for assuring product security in terms of financing, policy, and commitment (MSH, 2012).

Planning, implementing, and controlling the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the site of consumption to meet customers' requirements is what logistics management is all about (CSCMP, 2011).

Effective logistics activity not only ensures commodities security but also determines whether a public health program is successful or not. Because logistics improvements provide significant and verifiable benefits, decision-makers are increasingly focusing their efforts on improving supply chains. Logistics that work well benefit public health programs in a variety of ways, including increasing program impact, improving care quality, and increasing cost-effectiveness and efficiency.

Logistics activity includes product selection depending on the clinical service given, forecasting, supply planning, tendering, inventory management, transportation and fleet management, and data collecting and reporting, among other things (USAID|DELIVER, 2011).

Forecasting and supply planning are two independent jobs that necessitate different resources and skill sets. Forecasting and supply planning may done separately in some regions, with different persons having competence in each of these areas. More often than not, the same quantification professionals are in charge of both tasks, making it even more critical for them to have a thorough understanding of both (SIAPS, 2014).

The benefit of improved inbound logistics practice is to achieve the right goods in the right quantities in the right condition delivered to the right place at the right time for the right price, which are the six rights of logistics, through product selection, forecasting, supply planning, procurement, and product shipment and receipt (MSH, 2012).

2.1.1 Medical Device Product Selection

The process by which health programs as a whole select, assess, and ultimately acquire the products utilized and consumed in service delivery known as product selection (JSI, 2017). Product selection is an important part of the logistics cycle since it determines what items procured and used in the health system, as well as the range of products that customers can obtain (USAID|DELIVER, 2011).

The supply chain can made more controllable by limiting the variety of products used and available at public sector facilities. Staff may become more familiar with the products, ensuring that they fulfill the program's needs, and monitor and maintain stock levels of all products throughout the system with a specified list of products. Selecting items allows for the creation and operation of a national coordinated logistics system, as well as product redistribution throughout the system. Prioritizing specific products can help supply chain management ensure that they are always available. Because a bigger quantity of a fewer number of products is required, product selection provides access to more cheap commodity prices through economies of scale and cost reduction for particular supplies (SIAPS, 2014).

Standardization is one of the most important components of product selection, as it allows programs to make judgments about a variety of factors of the products in question, resulting in the best value and the avoidance or proliferation of similar items in the supply chain program (JSI, 2017). The product selection process is dependent on multiple supply chain actors working together to make decisions.

In many circumstances, a multidisciplinary committee formed with explicit terms of reference, governance structures, policies and procedures, and selection criteria to establish an approved list of products, with the output being a specified list of things (JSI, 2017).

Formulating the proper investment decisions with the limited available resources is both critical and elusive in today's dynamic and aggressive largely technology-driven business world. Selecting the correct product(s) that adds the most value and aligned with the firm's strategic business objectives is a difficult task. In the corporate sector, it is highly usual for companies to propose more items than can be realized, especially with limited resources. This means that top executives must decide which items will implemented and in what order they will implemented. Not the entire planned goods can executed at the same time due to restricted resources such as time, budget, production capacity, and human resources. Each product must assessed to determine its commercial impact and importance. As a result, businesses are obliged to choose the correct goods and prioritize them to match with their company objectives and, ultimately, enhance their return on investment. Organizational strategies in the age of modern information technology centered on exploiting all available options to reduce redundant products/projects, allocate resources to high-yielding projects, limit risks, and rationalize. Current products constantly checked in this situation, products under consideration and sanction will be prioritized, then added, updated, and withdrawn from the project inventory in response to company activity, changing market conditions, and consumer wants (Randy, 2008).

The capacity to choose items allows for the creation and implementation of a national coordinated logistics system, as well as product redistribution throughout the system. Prioritizing specific products can help supply chain management ensure that they are always available. Product selection can result in economies of scale, lowering the cost of some supplies and allowing access to more affordable goods (JSI, 2017). Selection is an important aspect of putting the concept of value analysis into practice. The systematic and coordinated application of recognized procedures and criteria to determine the advantages received from the use of a certain product known as value analysis (or service).

The approach aims to improve the benefit by delivering the required performance at the lowest possible cost. As a result, product selection leads to more efficient resource usage, lowers the risk of error, and improves clinical service-centered outcomes.

Because it identifies the items that should forecasted, selecting products is a requirement for forecasting. A supply chain with fewer items is more agile, manageable, and efficient (USAID|DELIVER, 2011).

2.1.2 Medical Device Forecasting

Forecasting bases selected products that directly linked to serving customers by defining what products procured and used in the health system and the range of products that a customer can receive.

Forecasting solves the question, "How much is required, in terms of quantity and cost, to meet the health facility's clinical service?" The process of calculating the quantities of product required to meet the demand for a specific period based on past consumption, service statistics, and assumptions where data is unavailable (UN Commission, 2015).

Typically, health SCM problems are the uncertainty arising from customers' demand, supplies transportation, organizational risks, and lead times vary. Demand uncertainties, in particular, have the greatest influence on SC performance with widespread effects on supply planning, inventory management, and transportation (Tosarkani, 2018). In this sense, demand forecasting is a key approach in addressing uncertainties in supply chains.

Medical device forecasting is a vital supply chain activity that connects facility-level information on services and commodities with national strategic planning, which then utilized to influence higher-level decision-making on medical device funding and procurement. Forecasting data utilized to help maximize the use of available procurement resources, advocate for additional resources when needed, and inform product provision cycles and supplier shipment timetables (USAID/DELIVERY, 2009). It is the process of predicting the quantities and costs of products needed for a certain therapeutic service, as well as determining when those products should delivered to maintain a continuous supply. Medical device forecasting is concerned with the amount of product predicted to use by health care institutions.

Demand forecasting is an important aspect of managing company processes. Regardless of the complexity and execution of forecasting processes across different businesses, the goal remains the same: to obtain a accurate estimate of future demand for a product or service based on historical data and the current state of the environment (e.g., political, social, and economic) so that businesses can plan and organize themselves accordingly.

In the pharmaceutical business, forecasting accuracy remains a major concern. Demand projections serve as the foundation for all logistics and supply chain management decisions. Demand forecasting is the beginning point for all planning activities and execution procedures, regardless of whether a supply chain system is pushing or pulling. Consider push operations that carried out in front of customer requirements. Demand projections are required as data input for sourcing, production, transportation, and operating activities and actions; the same is true for the pull processes, which use consumer demand data to plan appropriate levels of activity and inventory.

Based on two well-known approaches to forecasting: qualitative and quantitative, a variety of forecasting methodologies has created. Similarly, qualitative methods such as Executive opinions, Delphi technique, Sales force polling, and Customer services generate forecasts based on judgments or opinions, whereas quantitative techniques, such as the Naive method, Trend Analysis, Time Series Analysis, Holt's and Winter's models, or so-called associative forecasts, which identity causal relationships between variables using simple, multiple, generate forecasts based on historical data. Furthermore, mixed or integrated models allow for the incorporation of both methodologies. Demand forecasting for pharmaceutical products is also influenced by the product lifecycle; it differs dramatically for new and old (in-market) products (Cook, A.) (2006). at the product development stage, determining an acceptable market size is difficult. Because no quantitative data is available at this time, judgmental methods are more likely to employ for forecasting. When using quantitative or mixed models to predict potential market share for in-market items, one should also account for future market growth or decrease.

The forecasting process is an iterative process that involves analyzing and updating data and assumptions, as well as recalculating total commodity requirements and costs to reflect actual service delivery, as well as changes in directives, rules, and guidelines.

Forecasting activities based on product selection follow a four-step process that includes organizing, analyzing, and adjusting raw data, developing and obtaining consensus on forecasting assumptions, calculating the forecasted amount for each product, and comparing and reconciling the results of different forecasts. Forecasting involves access to precise data and a high level of programmatic understanding, in addition to experienced employees.

It also requires a strong understanding of quantification methods, the capacity to apply programmatic considerations to consumption data, and the ability to make educated predictions regarding commodity use and demand. Forecasting is most effective when supply chain personnel, commodity-coordinating committees, and other important stakeholders work together closely.

2.1.3 Medical Device Supply Planning

The supply planning created after the forecasting completed. The supply plan connects forecasting and procurement by defining what products will procured, how much they will cost, how much they will cost to procure, and how long they will take. Logistics personnel that have a thorough understanding of the whole supply chain, as they must be able to account for the capabilities and constraints of each supply chain function (SIAPS, 2014), best do supply planning.

Following the formulation of the forecast and supply plan, both must be reviewed and revised regularly to ensure that new data and other essential aspects are continually included in the quantification plan. Forecasts should be evaluated and amended at least once a quarter. Forecasts evaluated and amended at least once a year. The forecasts are then utilized to update the supply strategy once they have been revised (SIAPS, 2014). To ensure effective procurement and delivery schedules, supply planning specifies the quantities required fill the supply pipeline, as well as costs, lead times, and shipment arrival dates (UN Commission, 2015).

Develop a plan to address the identified risks of stock-outs and overstock/damage during supply planning. To avoid stock-outs and excesses/damage noted in the forecast, it tells which quantities will be delivered and when. If the stock risk is strangling the system, now is the moment to discover companies outside the intended population that may require such commodities. The outcome of supply planning reveals what has planned to keep stock levels within acceptable minimum and maximum levels.

It is worth noting that supply planning is more of an art than a science, as it's a highly participatory and ongoing process that necessitates greater stakeholder management abilities.

Supply planning is an activity that examines problems such as whether we have enough of each product in the pipeline from suppliers; whether we need to reschedule deliveries depending on consumption trends; and whether we need more resources or suppliers to meet unforeseen supply shortages. Based on the projected amount, supply planning estimates the entire medical equipment requirements and expenses for the clinical service. Developing the supply plan requires combining the timing of financing disbursements from numerous funding sources with procurement lead times and supplier shipment schedules to ensure a continuous supply of products and keep stock levels between the defined maximum and minimum levels. The supply-planning phase is output and the supply/procurement plan must updated regularly.

Supply planning is the part of supply chain management that deals with figuring out how to meet the demands generated by the demand plan. The goal is to strike a balance between supply and demand that meets the company's financial and service goals.

The complete supply planning process, which includes distribution, manufacturing, and procurement processes based on demand projections, capacity restrictions, and material availability, referred to as supply planning. The process' purpose is to arrange supply in such a way that it meets the demand for the product/service in the most efficient way feasible.

By considering, maintenance and stock policies, and sourcing characteristics, best practices for supply planning create a supply structure that effectively and efficiently meets demand (lead-time, minimum order quantities, lot sizes, etc.).

The ultimate decision on how much to buy based on the amount of money available for product purchases. If there is enough funding, the final amount to procure for each product will be the same as the quantity to order estimated during forecasting.

If financing is insufficient, however, the predicted quantity must use to decide whether further resources are available. Presenting the outcomes of the quantification exercise to stakeholders and identifying financial gaps is an efficient resource mobilization strategy.

When additional resources are not available to procure the full quantities of products necessary, predicted consumption will lowered. This achieved by revisiting the forecasting step and engaging in further consultation and consensus building to adjust the forecasting assumptions.

2.1.4 Medical Device Procurement

After a supply plan development as part of the quantification process, quantities of products procured. Health systems or programs can procure from international, regional, or local sources of supply. The procurement should follow a set of specific procedures that ensure an open and transparent process that supports the six rights. Procurement is a critical part of inbound logistics. Procurement planning and execution are critical operations that ensure the right products are on hand in the country and ready to distribute when needed. It will not be possible to meet the six rights without procurement procedures and processes. A staff-staffed procurement unit also guarantees that national procurement legislation and procedures followed correctly.

The procurement department of the company is in charge of procuring the necessary amounts of high-quality products to ensure continual product availability. The quantification informs the procurement unit on what to buy, how much to pay, and what funding sources to use, as well as the numbers and specifications of the medical item to buy. Staff in the procurement unit, on the other hand, are more likely to be familiar with previous processes; quantification staff, for example, are familiar with product prices, budget development, and order amounts.

Open tender, restricted tender, competitive negotiation, and direct procurement is the most common procurement methods used by health systems, and each has a different impact on pricing, delivery time, and the workload of the procurement office. Given the impact of procurement activities on the operation and effectiveness of health services, these activities must carried out by qualified personnel following sound procedures, in adequate offices with good communications, and with access to accurate inventory and consumption data (MSH, 2012).

Effective procurement is a technique for managing the buyer-seller relationship to ensure transparent and ethical transactions in which the buyer receives the correct items and the seller receives payment on time. Technical committees may make final decisions about which medical device to buy, in what quantities, and from which suppliers and a collaborative process are required between the procurement office, which has requirements for trained staff and appropriate management systems.

Technical committees, which may make final decisions about which medical device to buy, in what quantities, and from which suppliers.

Trustworthy access to cash for medical device purchases and procurement office support, access to foreign currency exchange for international procurement, and reliable payment channels are all important issues for financial sustainability.

Reliable payment and appropriate financial payment are the cornerstones of good medical device procurement for the health system. The single most important factor in bringing down and keeping medical device prices as low as feasible is the prompt and reliable payment of suppliers. This area, however, frequently receives insufficient attention. Given the increased need and limited resources, donors and funding organizations are increasingly directing monies to health programs with a record of accomplishment of sound financial management, and in some cases, exclusively to countries with such a record of accomplishment. Decentralized, dedicated medical device purchasing accounts, for example, may allow the procurement cycle to function independently of the treasury cycle. By establishing their bank accounts and their business entities, revolving funds can assist in achieving this separation.

Procurement is the acquisition of goods, services, capabilities, and knowledge that businesses require from the right source, at the right quality, in the right quantity, at the right price, and at the right time to maintain and manage the company's primary and support activities (Giuniperol, 2006). The following are examples of high-level procurement activities: determining specifications in terms of required quality and quantities; selecting the right suppliers to provide the required goods and services; establishing agreements with suppliers; supplier relationship management; placing orders with the selected supplier (Dahwa, 2010). Thai (2001) distinguishes between non-procurement and procurement goals in the procurement system.

Procurement objectives are largely concerned with quality, the reduction of financial and technical risks, and the safeguarding of the system's integrity and competition.

Non-procurement goals frequently include the system's economic, social, and political objectives.

Typically, portfolio models start by categorizing products or buyer-supplier relationships then taking into account interdependencies between them. The strategic planning then based on portfolios. Kraljic's initial portfolio model built on analyzing the buyer-supplier relationship's features and assigning appropriate strategies to commodities. He claimed that all commodities and buyer-supplier relationships should not be treated the same. Based on these findings, a two-by-two matrix with four categories created bottleneck, noncritical, advantage, and strategic commodities. Each of the four groups necessitates a unique supplier strategy. Three primary power positions found and related with three different provider strategies: balance, exploit, and diversify, by charting the buying strengths against the strengths of the supply market.

Three primary power positions found and related with three different provider strategies: balance, exploit, and diversify, by charting the buying strengths against the strengths of the supply market. Kraljic's methodology categorizes commodities according to their preferred buying strategy. This reduces supply risk and maximizes purchasing power to improve the purchasing performance and yield of the firm. Purchasing managers should give the most attention to strategic items (high-profit effect, high supply risk). Long-term supply partnerships, regular risk analysis and management, contingency planning, and, if appropriate, considering producing the item in-house rather than buying it are all options. Purchasing techniques to consider here for advantage products (high-profit impact, minimal supply risk) include spending your entire procurement budget.

Items that cause bottlenecks (low-profit impact, high supply risk) Over ordering when the item is available (lack of reliable availability is one of the most common reasons that supply is unreliable) and looking for ways to manage vendors are two approaches that can be used here. Using standardized products, monitoring and/or optimizing order volume, and managing inventory levels are all techniques for non-critical items (low-profit impact, low supply risk).

Procurement is limited to a predetermined list, which improves the health service. Almost no healthcare program can afford to buy every product on the market.

One of the most efficient strategies to control procurement expenses is to use a limited medical device list that specifies which medical devices are purchased. It also streamlines other supply-chain management tasks and lowers inventory-holding costs.

As long as there is enough competition in the market, increasing the total procurement volume for any commodity raises the possibility of favorable prices and contract terms. Furthermore, increasing procurement volume often increases the number of potentially interested suppliers that want to earn the business, as well as supplier loyalty and responsiveness. When the market for a particular product or group of products is tight and available supplies are insufficient to meet global demand, suppliers usually give larger purchasers priority.

The procurement unit must ensure that the technical specifications include, in addition to the product information, testing requirements for quality assurance, parameters, commissioning and warranty, packing, and shipping requirements. The requirements are the major means of preventing counterfeit or substandard items, as well as ensuring that products properly labeled and suitably insulated from heat and cold during transportation. Quality assurance specifications are also included in the bid, precisely defining any documentation that the buyer would expect from the supplier, such as manufacturing records, the Certificate of Analysis, test data, and regulatory certificates. The purchaser's inspection plans, product sampling processes, and the manufacturer's process for sampling their production lots should all be included in these specifications. Many of the above-mentioned essential stakeholders, as well as technical professionals, are involved in procurement agencies to guarantee that product specifications followed and are complete.

All vendors should go through a qualification process that takes into account product quality, service reliability, delivery time, and financial sustainability. Formal registration, reference checks with prior clients and international agencies, and test purchases are all part of the process of vetting new suppliers.

Even though both prequalification (qualifying suppliers before the tender process) and post qualification (qualifying suppliers after bids have been received) have been used in international pharmaceutical procurement, health systems and the donors who fund procurement increasingly preferring prequalification.

After receiving bids, the procurement office examines the suppliers through a post-qualifying method. The time window for evaluating and awarding a contract is restricted after the bids are open, which can lead to rushing through the post-qualification process. Qualifying suppliers before submitting a tender provides for a complete examination.

Prequalification also leads to a more efficient procedure by automatically qualifying the lowest-priced bidder by eliminating inferior suppliers from the bidding process. Through a formal monitoring system that tracks lead time, compliance with contract pricing terms, shipments, compliance with packaging and labeling instructions, and commissioning and warranty compliance with other contract terms, successful procurement operations ensure continued good performance by suppliers.

To attract the greatest suppliers and the best pricing, the perception and reality of open and fair competition are critical. Fair competition achieved by following transparent tender procedures, which include following formal documented procedures throughout the tender and using formal, explicit criteria to determine procurement decisions. Solely broad-based committees should make contract award decisions. To the degree permissible by law and regulation, information about the tender process and results should made public. Both bidders and health units should have access to information on suppliers and costs for all winning contracts, at the very least.

When the process of procuring medical devices kept secret, it can see as corrupt or unfair. Cronyism charges may leveled. Whether or whether the allegations are genuine, they are detrimental because vendors, healthcare providers, and patients lose faith in the system. Unsuccessful providers may believe they have little chance of winning future tenders and, as a result, withdraw or submit only token bids. Price competition weakens when the pool of prospective providers shrinks, and procurement prices will be significantly higher than necessary (USAID|DELIVER, 2011). An efficient procurement procedure must ensure that the medical device drugs purchased and supplied meet defined quality requirements that are both clear and well known.

2.1.5 Medical Device Shipment & Receipt

The last step in the procurement process is to ensure Shipment and receipt of the goods at the required destination. For international shipments, this includes the shipment of goods from the supplier's warehouse, through the port of entry, clearance through customs, receipt, and inspection at the designated place of shipment, and resolution of any insurance or damage claims. While shipping terms and responsibilities may vary, it is the responsibility of both the purchaser and supplier to support the customs clearance process by ensuring that they have the necessary documentation to facilitate clearance.

Insufficient or incorrect documentation can cause unnecessary delays in clearance, which frequently leads to charges that the purchaser is responsible to pay.

Unless the medical device purchased locally or the overseas supplier handles port clearance, the purchaser is responsible for making the product available for distribution. Port clearing entails identifying shipments as soon as they arrive at the port, processing all importation documents, fulfilling any customs requirements, properly storing medical devices until they leave the port, inspecting the shipment for losses and signs of damage, and collecting the product as soon as it has cleared. Port clearing can handled in-house or through a separate agreement with a clearing company.

Customs requirements clarified with the national agency and shared with the supplier before the shipment sent so that all the documentation provided to the purchaser in a reasonable time. When the consignment delivered at the destination, the warehouse must officially receive the shipment by confirming receipt of the correct documentation; including the commercial invoice, packing list, and any other required documentation.

The warehouse staff inspects the shipment at this point to ensure that it contains the correct products, in the correct quantities, in good condition (no damage), in proper packaging and labeling, and that it complies with the contract conditions for medical device type, accessories, spare parts, quantity, packaging, labeling, and any special requirements. To guarantee that suppliers meet their commitments, all shipments must inspected promptly and accurately. Before resolving a claim, insurance companies will want an accurate record of any damages suffered. If no faults found during the inspection, the products accepted into the warehouse and added to the usable inventory.

2.2 Review of Empirical Studies

2.2.1 Medical Device Product Selection

Farzana, E. (2017). Investigate the factors that influence the decisions in selecting the pharmaceutical products and rank them through the application of the analytical hierarchy process (AHP). In this regard, six factors are identified, namely, quality of products, availability of products, variety of products, shipment deadline, flexibility in quantity, and competitive price that affect the purchasing decision of the company.

The result indicates that among the chosen six factors, quality of products is ranked first followed by a variety of products, availability of products, flexibility in quantity, competitive price, and shipment deadline.

2.2.2 Medical Device Forecasting

Radi, H. (2013). Assessed eight international pharmaceutical companies, who are involved in the forecasting management process and impact on it through a qualitative approach by applying grounded theory as the research methodology. The lack of forecasting experts, inconsistence of the forecasting knowledge, the forecasting construction method, and dealing with initial forecasting errors. Moreover, forecasting experts to be available to support and manage the forecasting process and set targets for the overall organizational goals. Inadequate training on forecasting management and techniques in pharmaceutical companies has led to variations in defining and understanding forecasting, which has led to communication clashes. The differences between users' priorities of forecasts in different departments affect forecasting management. The initial forecasting errors never calculated in pharmaceutical companies. Instead of calculating the forecasting errors, the management puts a margin of error, usually indicated by a certain percentage, through a shallow and superficial calculation, just in case markets might demand more goods. There is no calculation of these errors scientifically during the management decision making due to the unrealized importance of forecasting errors and insufficient training. This will lead to organizational loss because of over or under product supply. External Noise represents the uncontrollable factors that affect the forecasting in pharmaceutical companies due to the governmental and organizational bodies.

The external noise has three subcategories including market complexity, cross boarders' issues, and market instability and turbulence.

2.2.3 Medical device Supply Planning

Alexander, D. (2007). The study used models from literature that deal with random demand or lead-time uncertainties to analyze supply-planning situations that can affect logistics performance. Inventory control in supply planning is crucial for companies desiring to satisfy their customers' demands as well as control costs. It appears that lead-time uncertainty has ignored in the past, despite their significant importance.

In particular, an interesting topic concerns assembly systems with uncertain lead times, for which the main difficulty comes from the inter-dependence of components inventories. Another promising issue, which also presented, relates to supply planning under simultaneous demand and lead-time uncertainties.

Joby, G. (2018). The study reviewed 54 pieces of literature to analyze the supply-planning effect on logistics performance. The supply planning activity affects logistics performance through various internal and external factors. The identified factors by reviewing various literature in the supply planning are supply chain structure, inventory control policy, information sharing, customer demand, forecasting method, lead-time, and review period length. The optimum selection of parameters of these factors improves logistics performance.

2.2.4 Medical device Procurement

Akoko, K. (2017). Analyzed Kenya Medical Supplies Agency is directly involved in the medical supply chain with the target population of study consisting of 375 employees. The study identified the procurement practice of medical supply agents in Kenya is affected by policies ranging from procurement policy, handling policy, storage, and means of transport as these affect logistics performance among medical supply agents in Kenya positively. Lastly, the study identified that medical supply agent inbound logistics performance was affected because of not using the technology more in stock quantification, stock management, and forecasting.

Roda, A. (2014). Research on state-owned institutions in Kenya regarding factors affecting procurement lead-time and logistics performance results that inadequate financing to the firm's procurement process, staff capacity to effect procurement, and stringent public procurement procedures found to impede successful management of the procurement process. In addition, a lack of adequate enforcement of the ethical code of conduct by staff and other actors in the supply chain found to delay the processing of tenders and the eventual Shipment of the products or services. There is a need to increase the funding process of the organization towards lead-time management. The government has a role to play in ensuring successful enforcement of all procurement laws since the problem is not a lack of the laws but the circumventing of the laws by the parties for their selfish gains.

Patrick, K. (2019).

Procurement efficiency and procurement effectiveness of the purchasing function are measures of procurement performance. A survey instrument was developed and administered to a public entity to establish the importance of financial and nonfinancial measures in the performance of the procurement function. To ensure entities maximize purchasing efficiency and effectiveness, loss of professional turnover should reduce. This can done by establishing clear roles and procedures within the procurement processes. To ensure value for money, there should be continuous improvement in the efficiency of internal processes and systems and public entities should maintain structures that avoid unnecessary costs. As much as the quality of procured goods and services featured the most preferred measure of procurement performance, other intangible measures like timely Shipment of orders, customer satisfaction, dependability, flexibility, and quality of employees not ignored.

2.2.5 Medical Device Shipment & Receipt

Afro Consult, (2010). Related with the cost of the product because of the Shipment of pharmaceutical product to the buyer warehouse especially in East Africa has the highest transportation cost. For instance, the logistics cost proportion in 2003 was about 15% of import value compared to 5.4% for the world average. The situation of landlocked countries, such as Ethiopia was 16% of the foreign trade values in 2008 were in that much cost consumed by transport and transit costs, which were nearly, double of the coastal countries on average at the time.

2.3 Conceptual Framework

A conceptual framework is a brief description of the phenomenon under investigation, along with a graphical or visual representation of the study's primary variables (Mugenda, 2008).

The six rights supported by inbound logistics management, which involves many operations. Over time, logisticians have developed a model called the logistics cycle to depict the interaction between the operations in a logistics system (USAID/DELIVER, 2011). In any health, inbound logistics system the health programs select products for use b/c it will affect the inbound logistics system and the logistics requirements considered during the product selection.

After products are selected, the required quantity and cost of each product are determined which is forecasting and supply planning for a specific health program (or clinical service), and, to ensure an uninterrupted supply for the program, determining when the products should be procured. After a supply plan developed as part of the quantification process, quantities of products procured. Procurement should follow a set of specific procedures that ensure an open and transparent process that supports the six rights. Shipment is playing a critical role in logistics and seen as the glue that holds channel members together. The shipment service characteristics of freight include transit time, reliability, accessibility, capability, and security.

Based on the overall review of related literature and the problem statement of the study governed by the following conceptual framework.

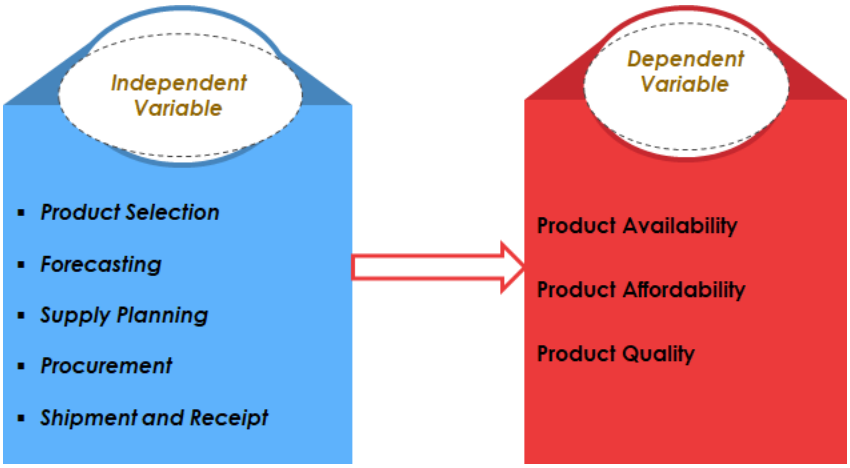

Figure 1 Adopted from The logistics handbook, 2011 G.C.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents the research design and methods used to achieve the objectives of the research. It includes a description of the study area, research approach, research design, study population, data source and type, data collection procedure, data analysis, validity and reliability test, and ethical considerations that are used to achieve the objectives of the research.

3.1 Description of the Study Area

The Ethiopian pharmaceuticals supply agency (EPSA), formerly known as pharmaceuticals fund and supply agency (PFSA), is state-owned pharmaceuticals supply agency established by proclamation number 553/2007 with a mission to supply quality assured pharmaceuticals to public health facilities at an affordable price in a sustainable manner (PSTP II, 2021). The Agency is responsible for the public sector's healthcare supply chain and all its key functions are quantification, procurement, warehousing, and distribution of the medical device, medicines, medical supplies, diagnostic chemicals, and reagents through 17 Hubs all over the country. Today, its activities constitute an annual turnover of almost USD 1 billion (PSTP II, 2021).

The agency's key functions categorized into inbound logistics, which consists of quantification, and market-shaping, tender management, and contract management directorates, and outbound logistics, which consists of inventory and warehouse management and distribution and fleet management directorates (PFSA BPR, 2016). The study focus on the effect of inbound activities on the logistics performance of the medical device of the Ethiopian pharmaceutical supply agency to ensure sustainable and quality assured medical device supply.

3.2 Research Approach

The study used quantitative approaches, it is one in which the investigatory primarily uses postpositive claims for developing knowledge, employs strategies of inquiry to provide data that can answer the research questions and achieve the research objectives.

The quantitative approach involves the collection of objective, verifiable data usually a numeric value or percentage.

This approach helped in using better statistical analysis and in avoiding bias. In this study quantitative approach of the study focus on analyzing the effect of medical device, inbound logistics practice on Ethiopian pharmaceutical supply agency performance.

3.3 Research Design

Research design is the conceptual structure within the study conducted; it establishes the blueprint of what the study will do from writing questions, hypothesis, and its operational implications to the final analysis of data (Tabachnick & Fidell, 2007).

Explanatory research looks for causes and reasons and provides evidence to support or refute an explanation or prediction (Lelissa, 2018).

This study represented explanatory research as the effect of inbound logistics practice on the performance using correlation and regression analysis to which the variables correlated and determining the cause and effect relationship. As result, the study used an explanatory research design to generate answers to the research questions.

3.4 Research Population and Sampling

The population is the entire group of people, events, or things of interest that the researcher wishes to investigate; while the target population is the total collection of elements about which the researcher wishes to make some inferences (Okiro & Ndungu, 2013).

The target population is the group to which the findings are applicable, should be defined, and consistent with the statement of the problem and objectives. The study conducted among the targeted population of the agency quantification and market-shaping, tender management and contract management directorates officer, coordinator, advisor & Directors. From the above population of respondents, the Human resource directorate consulted and obtained this 100 intended number of permanent employees.

The target population for this study constituted all employees who work at the inbound logistics stream in EPSA. Due to the small target population (100), it has decided to employ a census technique to gain insight into logistics performances. For this study, purposive sampling implemented to select the respondents to reduce variability in the information received.

3.5 Data Source and Types

The sources of the data for conducting this study collected from primary and secondary sources of data.

Primary data sources were respondents/targeted employees of EPSA at head office. The interpretation was conducted which could account as quantitative. The primary data was collected through using a survey questionnaire by drop and pick strategy to ensure a high response rate. The data collection was standardized because each respondent got the same question and in the same arrangement. Questionnaires also enabled the collection of original data from the sample of the target population within a short time and at low cost for purposes of describing the entire population (Ogutu, 2012).

The secondary sources of the information are from the related study conducted previously, and journals, strategies, policies, standard operating procedures, and guidelines produced from concerned bodies, which used to collect essential data to enrich the study.

3.6 Data Collection

The data collection method considered the current inbound logistics practice and its effect on the performance investigated using a structured questionnaire based on 5 points Likert Scale rating from 1 (strongly disagree) to 5 (strongly agree) for independent variable leadership styles and from 1(very low) to 5(very high) for the dependent variable organizational performance. The questionnaire designed to gather quantitative data about subordinate employees' feelings or perceptions of the inbound logistics practice and its effect on agency performance.

Thus, data for this study collected using a structured research questionnaire, distributed to the target population, and collected after a few days. Primary data collected from the subject of the study. Accordingly, the data collected using the questionnaire checked for its consistency and completeness before analysis made.

The questionnaire that was proposed and used in this study divided into three parts. Part one as introduction part; Part two explored demographic characteristics or variables of respondents;

Part 3 consisted of a series of statements to capture the perception of employees on the product selection, forecasting, supply planning, procurement, and transportation practice and its effect on the agency logistics performance.

3.7 Data Analysis

Data analysis is the process of editing and reducing accumulated data to a manageable size, developing summaries, seeking patterns, and using statistical methods as described by Cooper and Schindler (2000). The questionnaire coded before entering the data into Statistical Package for Social Sciences (SPSS) for analysis. The data analysis involved frequencies, means, analysis of variances, and bi-variate analysis in form of cross-tabulation to explore the relationships between the various variables tested in the current study. After the data collected, then coded and entered into SPSS. Correctness of data entry also checked. The scale-based variables checked for internal consistency after which the scores aggregated and obtained for each respondent per scale variable measure. Descriptive and inferential statistical techniques used for data analysis. According to Amin (2005) Descriptive, statistics provides us with the techniques of numerically and graphically presenting information that gives an overall picture of the data collected. In inferential statistics, Pearson's correlation and multiple regression analysis, which is ANOVA and summary model used to assess both relationships and effects as per the study.

3.8 Validity and Reliability of the instruments

Validity test of the instruments

The amount to which a measure accurately represents the underlying concept that it is designed to measure is referred to as validity (Bhattacherjee, 2012). It is concerned with the measure's ability to define the idea. The logistics indicator assessment tool (LIAT) used to conduct inbound logistics practice effect quantitatively on logistics performance (John Snow, 2005). LIAT reviewed and adapted to meet the objectives identified for the effect assessment, as well as to meet ongoing study.

Reliability test of the instruments

The degree to which a construct's measure is consistent or trustworthy called reliability (Bhattacherjee, 2012). Internal consistency reliability is a measure of consistency between different items of the same construct (Bhattacherjee, 2012).

Reliability is the extent to which findings repeat/are consistent (Joppe, 2000). Reliability refers to the accuracy and consistency of information attained in a study (Beck, 2004). Reliability is the consistency of a score from one occasion to the next occasion. This study used a well-structured questionnaire to avoid reliability problems. Cronbach alpha with acceptable cut-off points 0.7 demonstrate that all attributes are internally consistent; the reliability test for the instrument used for the study conducted using SPSS the results shows that the items used are reliable. Therefore, in this study, to test the reliability of the research instruments, a pilot test carried out before the final research was commenced from 15(10%) of the sample size, the respondents did not participate in the main research. The reliability test was conducted based on (Zikmund, 2010) scales with a coefficient between 0.80 and 0.95 are considered to have very good reliability, Scales with a coefficient between 0.70 and 0.80 are considered to have good reliability, and value with a coefficient between 0.60 and 0.70 indicates fair reliability.

When the coefficient is less than 0.6, the scale considered unreliable.

Table 1. Reliability Test

No	Variables	Number of items	Cronbach alpha
1	Product Selection	5	0.859
2	Forecasting	5	0.800
3	Supply Planning	5	0.819
4	Procurement	7	0.861
5	Shipment & Receipt	5	0.882
	Total	27	0.8445

Source: (SPSS, 2022)

The alpha value for democratic Product Selection, Forecasting, Supply Planning, Procurement, transformational and Transportation is 0.859, 0.800, 0.819, 0.861, 0.882 and 0.846 respectively. The result implied that the alpha value for all variables was above 0.70. Therefore, all attributes are internally consistent and reliable.

The overall reliability test for all measurement items used in this study was 0.8445.

This implied that there was very good internal consistency among measurement items used in this study.

3.9 Ethical Consideration

Before commencing data collection, the selected directorate of the agency communicated with formal letters from the school of commerce, Addis Ababa University. The study conducted after permission from the higher officials of respective directorates obtained. Participants of the study asked for their consent before participating in the study. During the consent process, provided information regarding the purpose of the study, why and how they selected to be involved in the study and expectations from them, and that they can withdraw from the study at any time. Participants also assured about the confidentiality of the information obtained in the course of the study by not using personal identifiers and analyzing the data in aggregates.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter presents an analysis of data collected and discusses the findings in the light of the research objectives and hypothesis of the study stated in the first chapter of the study. The main objective of this study is to show THE EFFECT OF INBOUND LOGISTICS ON THE LOGISTICS PERFORMANCE OF MEDICAL DEVICES: of the Ethiopian Pharmaceuticals Supply Agency.

The first part of the questionnaire consists of demographic information of the respondents as presented in the tables below. The second part of the questionnaire assess the inbound logistics practice of the agency. The third part of the questionnaire presented the results of regression and correlation between the variables (independent and dependent). In this analysis, the Statistical Package for Social Science (SPSS) of a computer software program was used to make the necessary calculations.

4.1 Response Rate

By dividing, the number of completed questionnaires by the number of eligible sample participants, the response percentage is calculated (Frohlich, 2001). The most usually compared statistic for evaluating the quality of surveys is the response rate (Johnson and Owens, 2008). There is no simple response rate that assures a sample of the population that is representative. Most reviewers seek a response rate as a general rule of thumb of 70% or higher (Rubenfeld, 2004).

One hundred questionnaires distributed to permanent employees of EPSA at head office who engaged in forecasting and quantification, tendering, and contract management directorate as well as to employees who have indirect exposure but have enough knowledge about the inbound logistics activities of the agency. Ninety-Four valid questionnaires returned to the researcher, representing a response rate of 94 percent whereas, four (0.04%) questionnaires not returned from respondents and two (0.02%) questionnaires are incomplete. Therefore, 94 questionnaires considered sufficient for the study, as it is higher than the rule of thumb for the general response rate.

4.2 Socio-demographic Characteristics of Respondents

The background information of the respondents such as age, sex, education qualification, and years of experience filled. The general socio-demographic characteristics of the respondents asked to describe were Age, Sex, Educational Qualification, Directorate of their work unit, and Years of Service. These 94 respondents gave their socio-demographic requests as described in the table below.

Table 2. Socia demographic data

Socio Demographic character	Sub category	Frequency (n)	Percent (%)
Age	21-30 Yrs.	30	31.9
	31-40 Yrs.	48	51.1
	41-50 Yrs.	12	12.8
	51 & Above Yrs.	4	4.3
Sex	Male	66	70.2
	Female	28	29.8
Educational Qualification	Diploma	0	0
	First Degree	57	60.6
	Second Degree	37	39.4
	Above	0	0
Working Directorate	QMSD	30	31.9
	TMD	22	23.4
	CMD	39	41.5
	DDG, Inbound office	3	3.2
Year of Exp.	Less 3Yrs	10	10.6
	3-6Yrs	24	25.5
	7-10yrs	45	47.9
	Above 11yrs	15	16.0

Source: (SPSS, 2022).

As is revealed in table 4.2 above, it has discovered that males accounted for 70.2 percent of the respondents, while females accounted for 29.8 percent. This shows that both men and women were involved in the study.

Regarding the age distribution of the respondents, the large number of respondents dominated by the age group of 31-40 Yrs. were 48 (51.1%), respondents whose age fall in the age group of 21-30 Yrs. were 30 (31.9%), those in the age group of 41-50 Yrs. were 12 (12.8%) and those 51 & Above Yrs. were four (4.3%). This could show that half of the sampled respondents in the agency were young employees.

According to the findings, the majority of respondents (60.6%) had a first-degree level of education, followed by 39.4 percent with a second-degree. This suggests that the respondents had adequate educational levels to comprehend and react to the study issues. The study found out the years of service the respondents have directly or indirectly with the logistics and supply management functions in the case agency. The responses analyzed, and the findings summarized in table 4.2 above. From the inbound logistics-working unit thirty-nine (41.5%) respondents are working in the contract management directorate and 30 (31.9%) respondents are working in the quantification and market-shaping directorate.

According to the results, the majority of respondents (47.9%) had 7 to 10 years of work experience, while (25.5%) had 3 to 6 years of work experience, (16.0%) had above 11 years of work experience, while just (10.6) had less than 3 years. This indicated that the majority of the respondents (47.9%) had worked for more than 7 years, implying that they were in a position to provide reliable information about the report.

Generally, the socio-demographic characteristics of respondents' shows that majority of the respondents had significant knowledge that infers they were in a position to give reliable information relating to the study.

4.3 The Medical Device Inbound Logistics Practice of EPSA

The first objective of the study was to examine the status of medical device inbound logistics practices in the Ethiopian pharmaceuticals supply agency. The respondents requested to show the state of inbound logistics practices in the Ethiopian pharmaceuticals supply agency. The inbound logistics practices constituted of product selection, forecasting, supply planning, procurement, shipment, and receipt of the products.

A five-point Likert scale with 5=Strongly Agrees 4=Agree 3=Neutral 2=Disagree 1=Strongly Disagree was used to rate the state of inbound logistics practices.

Analysis of the statutes of the inbound logistics practices done using means and standard deviations. The means recorded interpreted as follows: 1-1.49 = Never practiced; 1.5-2.49 = rarely practiced; 2.5-3.49 = occasionally practiced; 3.5-4.49 = Very often practiced; 4.5-5.0 =Always practiced (Lady, 2016).

Coming to the standard deviation of the variables small variance indicates that data are close to the mean whereas a large variance indicates that the points are distant from the mean. The standard deviation is a metric for determining how well the mean accurately represents the data. In other words, Standard deviation shows how different the responses of respondents are for a given idea. High standard deviation means that the data is widespread, which means that respondents give a variety of opinions and a low standard deviation means that respondents had an almost similar opinion.

4.3.1 The Medical Device Product Selection Practice of EPSA

The study attempt to determine the state of product selection practices in the Ethiopian pharmaceuticals supply agency. The study finding presented in table:

Table 3. Descriptive Statistics of medical device product selection practice

	N	**Mean**	**Std. Deviation**
The agency implement has standard guidelines/tools for product selection activity	94	2.6489	1.05451
The agency participates in competent and skilled health professionals during product selection activities.	94	2.8617	1.04317
The agency select products in consideration of in-country registered product	94	2.4468	1.01194
The agency select products with generic standardized technical specification.	94	3.6915	.98403
The agency updates the technical specification frequently for the selected product	94	2.0532	.80812
Overall Total	**94**	**3.340**	**.98035**

Source: (Own Survey, 2021).

The survey result in the above table 4.3 shows that an overall mean and standard deviation of (M=3.340 SD=.98035) represented that the product selection was practiced occasionally in the agency.

The above table demonstrates that the agency select products with generic standardized technical specification was very often practiced with the highest mean (M=3.6915, SD=.98403). The agency participates in competent and skilled health professionals during product selection activities (M= 2.8617, SD= 1.04317) and implementation of standard product selection guideline/tool (M=2.6489, SD=1.05451) was occasionally practiced.

The agency selects products in consideration of in-country registered products (M=2.4468, SD=1.01194) and updates the technical specification frequently for the selected product (M=2.0532, SD=.80812) was practiced rarely.

In general, the descriptive analysis showed comparatively a high standard deviation spread ranging from .80812 to 1.05451. It indicates that respondents more varied in their opinions to the responses given under product selection practice.

4.3.2 The Medical Device Forecasting Practice of EPSA

The study attempted to determine the state of medical device forecasting practices in the Ethiopian pharmaceutical supply agency.

Table 4. Descriptive Statistics of medical device forecasting practice

	N	Mean	Std. Deviation
The agency implement a standard guideline/tools to perform forecasting activities	94	2.4681	.92402
The agency participates in competent and skilled health professionals during forecasting activities.	94	3.0851	1.17005
The agency consider the baseline data during forecasting	94	2.7872	1.00400
The agency use medical device essence/nature based forecasting procedure/approach.	94	2.4468	.99046
The agency has reduced medical device forecasting error	94	2.7128	.77073
Overall Total	**94**	**2.7**	**0.97185**

Source: (Own Survey, 2021).

The survey result in the above table 4.4 shows that an overall mean and standard deviation of (M=**2.7** SD=**0.97185**) represented that the forecasting was practiced occasionally in the agency.

The above table demonstrates that the agency participates in competent and skilled health professionals during forecasting activities with the highest mean (M= 3.0851, SD= 1.17005) occasionally practiced. The agency considers the baseline data [like No. of health facility with their clinical service, supplier information, product information, national-level stock on hand, quantity on order, and shipment schedule] during forecasting (M=2.7872, SD=1.00400) and the agency has reduced medical device forecasting error (M=2.7128, SD=.77073) were occasionally practiced. The agency has enhanced forecasting practice (M=2.4681, SD=.92402) and the agency uses medical device essence/nature-based forecasting procedure/approach (M=2.4468, SD=.99046) were rarely practiced.

In general, the descriptive analysis showed comparatively a high standard deviation spread ranging from .77073 to 1.17005. It indicates that respondents more varied in their opinions to the responses given under forecasting practice.

4.3.3 The Medical Device Supply Planning Practice of EPSA

The study wanted to determine the state of medical device supply planning practices in the Ethiopian pharmaceuticals supply agency. The research finding presented in table below:

Table 5. Descriptive Statistics of medical device supply planning Practice

	N	Mean	Std. Deviation
The agency implement has standard guidelines/tools to enhance supply-planning practice.	94	3.2021	.74169
The agency has enhanced practice through organizing and analyzing supply plan data requirements	94	3.1064	.79607
The agency has enhanced supply-planning practice by reconciling the amount of available funding with total product costs and adjusting.	94	2.2979	.82735
The procurement request is following the analysis of supply planning data.	94	2.5851	.99903
The agency uses a medical device essence/nature-based supply-planning procedure/approach.	94	2.2447	.96927
Total Overall	**94**	**2.6872**	**0.8667**

Source: (Own Survey, 2021).

The survey result in the above table 4.6 shows that an overall mean and standard deviation of (M=**2.6872** SD=**0.8667)** represented that supply planning was practiced occasionally in the agency.

The above table demonstrates that the agency has enhanced the supply planning tool with the highest mean (M= 3.2021, SD= .74169) occasionally practiced. The agency has enhanced practice through organizing and analyzing supply plan data requirements [Like item list, supplier, procurement lead-time, and distribution and stock status] (M=3.1064, SD=.79607) and the procurement request is following the analysis of supply planning data (M=2.5851, SD=.99903) were occasionally practiced. The agency has enhanced practice through analyzing the amount of available funding with total product costs and making an adjustment (M=2.2979, SD=.82735) and the agency uses medical device essence/nature-based supply planning procedure/approach (M=2.2447, SD=.96927) was rarely practiced. In general, the analysis further displayed that moderately high standard deviation spread from .74169 to .99903. This implies that respondents more varied in their opinions to the responses given under the agency supply planning practice.

4.3.4 The Medical Device Procurement Practice of EPSA

The study wanted to determine the state of medical device procurement practices in the Ethiopian pharmaceuticals supply agency. The research finding presented in table below:

Table 6. Descriptive Statistics of medical device procurement practice

	N	Mean	S. Dev.
The agency participates in competent and skilled procurement specialists & health professionals during procurement activities.	94	3.8830	1.28562
The agency procurement plan adheres to the requirement of the Federal Public Procurement Directive of Ethiopia & shares it with the relevant stakeholders.	94	3.0638	1.17142
The agency tender type selection method is as per the thresholds indicated in the Federal Public Procurement Directive of Ethiopia.	94	3.9043	1.01673
The agency has enhanced tender evaluation practice as per the requirement as defined in the bidding document.	94	3.7979	1.05321
The agency practices organizing the pre-performance conference with suppliers on the contract document before signing.	94	2.0745	.88280
The agency has enhanced practice on identifying gaps between planned targets and actual performance to develop countermeasures.	94	3.9041	1.27059
The agency has enhanced procurement practice on using the central database to record lessons learned and best practices for subsequent procurement.	94	2.4681	.88842
Overall Total	**94**	**3.299**	**1.08125**

Source: (Own Survey, 2021).

The survey result in the above table 4.6 shows that an overall mean and standard deviation of (M=**3.299** SD=**1.08125)** represented that the procurement was practiced occasionally in the agency.

The above table demonstrates that the agency tender type selection method is as per the thresholds indicated in the Federal Public Procurement Directive of Ethiopia with the highest mean (M= 3.9043, SD= 1.01673) very often practiced. The agency has enhanced practice on identifying gaps between planned target and actual performance and developing countermeasures to close the gap (M= 3.9041, SD=1.27059) was very often practiced.

The agency participates in competent and skilled procurement specialists & health professionals during procurement activities (M= 3.8830, SD=1.28562) and the agency has enhanced tender evaluation practice as per the requirement as defined in the bidding document (M=3.7979, SD=1.05321) were very often practiced.

The agency procurement plan adheres to the requirement of the Federal Public Procurement Directive of Ethiopia & shares with the relevant stakeholders (M=3.0638, SD=1.17142) was occasionally practiced.

The agency-enhanced practice of using the central database to record lessons learned and best practices for subsequent procurement (M=2.4681, SD=.88842) was rarely practiced.

In general, the descriptive analysis showed comparatively a high standard deviation spread ranging from .88280 to 1.28562. This implies that respondents more varied in their opinions to the responses given under the agency procurement practice.

4.3.5 The Medical Device Shipment and Receipt Practice of EPSA

The study wanted to determine the state of medical device shipment and receipt practices in the Ethiopian pharmaceuticals supply agency.

The research finding presented in table:

Table 7. Descriptive Statistics of medical device shipment and receipt practice

	N	Mean	Std. Deviation
The agency has standard guidelines for transportation activities to enhance on-time product delivery.	94	2.8936	1.07231
The agency use sea transportation for bulk/high volume products & air carrier for low volume products	94	3.8191	1.26969
The agency has increased practice through on time custom clearance	94	3.1383	1.30838
The agency deploy required numbers of suitable trucks to deliver product from port to EPSA warehouse	94	3.3191	1.00764
Prior to receipt the agency inspect the consignment to ensure shipment includes correct products specification, quantities, in good condition (with no damage), in correct packaging and labeling.	94	3.2234	1.15614
Overall Total	**94**	**3.2787**	**1.162832**

Source: (Own Survey, 2021).

The survey result in the above table 4.6 shows that an overall mean and standard deviation of (M=**3.2787** SD=**1.162832)** represented that the Shipment and receipt were practiced occasionally in the agency.

The above table demonstrates that the agency uses sea transportation for bulk/high volume products & air carrier for low volume products with the highest mean (M= 3.8191, SD= 1.26969) was very often practiced. Before receipt, the agency inspects the consignment to ensure shipment includes correct products specification, quantities, in good condition (with no damage), incorrect packaging and labeling (M=3.2234, SD=1.15614) and the agency deploy required numbers of suitable trucks to deliver product from port to EPSA warehouse (M=3.3191, SD=1.30838) were occasionally practiced.

The agency has increased practice through on-time custom clearance (M= 3.1383, SD=1.30838) and the agency has enhanced transportation practice through on-time product Shipment (M= 2.8936, SD=1.07231) were practiced occasionally.

In general, the analysis further displayed that moderately high standard deviation spread from 1.00764 to 1.26969. This implies that respondents more varied in their opinions to the responses given under the agency Shipment and receipt practice.

4.5 Correlation Analysis

The Pearson's Product Moment Correlation Coefficient was computed to determine the relationships between the inbound logistics practices specifically product selection, forecasting, supply planning, procurement, shipment/receipt, and logistics performance of the Agency.

If correlation (r) is 0.00 it is said to be no correlation, if it is between 0.01-0.09 it is very weak, if it is 0.10-0.29 the correlation is weak, if it is between 0.30-0.59 the correlation is moderate if it is between 0.60-0.79 the correlation is strong and if it is between 0.80-1.0 the correlation is very strong (Alwadael, 2010). Pearson correlation coefficients were determined with the objective of obtaining information about the relationships between the dependent and independent variables as presented in the table below:

Table 8. Dependent and independent variables correlation coefficients

Correlations							
		Logistics Performance	Product Selection	Forecasting	Supply Planning	Procurement	Shipment & Receipt
Logistics Performance	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	94					
Product Selection	Pearson Correlation	0.743	1				
	Sig. (2-tailed)	0.000					
	N	94	94				
Forecasting	Pearson Correlation	0.813	.789	1			
	Sig. (2-tailed)	0.000	0.000				
	N	94	94	94			
Supply Planning	Pearson Correlation	0.752	0.719	0.751	1		
	Sig. (2-tailed)	0.000	.000	.000			
	N	94	94	94	94		
Procurement	Pearson Correlation	0.829	0.671	0.643	.650	1	
	Sig. (2-tailed)	0.000	.000	.000	.000		

	N	94	94	94	94	94	
Shipment & Receipt	Pearson Correlation	0.804	.786	0.831	0.816	.725	1
	Sig. (2-tailed)	0.000	.000	.000	.000	.000	
	N	94	94	94	94	94	94
	**. At the 0.01 level, the two stars indicate that the correlation is significant (2-tailed).						

Source: (Own Survey, 2021).

As seen on the table, it realized that most of the independent constructed variables correlated with the logistics performance of the Ethiopian pharmaceuticals supply agency. The results indicated that there is a positive and significant correlation between product selection practice and logistics performance ($r=0.743$, $p<0.01$). According to Evans's (1996) magnitude of the correlation, the relationship between the two variables is strong. In addition, the result showed that forecasting practice is positively and significantly correlated with logistics performance ($r=0.813$, $p<0.01$). Thus, the relationship between the two variables is very strong. According to the results, a strong and statistically significant positive correlation is found between supply planning practice and logistics performance with ($r=0.752$, $p<0.01$). Furthermore, as shown in the above table, a positive and significant correlation could be observed between procurement practice and logistics performance at ($r=0.829$, $p<0.01$), which infer that a strong relationship exists between the two variables. From the results, the correlation between shipment and receipt practice and logistics performance is positive and significant relations at ($r=0.804$, $p<0.01$) according to the correlation magnitude of Evans (1996). Thus, all the constructs under consideration significantly correlated.

Generally, the correlation analysis exhibited that there is a positive and statistically significant relationship between inbound practices and logistics performance of the Ethiopian pharmaceuticals supply agency. As per the logistics handbook, a practical guide for the supply chain management of health commodities book these findings are consistent that whatever improvement done in respect of logistics will help to enhance logistics performance in terms of increased revenue generation in a very cost-effective way.

4.6 Regression Analysis and Hypothesis Testing

As described by R.Burns & B.Burns, (2008) the practice of regression allows make predictions of the likely values of the dependent variable from known values of the independent variable in a simple linear regression or multiple linear regression. The study will bear a multiple linear regression because it has more than two independent variables. The regression analysis in the study conducted to find out how much the independent variable (product selection, forecasting, supply planning, procurement, and shipment/receipt) affect the dependent variable (Logistics Performance).

4.6.1 Testing Regression Analysis Assumptions

A. Normality Distribution Test

This Multiple regression analysis requires the independent variables to be normally distributed. As defined by Smith and Wells (2006), kurtosis defined as the "property of a distribution that describes the width of the tails.

The width of the tail comes from the number of tallies falling at the extremes relative to the normal distribution and Skewness is a measure of symmetry. A data set is symmetric if it's equivalent to the left and right of the middle point. The skewness and kurtosis test results of the data are within the acceptable range is (-1.0 to +1.0) and it can be determined that the data is normally distributed.

Table 9. Normality distribution test

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistics	Statistics	Std Error	Statistics	Std Error
Product Selection	94	-0.473	0.464	-0.538	0.902
Forecasting	94	-0.494	0.295	-0.695	0.582
Supply Planning	94	0.892	0.361	-1.265	0.709
Procurement	94	-0.459	0.279	-0.663	0.552
Receipt & Shipment	94	-0.323	0.427	-0.722	0.833

Source: (Own Survey, 2021).

As seen on the table the result of kurtosis Skewness is between -1.0 to +1.0, which is acceptable.

B. Multi Collinearity

Linear regression assumes that there is little or no multi-co linearity in the data. Before presenting the regression models, it should be inspected for none existence of excessive correlations between the independent variables in the model. When there is a perfect or exact (it means if r=1 between independent variables) relationship between the predictor variables or at least one independent variable with a combination of other independent variables, it will result in incorrect conclusions about the relationship between the dependent variable and predictor variables (Alibuhtto and Peiris, 2015). Sometimes, it will be difficult to identify the individual contribution of each variable in predicting the outcomes of the dependent variable, when independent variables are highly correlated. Collinearity diagnostics can help the researcher to notice problems with multicollinearity that may not be evident in the correlation matrix.

According to Reddy et al. (2013), the most widely applicable method of detecting the multicollinearity is Variance Inflation Factor (VIF) and as a rule of thumb, the Variation Inflation Factor (VIF) values exceed 5 or 10 suggests problems with multi-collinearity (Reddy et al. 2013). The VIF (Variance Inflation Factor) is defined as VIF = 1/Tolerance. Moreover, Field (2009), also underlined that values for Tolerance below 0.1 indicate serious problems, although several statisticians suggested that a value below 0.2 indicates that the multiple correlations with other independent variables are high, which suggests the possibility of multicollinearity (Field 2009).

Table 10. Multi Collinearity Test

Model	Independent variables	Collinearity Statistics	
		Tolerance	Variance Inflation Factor (VIF)
1	Product Selection Practice	.949	1.054
	Forecasting Practice	.993	1.007
	Supply Planning Practice	.948	1.055
	Procurement practice	.919	1.089
	Shipment & Receipt Practice	.848	1.179

Source: (Own Survey, 2021).

As seen in the table above Variance inflation factor Value ranges from 1.007 to 1.179. Where the Tolerance value ranges from 0.848-0.993. These values of Tolerance and VIF indicate that there is no serious multi Collinearity problem. Therefore, the independent (predictors) variables are not overlapped or highly related. They are free from multicollinearity problems, which possibly hinders the prediction ability of the multiple linear regressions model.

C. Linearity Test

The Linearity test conducted by producing scatterplots of the relationship between each independent and dependent variable. According to Balance, (2004) Linearity defines the dependent variable as a linear function of the predictor (independent) variable.

Figure 2Linearity Test

Source: (Own Survey, 2021).

By visually looking at the normal probability plot produced by Statistical Package for Social Science (SPSS),

As demonstrated in figure above, the relation between each independent variable and the dependent variable found to be linear.

By looking at the above figure we can say that the dots follow the line though there seems to be some tiny deviation, we can say that the relationship between the independent and dependent variables looks to be linear.

D. Homoscedasticity Test

As stated by Field, (2005) the residuals at each level of the independent variable should have the same variance (homoscedasticity); when the variance is very unequal there said to be homoscedasticity. In other words, the homoscedasticity test refers to the equal variance of errors across all levels of the independent variables.

This suggests that errors evenly distributed among the variables. This is apparent when the variance around the regression line is identical for all values of the independent variable. Homoscedasticity can be checked by visual examination of a plot of the standardized residuals by the regression standardized predicted value. As seen in the below figure, though the residuals are scattered we can say that there is consistency since the residuals are not that far apart.

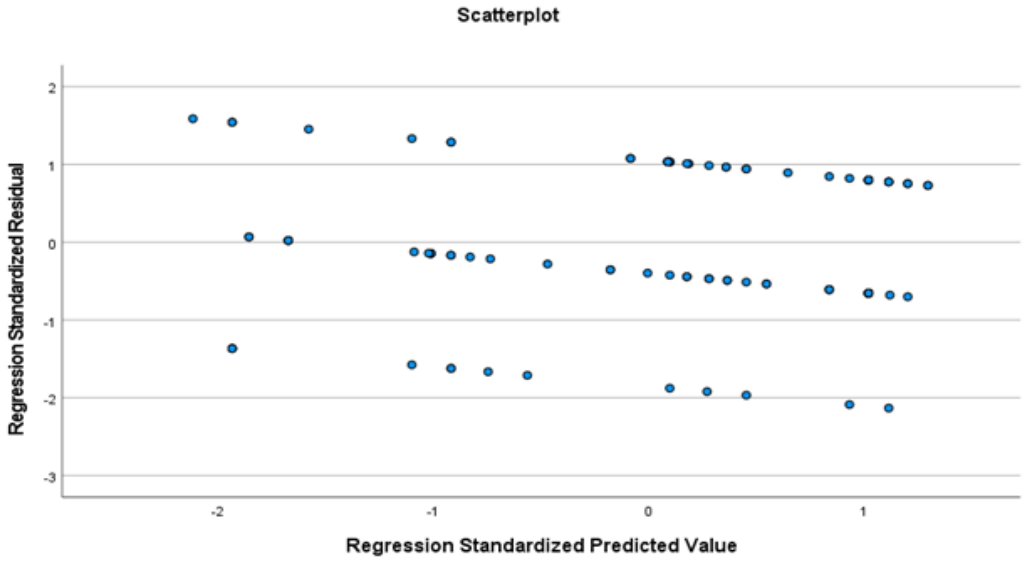

Figure 3Scatter Plot

Source: (Own Survey, 2021).

4.6.2 Regression Model

As seen in the table below regression analysis used to express the relationship between the independent and dependent variables. The dependent variable, logistics performance, and the independent variables were product selection, forecasting, supply planning, procurement, Shipment, and receipt.

The ability of independent variables to illuminate the changes independent variables measured by adjusted R-square, which happened to be 78% meaning that other factors not overseen in this research contribute around 22% of the effects on organizational performance.

Table 11. Model summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.879[a]	.773	.780	.227
a. Predictors: (Constant), Deliver Receipt, Forecasting, Product Selection, Supply Planning, Procurement				
b. Dependent Variable: logistics Performance				

Source: (Own Survey, 2021).

As shown in the model summary table (table 4.13), the "R" column represents the value of R, the multiple correlation coefficient. R-value of .879 indicates a very strong correlation between logistics performance and the five independent variables and that shows a good level of prediction.

The "R Square" column denotes the R square value, known as the coefficient of determination, which is the proportion of variance in the dependent variable that explained by the independent variables. As presented in the table above, the R square value of .773 indicates that 77% of the variance in the model predicted using the independent variables explained by the inbound logistics practices (independent variables included in the model). However, the remaining 23% changes in logistics performance in Ethiopian Pharmaceuticals Supply Agency (EPSA) caused by other factors that are not included in the model.

Therefore, the five inbound logistics practices of the Agency (Product selection, Forecasting, Supply Planning, Procurement, Shipment & Receipt practices) are good explanatory variables to predicting the logistics performance of the Agency.

A. ANOVA Model Fit

The F-ratio in the ANOVA table below tests whether the overall regression model has been a good fit for the data. To be statistically significant, the value of Sig. is less than 5% ($P < 0.05$). The outputs produced by the SPSS software program presented in table below:

Table 12. ANOVA Results

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	59.754	5	11.958	99.64	.000[b]
	Residual	13.548	89	.147		
	Total	73.302	94			
a. Dependent Variable: Logistics Performance						
b. Predictors: (Constant), Shipment & Receipt, Forecasting, Product Selection, Supply Planning, Procurement						

Source: (Own Survey, 2021).

The table shows that Sig. value 0.05 is greater than the calculated sig. value of 0.000. This shows that statistically significant relationships exist between the two variables. In other words, this indicates that the independent variables statistically significantly predict the dependent variable. F = 99.64, calculated sig. value of 0.000 < sig. value 0.05 ($p<0.001$). Therefore, the regression model is a good fit for the data at a 5 percent level of significance.

4.6.3 Regression Coefficient

Table 13. Coefficients of inbound logistics practices

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.136	.102		-.667	.523
	Product Selection	.211	.001	.178	2.219	.039
	Forecasting	.249	.002	.216	2.500	.021
	Supply Planning	.107	.071	.219	3.215	.012
	Procurement	.268	.089	.233	2.765	.027
	Shipment & Receipt	.256	.073	.106	3.278	.023

Source: (Own Survey, 2021).

Standardized Coefficient (Beta)

The standardized coefficients are useful to know which of the different independent variables is more important. It's used in the comparison of the impact of any independent variable on the dependent variable. As indicated in the regression coefficients table, medical device procurement practice had the highest standardized coefficient (0.233) followed by supply planning practice (0.219). This explains that procurement practice has a higher relative effect on logistics performance. Forecasting, product selection, and shipment/receipt practice ranked three to five respectively in their relative importance on the logistics performance.

It is realized from the regression coefficient table, the predictor variables of product selection, forecasting, supply planning, procurement, shipment, and receipt practices of the agency are statistically significant in predicting the logistics performance of the Agency. This is because of all their sig. values (p-values) are less than the alpha level of 0.05.

Unstandardized beta coefficient

The unstandardized coefficients (X1 up to X4) are coefficients of the assessed regression model. Hence, together with the error term (ε), the model for logistics performance can written as;

$y = \beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 + \varepsilon$,

Where; y = logistics performance

β0 = Constant factor

X1 = Product selection β1 = Coefficient of product selection

X2 = Forecasting β2 = Coefficient of Forecasting

X3 = Supply planning β3 = Coefficient of Supply planning

X4 = Procurement β4= Coefficient of Procurement

X5 = Shipment & Receipt β5= Coefficient of Shipment & Receipt

ε= Error term

Y = -0.136 + 0.211X1 + 0.249 X2 + 0.107X3 + 0.268X + 0.256X5 + ϵ

From the above model formula, the constant value (β0 = -0.136) implies that the logistics performance of the Ethiopian Pharmaceuticals Supply Agency would be -0.136 if other variables of the model were zero.

Similarly, a beta coefficient (β) of 0.211 indicates that a unit change in product selection practice leads to a change in the logistics performance of Ethiopian Pharmaceuticals Supply Agency by 0.211 followed by a beta coefficient of 0.249 shows that a unit change in forecasting practice leads to a change in the logistics performance of the agency by 0.249. Moreover, a beta coefficient of 0.107 indicates that a unit change in supply planning practice leads to a change in the logistics performance of the agency by 0.107. As shown from the above regression model formula, a beta coefficient of 0.268 displays that unit changes in procurement practice lead to a change in the organizational performance of the Agency by 0.268.

Accordingly, a beta coefficient of 0.256 signifies that a unit change in shipment & receipt practice leads to a change in the logistics performance of the Agency by 0.256.

In addition, in the above regression model formula, the error term (є) estimate assumed zero. Regression coefficient results show that all five independent variables are statistically significant in predicting the logistics performance of the Ethiopian Pharmaceuticals Supply Agency. The statistically significant variables are product selection practices, forecasting practice, supply planning practice, procurement practice, and shipment/ receipt practice as evidenced by their P-values ($P<0.05$). This indicates that an increase in these variables increases the logistics performance of the agency. These findings provide significant support for the reliability, transaction efficiency, and literature, which advocates that the variables affect logistics performance in Ethiopian Pharmaceuticals Supply Agency.

4.4.5 Hypothesis Testing

Based on the above regression analysis result the hypothesis of the study is tested and presented As follows:

I. The Effect of Product Selection Practices

Hypothesis 1: Product selection practice has a significant and positive effect on the logistics performance of EPSA.

Based on the above coefficient of regression table (table 4.15), the results in the table show that product selection practice has a beta coefficient (unstandardized β coefficient) of 0.211 and a p-value of 0.039. Holding other explanatory variables constant product selection practices found to have a statistically significant positive effect on the logistics performance of the Ethiopian pharmaceuticals supply agency.

Thus, the study has rejected the null hypothesis and accepted the alternate one (Hypothesis 1) that stated product selection practice has a significant and positive effect on logistics performance.

II. The Effect of Forecasting Practices

Hypothesis 2: Forecasting practice has a significant and positive effect on the logistics performance of EPSA.

Concerning forecasting practice, the statistically significant and positive effect observed between forecasting and logistics performance is as hypothesized. Forecasting practice has a beta coefficient (unstandardized β coefficient) of 0.249 and a p-value of 0.021 (i.e., $p<5\%$).

Therefore, the alternate hypothesis (Hypothesis 2) that stated that forecasting practice has a significant and positive effect on the logistics performance of the agency accepted while rejecting the null hypothesis.

III. The Effect of Supply Planning Practices

Hypothesis 3: Supply-planning and procurement practice has a significant and positive effect on the logistics performance of EPSA.

As it can be realized from the regression coefficient table (table 4.15), supply planning practice has a beta coefficient (unstandardized β coefficient) of 0.107 and a p-value of 0.012. Holding other explanatory variables in the model constant supply planning practice found to have a statistically significant positive effect on the logistics performance of the agency. Therefore, the study has accepted the alternate hypothesis (Hypothesis 3) that stated that supply-planning practice has a significant and positive effect on the organizational performance of the agency while rejecting the null hypothesis. The expected positive coefficient estimates of supply planning practices are consistent with the literature review.

IV. The Effect of Procurement Practices

Based on the above coefficient of regression table (table 4.15), the results in the table show that procurement practice has a beta coefficient (unstandardized β coefficient) of 0.228 and a p-value of 0.017 (i.e., $p<5\%$).

Holding other explanatory variables constant procurement practice found to have a statistically significant positive effect on the logistics performance of the Ethiopian Pharmaceuticals Supply Agency. Thus, the study has rejected the null hypothesis and accepted the alternate one (Hypothesis 3) that stated that procurement practice has a significant and positive effect on organizational performance.

V. The Effect of Shipment and Receipt Practices

Hypothesis 4: Shipment and Receipt practice has a significant and positive effect on the logistics performance of EPSA.

Based on the above coefficient of regression table (table 4.15), the results in the table show that Shipment and Receipt practice has a beta coefficient (unstandardized β coefficient) of 0.216 and a p-value of 0.011 (i.e., $p<5\%$).

Holding other explanatory variables constant Shipment and Receipt practice found to have a statistically significant positive effect on the logistics performance of Ethiopian Pharmaceuticals Supply Agency. Thus, the study has rejected the null hypothesis and accepted the alternate one (Hypothesis 5) that stated that shipment and receipt practice has a significant and positive effect on logistics performance.

4.5 Discussion of the Result

The inspiration behind this investigation is to explain the relation between the practices of inbound activity and logistic performance. Descriptive results revealed that regarding inbound activity, the survey revealed that that product selection (M=3.340 SD=0.98035) was occasionally practicing inbound logistics activity and followed by shipment and receipt practice with a mean (M=3.299 SD=1.08125**)** the mean value of product selection practices is greater than that of the procurement practice. Although more attention given for product selection practices as the overall mean indicates at a moderate extent. The study also brought out that forecasting, supply planning and procurement practice are occasionally practiced (M=2.7 SD=0.97185), (M=2.6872 SD=0.8667) and (M=3.2787 SD=1.162832**)** respectively.

Based on the analysis of the study product selection, forecasting, supply planning, procurement, shipment, and receipt practices have the highest positive and significant impact on organizational performance.

This means the inbound activities of the agency have a significant and positive effect on the logistics performance of the medical device of Ethiopian Pharmaceuticals Supply Agency.

Regarding correlation coefficient result, procurement practice has a statistically significant and a very strong positive relationship with logistics performance with Pearson's correlation coefficient of ($r=0.829$, $p<0.01$) followed by shipment and receipt practice with its Pearson's correlation of ($r=0.804$, $p<0.01$).

Procurement practice consistently claimed to be more effective on the logistics performance of medical device followed by shipment and receipt than the other inbound activities.

The study also demonstrated that forecasting practice has a statistically significant and positive effect on logistics performance with an unstandardized coefficient value of 0.249. Product selection and supply practice have a statistically significant and positive effect on logistics performance with an unstandardized coefficient value of 0.211 and 0.107 respectively. Based on the regression coefficient result, one can conclude that there is a direct influence of inbound practice on the logistics performance of the Ethiopian pharmaceutical supply agency.

Therefore, the study accepted all the five alternative hypotheses which stated that product selection, forecasting, supply planning, procurement, shipment and receipt practices have positive and significant influence on logistics performance of the agency. These findings are consistent with previous studies showing the significant positive influence of inbound activity on medical device logistics performance. Furthermore, procurement practice consistently claimed to be more effective than the other inbound activities.

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATION

The study intended to investigate the relationship between the medical device inbound practices and logistics performance of the Ethiopian pharmaceuticals supply agency. This chapter presents the summary of key data findings concerning the objectives of the study with conclusions drawn from the findings and makes appropriate recommendations. Accordingly, the conclusions and recommendations drawn focused on addressing the four objectives of the study: which were to determine the status of the inbound logistics practices in the Agency, establish the relationship between inbound logistics practices and organizational performance in the Ethiopian pharmaceuticals supply Agency. Furthermore, this chapter provides limitations and suggestions for future research.

5.1 Summary of Findings

In this study, efforts made to cover the relationships between inbound activities and logistics performance in the Ethiopian Pharmaceuticals Supply Agency (EPSA). The study was also an attempt to determine the statutes of the practices of product selection, forecasting, supply planning, procurement, shipment, and receipt. The study tried to explore important concepts concerning the research objectives in consideration. That included a review of related literature regarding theories of logistics and logistics cycle, logistics management practices and logistics performance, and empirical literature reviews manifesting actual practices. Data for the study obtained through the distribution of questionnaires to a pre-determined sample of employees in the Ethiopian Pharmaceuticals Supply Agency. A hundred questionnaires distributed to respondents and Ninety returned with a response rate of 94%. An overall value of Cronbach's alpha (α =0.8445) was obtained and the overall internal consistency test of research instruments was found in a good and reliable range.

It has discovered that males accounted for 70.2 percent of the respondents, while females accounted for 29.8%. This shows that both men and women were involved in the study.

According to the findings, the majority of respondents (60.6%) had a first-degree level of education, followed by 39.4 percent with a second-degree.

This suggests that the respondents had adequate educational levels to comprehend and react to the study's issues. The study found out the years of service the respondents have directly or indirectly with the logistics and supply management functions in the case agency. According to the results, the majority of respondents (47.9%) had 7 to 10 years of work experience, while (25.5%) had 3 to 6 years of work experience, (16.0%) had above 11 years of work experience, while just (10.6) had less than 3 years. This indicated that the majority of the respondents (47.9%) had worked for more than 7 years, implying that they were in a position to provide reliable information about the report.

The first objective of the study was to determine the status of the inbound logistics practices in the Ethiopian pharmaceuticals Supply Agency. Through the descriptive statistical analysis, an overall mean score computed for each independent variable (inbound logistics practices).

The survey revealed that product selection (M=3.340 SD=0.98035) was occasionally practicing inbound logistics activity and followed by procurement practice with a mean (M=3.2787 SD=1.162832**)**.

The study also brought out that forecasting, supply planning, shipment and receipt practice are occasionally practiced (M=2.7 SD=0.97185), (M=2.6872 SD=0.8667) and (M=3.299 SD=1.08125**)** respectively.

The study explored the relationship between inbound activities and logistics performance in the Ethiopian pharmaceuticals Supply Agency. The Pearson‘s Product Moment Correlation Coefficients were computed and able to obtain results about the relationships between the dependent (logistics performance) and independent variables (inbound logistics practices). The study showed that there is a positive and statistically significant relationship between each independent variable and the dependent variable. Based on the Pearson correlation analysis result, there is a positive and significant correlation between practices of product selection, forecasting, supply planning, procurement, shipment and receipt, and logistics performance of the Agency. The mean and standard deviation values were ($r=0.743$, $p<0.01$), ($r=0.813$, $p<0.01$), ($r=0.752$, $p<0.01$), ($r=0.829$, $p<0.01$), and ($r=0.804$, $p<0.01$) respectively. Thus, the study discovered from Pearson correlation analysis that the relationship between each independent variable and dependent variable is strong according to Evans (1996) magnitude of correlation.

Multiple regression analysis used to determine whether the independent variables were influencing the dependent variable. The model summary of multiple regression analysis revealed that the R square value (R2 = 0.773) demonstrated that 77.3% of the variation in the logistics performance of the Ethiopian pharmaceuticals supply agency can be explained by the inbound logistics practices (independent variables) included in the model. However, the remaining 23.7% changes in logistics performance in the Agency caused by other factors that are not included in the model.

Thus, all the five inbound logistics practices have a statistically significant and positive effect on the logistics performance of the Ethiopian pharmaceuticals supply agency. As shown in the ANOVA model fit test table the F-statistic suggested that all the independent variables (practices of product selection, forecasting, supply planning, procurement, shipment, and receipt) were statistically and significantly predicted the variation in logistics performance of the Agency at 95% confidence level ($F = 99.64$, $p < .001$), because all their p-values are less than alpha level of 0.05.

The findings supported by the literature which all of them outlined as important inbound logistics practices in it. Thus, this shows that the greater extent properly addressed in Ethiopian pharmaceuticals supply agency.

5.2 Conclusion

Based on the findings presented in the former sections, the study has drawn the following conclusions. From the statistical analysis, result regarding the status of inbound logistics practice in Ethiopian Pharmaceuticals Supply Agency the study drew the following conclusions:

- All the practices of product selection, forecasting, supply planning, procurement, shipment, and receipt practiced frequently/ regularly.
- The study concluded that inbound practices contributed to medical device logistics performance of Ethiopian pharmaceuticals supply agency logistics performance largely. Regarding the relationship between inbound logistics practices and logistics performance, the study concluded that there is a positive and significant relationship between inbound practices and the logistics performance of the agency. Further, all inbound practices have a strong relationship with the logistics performance of the Ethiopian Pharmaceuticals Supply Agency. Concerning the predicting power of independent variables, the study concluded that the independent variables (inbound logistics practices) have predicting power on the logistics performance of the Ethiopian Pharmaceuticals Supply Agency. Thus, inbound practices have a statistically significant and positive effect on the logistics performance of the Agency. In addition, all the hypotheses strongly supported and the proposed framework of the study was able to demonstrate a positive and significant relationship between independent and dependent variables. Therefore, notably, this study has provided evidence for the direct effect of inbound practice on logistics performance as advocated by the literature.

5.3 Recommendations

Based on the above findings and conclusions of the study the following recommendations forwarded to the Ethiopian pharmaceuticals supply agency management. The findings of the study showed that the Ethiopian pharmaceuticals supply agency adopted inbound logistics practices regularly. Moreover, the study confirmed that inbound practices had a strong positive relationship with the logistics performance of the agency. Hence, the study recommends that the Ethiopian pharmaceuticals supply agency ought to give priority and enhance the inbound logistics practices.

If the Agency practice inbound activities at a higher level, the Agency can significantly improve its logistics performance from the current position. In addition, the study confirmed that the five inbound logistics activities significantly influence the organizational performance of the Agency.

The study recommends the following to Ethiopian pharmaceuticals supply agency:

- Ensure the availability of affordable quality medical devices through exercising enhanced product selection practice.
- Providing sustainable quality medical devices by implementing enhanced forecasting practice.
- Ensure the availability of affordable quality medical devices through exercising enhanced supply-planning practice.
- Providing affordable quality medical devices through implementing enhanced procurement practice.
- Exercising enhanced shipment, and receipt practice to ensure the availability of affordable quality medical devices.
- Closely work with concerned stakeholders like customs, authority, and banks to prevent a shortage of foreign currency.
- Exert more efforts to collect receivables from customers based on the planning of collecting receivables using different mechanisms including harmonizing diplomacy.
- Apply a quick electronic system to exchange data and create a smooth integration system between working units.

Also, provide management with the summary exchange of information to equip leaders and higher officials with current and comprehensive knowledge about the situation in the agency.

5.4 Areas for Further Study

Although there are notable contributions, regarding the effect of inbound practices on logistics performance as proved from this study, the significance of this study needs to be view and acknowledged in light of its limitation. Thus, there are limitations in this study that left for future investigation and addressed by future studies.

First, the study focused on five inbound logistics practices as stated in the previous sections.

However, the study did not include outbound logistics practices. The scope of the study can be further increased and enriched to include other variables (other logistics practices) under the theoretical framework in future studies that might predict logistics performance holistically in the Ethiopian context. Therefore, it proposes conducting further studies considering several other types of logistics practices.

Second, the study only focused on the inbound logistics practices of the Ethiopian Pharmaceuticals Supply Agency (focused on the Head Office excluding the branches).

Therefore, future research should conducted on a wider scale by considering branches from all over the country.

The sample size can be bigger and broader to increase the representativeness and the results can be more gratifying. Similar studies should conducted on manufacturing firms for comparing the logistics practices between services and manufacturing firms. Therefore, the suggestion for further studies is about dealing with challenges of inbound logistics practices in the Ethiopian Pharmaceuticals Supply Agency with their alleviation/improvement mechanisms.

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ANNEX

Dear Respondents;

This is Sintayehu Silas conducting a study entitled "THE EFFECT OF INBOUND LOGISTICS ON THE LOGISTICS PERFORMANCE OF MEDICAL DEVICES: THE CASE OF ETHIOPIAN PHARMACEUTICAL SUPPLY AGENCY" for the partial fulfillment of master's degree in logistics and supply chain management, school of commerce, Addis Ababa University.

I would like to extend my deep appreciation to your agency and you for your willingness and cooperation in undertaking this valuable study. I request your cooperation to fill and respond truthfully to the questions asked. Your participation is voluntary. All information provided treated as confidential and used strictly for academic purposes only. No one other than the researcher will have access to your responses. Not use your identifiers like name and title. If you have any questions regarding the questionnaire please contact me via **+2519 11 28 41 94 or sintayehujsilas@gmail.com.**

Thank you in advance for your willingness to take part in this study.

Part I: Profile of the respondents

Please indicate your choice by putting check mark (√).

1. Age:
    - Between 21-30yrs
    - Between 31–40yrs
    - Between 41–50yrs
    - Above 51yrs
2. Gender:
    - Male
    - Female
3. Educational qualification:
    - Diploma
    - First degree
    - Master's degree
    - PhD & Above

4. Years of experience:
    - Below 3 years
    - Between 3-6 years
    - Between 7 – 10 years
    - Above 11 year
5. In which directorate are you working currently?
    - Quantification and market-shaping directorate
    - Tender management directorate
    - Contract management directorate
    - Inbound logistics director office
    - If Other, Please Specify_____
6. Job Position:
    - Director-General
    - Deputy director-general
    - Directorate Director
    - Advisor
    - Team leader
    - Officer

Part II: Medical Device Inbound Logistics Practice Assessment

This part of the questionnaire is to gather information on the level of your agreement for assessing medical device inbound activities: the case of the Ethiopian pharmaceutical supply agency. Please indicate (√) your level of agreement to the following statements under each category using the five-level scales given below:

1. Medical Device Product Selection activities						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
1.1	The agency implement has standard guidelines/tools for product selection activity	☐	☐	☐	☐	☐
1.2	The agency participates in competent and skilled health professionals during product selection activities.	☐	☐	☐	☐	☐
1.3	The agency select products in consideration of in-country registered product	☐	☐	☐	☐	☐
1.4	The agency select products with generic standardized technical specification.	☐	☐	☐	☐	☐
1.5	The agency updates the technical specification frequently for the selected product	☐	☐	☐	☐	☐
2. Medical Device Forecasting activities						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
2.1	The agency implement a standard guideline/tools to perform forecasting activities	☐	☐	☐	☐	☐
2.2	The agency participates in competent and skilled health professionals during forecasting activities.	☐	☐	☐	☐	☐
2.3	The agency consider the baseline data during forecasting	☐	☐	☐	☐	☐
2.4	The agency use medical device essence/nature based forecasting procedure/approach.	☐	☐	☐	☐	☐
2.6	The agency has reduced medical device forecasting error	☐	☐	☐	☐	☐

3. **Medical Device Supply Planning activities**						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
3.1	The agency implement has standard guidelines/tools to enhance supply-planning practice.	☐	☐	☐	☐	☐
3.2	The agency has enhanced practice through organizing and analyzing supply plan data requirements	☐	☐	☐	☐	☐
3.3	The agency has enhanced supply-planning practice by reconciling the amount of available funding with total product costs and adjusting.	☐	☐	☐	☐	☐
3.4	The procurement request is following the analysis of supply planning data.	☐	☐	☐	☐	☐
3.5	The agency uses a medical device essence/nature-based supply-planning procedure/approach.	☐	☐	☐	☐	☐
4. **Medical Device Procurement activities**						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
4.1	The agency participates in competent and skilled procurement specialists & health professionals during procurement activities.	☐	☐	☐	☐	☐
4.2	The agency procurement plan adheres to the requirement of the Federal Public Procurement Directive of Ethiopia & shares it with the relevant stakeholders.	☐	☐	☐	☐	☐
4.3	The agency tender type selection method is as per the thresholds indicated in the Federal Public Procurement Directive of Ethiopia.	☐	☐	☐	☐	☐
4.4	The agency has enhanced tender evaluation practice as per the requirement as defined in the bidding document.	☐	☐	☐	☐	☐
4.5	The agency practices organizing the pre-performance conference with suppliers on the contract document before signing.	☐	☐	☐	☐	☐
4.6	The agency has enhanced practice on identifying gaps between planned targets and actual performance to develop countermeasures.	☐	☐	☐	☐	☐

4.7	The agency has enhanced procurement practice on using the central database to record lessons learned and best practices for subsequent procurement.	☐	☐	☐	☐	☐
5. Medical Device Shipment and Receipt activities						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
5.1	The agency has standard guidelines for transportation activities to enhance on-time product delivery.	☐	☐	☐	☐	☐
5.2	The agency use sea transportation for bulk/high volume products & air carrier for low volume products	☐	☐	☐	☐	☐
5.3	The agency has increased practice through on time custom clearance	☐	☐	☐	☐	☐
5.4	The agency deploy required numbers of suitable trucks to deliver product from port to EPSA warehouse	☐	☐	☐	☐	☐
5.5	Prior to receipt the agency inspect the consignment to ensure shipment includes correct products specification, quantities, in good condition (with no damage), in correct packaging and labeling.	☐	☐	☐	☐	☐

Part III: The Effect of Inbound Activities on the Logistics Perfrormnace of Medical Device

This part of the questionnaire is to gather information on the level of your agreement for THE EFFECT OF INBOUND LOGISTICS ON THE LOGISTICS PERFORMANCE OF MEDICAL DEVICES: the case of Ethiopian pharmaceutical supply agency. Please indicate (√) your level of agreement to the following statements under each category using the five-level scales given below:

1. Medical Device Availability Indicators						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
1.1	The agency avail medical device through enhanced product selection practice	☐	☐	☐	☐	☐
1.2	The agency has enhanced forecasting practice to increase the availability of medical device	☐	☐	☐	☐	☐
1.3	The agency avail medical device through enhanced supply planning practice	☐	☐	☐	☐	☐
1.4	The agency has enhanced procurement practice to increase the availability of medical device	☐	☐	☐	☐	☐

1.5	The agency avail medical device through enhanced shipment and receipt practice					
2. Medical Device Affordability Indicators						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
2.1	The agency has enhanced product selection practice by providing affordable medical device	☐	☐	☐	☐	☐
2.2	The agency has enhanced forecasting practice to provide affordable medical device	☐	☐	☐	☐	☐
2.3	The agency has enhanced supply planning practice to provide affordable medical device	☐	☐	☐	☐	☐
2.4	The agency has enhanced procurement practice by providing affordable medical device	☐	☐	☐	☐	☐
2.5	The agency provides affordable medical devices through applying cost-effective way of shipment and receipt activity	☐	☐	☐	☐	☐
3. **Medical Device Quality Indicators**						
5. Strongly Agree 4. Agree 3. Neutral 2. Disagree 1. Strongly Disagree		**5**	**4**	**3**	**2**	**1**
3.1	The agency avail quality medical device through enhanced product selection practice	☐	☐	☐	☐	☐
3.2	The agency has enhanced forecasting practice to provide quality medical device	☐	☐	☐	☐	☐
3.3	The agency avail quality medical device through enhanced supply planning practice	☐	☐	☐	☐	☐
3.4	The agency has enhanced procurement practice to provide quality medical device	☐	☐	☐	☐	☐
3.5	The agency avail quality medical device through enhanced shipment and receipt practice	☐	☐	☐	☐	☐

THANK YOU FOR YOUR KIND COOPERATION!