ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

Department of Logistics and Supply Chain Management

The Effect of Warehouse Management Practices on Distribution Performance: The Case of Ethiopian Pharmaceuticals Supply Service, Addis Ababa

A Thesis submitted to Addis Ababa University School of Commerce for Partial Fulfillment of the Requirements for Degree of Master of Art in Logistics and Supply Chain Management

By Bereket Tezera

Advisor: Zelalem Bayisa (PhD)

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Addis Ababa

Declaration

I declare that this thesis is entitled "The Effect of Warehouse Management Practices on Distribution Performance: The case of Ethiopian Pharmaceutical Supply Service." It is my original work. I have undertaken the research work with the guidance and support of my advisor. This study has never been submitted for any degree or diploma program at any other institution, and all sources of materials used for the thesis have been duly acknowledged.

Bereket Tezera

Signature _____ **Date _____**

Certification

This is to certify that Bereket Tezera carried out the research thesis titled "The Effect of Warehouse Management Practices on Distribution Performance: The case of Ethiopian Pharmaceuticals Supply Service (EPSS)" and submitted it as a partial fulfillment of the requirements for the award of the degree of Master of Arts in Logistics and Supply Chain Management at Addis Ababa University.

Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree of diploma.

Advisor: Zelalem Bayisa (PhD)

_____ _____

Signature Date

Acronyms

- DFM……. (Distribution and Fleet Management)
- EPSS……. (Ethiopian Pharmaceuticals Supply Service)
- JIT ……. (Just-In-Time)
- KPS ……. (Key Performance Indicators)
- NGOs …….(Non-Governmental Organizations)
- PoD ……. (Proof of Delivery)
- RFID……. (Radio Frequency Identification)
- SDP ……. (Service Delivery Point)
- SOPs ……. (Standard Operating Procedures)
- STV……. (Stock Transfer Voucher)
- USAID……. (United States Agency for International Development)
- WHO ……. (World Health Organization)
- WIM ……. (Warehouse and Inventory Management)
- WMS ……. (Warehouse Management System)

Addis Ababa University School of Commerce

Department of Logistics and Supply Chain Management

This is to certify that the thesis prepared by BEREKET TEZERA, entitled: "**The Effect of Warehouse Management Practices on Distribution Performance: The case of Ethiopian Pharmaceuticals Supply Service (EPSS)"** and submitted in partial fulfillment of the requirements for Master of Arts degree in Logistics and Supply Chain Management at Addis Ababa University.

It also demonstrates that the thesis complies with all university regulations and standards.

Signed by the Examining Committee:

External Examiner_____ Signature _____Date _____

Internal Examiner_____ Signature _____ Date _____

Advisor_____ Signature _____ Date _____

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Abstract

The main objective of this study was to examine the effect of warehouse management practices on distribution performance at the Ethiopian Pharmaceutical Supply Service. Despite the critical role of effective warehouse management in ensuring timely and accurate distribution of pharmaceutical products, there is a lack of comprehensive research examining the specific relationship between warehouse management practices and distribution performance in the context of EPSS. The study employed both a quantitative research approach and an explanatory research design. A census was utilized to collect information on warehouse management practices and distribution performance from all staff members directly involved in warehouse management activities, including officers, warehouse managers, team leaders, technical advisers, and directors. Out of 110 distributed questionnaires, 106 valid responses were obtained, resulting in a 96% response rate. Descriptive and inferential statistical tools, such as mean, standard deviation, percentage, ,and multiple regression analyses, were employed to analyze the collected data using IBM SPSS Statistics version 27.The regression model summary demonstrated, which included five warehouse activities (Receiving Activity, Put-away Activity, Loading Activity, Picking Activity, and Dispatch Activity) as predictors, significantly explained the variance in distribution performance. The study identified receiving activity and dispatching activity as significant predictors of distribution performance, with receiving activity exerting a stronger influence. Given the interdependencies among various warehouse management practices, it is recommended that the organization enhance its practices in receiving, put-away, loading, order picking, and dispatch to ensure effective inventory management and warehouse performance for pharmaceuticals. The study suggested that the organization should improve its warehouse management practices (receiving, put-away, storage, order picking, and dispatch) to optimize distribution performance.

Keywords: *Warehouse Management Practices, Receiving, Put-away, Loading, order picking, and dispatch), Distribution Performance.*

CHAPTER ONE

1. INTRODUCTION

The efficient management of warehouses plays a crucial role in the distribution of pharmaceutical products, ensuring timely delivery, accurate order fulfillment, and overall customer satisfaction. In the context of the Ethiopian Pharmaceuticals Supply Service (EPSS), effective warehouse management practices are vital for optimizing the distribution performance and ensuring the availability of pharmaceutical products throughout the country. However, the specific relationship between warehouse management and distribution performance within EPSS remains relatively unexplored.

1.1 Background of the Study

Effective warehouse management practices are crucial for achieving efficient distribution performance. According to Chopra and Meindl (2007), Warehouses act as intermediaries between suppliers and customers, and their management directly affects the flow of products, information, and funds through the supply chain. Warehouse operations can significantly impact key distribution performance indicators such as order cycle time, order accuracy, on-time delivery, and overall customer satisfaction.

A well-designed warehouse layout optimizes storage capacity, minimizes travel distances, and streamlines the order fulfillment process. Merging and Chiu (1995) emphasize the importance of an efficient warehouse layout, stating that the layout of a warehouse significantly affects distribution performance by influencing material handling costs, order picking time, and overall productivity.

Effective inventory management within the warehouse is critical for maintaining adequate stock levels while minimizing carrying costs. Poor inventory management practices can lead to stock outs, excess inventory, and increased order cycle time. According to Lambert et al. (1998), Effective inventory management practices, such as accurate demand forecasting, safety stock optimization, and efficient replenishment strategies, positively impact distribution performance by ensuring product availability and reducing stock-related costs.

A warehouse management system (WMS) is principally designed to oversee the movement and storage of items within a warehouse, as well as to manage related processes such as shipping, receiving, put-away, and picking (Ramaa et al., 2012).

Efficient order processing and fulfillment are key drivers of distribution performance. Warehouse management practices that prioritize order accuracy, timely picking, packing, and shipping can significantly impact customer satisfaction and loyalty. By employing advanced picking strategies (e.g., batch picking, zone picking) and real-time order tracking systems, warehouses can improve order cycle times and minimize errors. In the words of Coyle et al. (2017), Effective order processing and fulfillment practices ensure the right products are delivered to the right customers at the right time, positively impacting distribution performance.

Order picking involves the retrieval of items from their storage locations, a process that can be carried out manually or semi-automatically. These items may then be transferred sequentially to grouping or sorting areas (Rouwenhorst et al., 2000).

The competence and training of warehouse personnel play a significant role in distribution performance. Well-trained staff can efficiently handle orders, optimize storage utilization, and minimize errors. Effective workforce management practices, such as proper staffing levels, performance incentives, and training programs, contribute to improved distribution performance. As highlighted by Bowersox et al. (2013), a skilled and motivated workforce positively impacts distribution performance by increasing productivity, reducing order processing time, and improving overall operational effectiveness.

Organizations employ a range of performance metrics to evaluate the effect of warehouse management on distribution performance. Key performance indicators (KPIs) commonly used in warehouse management include order accuracy rate, order cycle time, inventory turnover, fill rate, and on-time delivery performance. Tracking these metrics enables organizations to identify areas for improvement, set performance targets, and monitor the effectiveness of warehouse management practices. As noted by van den Berg and Zijm (1999), Performance measurement is essential in warehouse management to evaluate the impact of process changes, identify bottlenecks, and drive continuous improvement efforts.

The need to improve the smoothness of distribution of products was highlighted, particularly in relation to maintaining pallet condition and addressing problems in the distribution of goods. An effective warehouse management system is crucial for improving management in warehouses and ensuring efficient processes from receiving to delivery. (Nyanumba, R. M., & Ndeto, K. (2021).

The study (Abushaikha, Ismail, Salhieh, Loay and Towers, Neil ORCID: (2018) showed that warehouse waste reduction level has a significant positive impact on warehouse operational performance and distribution performance. The findings also suggested that firms with high levels of warehouse operational performance achieved high levels of distribution and business performance.

The Ethiopian Pharmaceuticals Supply Service (EPSS) is essential in ensuring the availability and distribution of pharmaceutical products across Ethiopia. As the demand for healthcare services and medications continues to grow, EPSS faces the challenge of efficiently managing its warehouses to meet the increasing needs of healthcare facilities throughout the country.

1.2 Statement of the Problem

A study conducted in the e-commerce sector revealed that effective warehouse management practices, including accurate inventory control, efficient layout design, optimized storage techniques, and streamlined order picking processes, positively influenced distribution performance indicators such as order fulfillment time, order accuracy, and customer satisfaction (Li, & Zhang, 2017).

A warehouse for health commodities is considerably more than just a structure with storage capacity. It must be built to efficiently receive, store, and arrange goods as well as to distribute life-saving supplies in an expedient manner. For products heading to service delivery points (SDPs), this calls for sufficient work space, shipping/receiving docks, and storage of the commodities in suitable circumstances (USAID/Deliver, 2014).

Warehouses are encountering growing demands related to cost, productivity, and customer service, making them crucial for the success of many companies. Concurrently, warehouse processes are becoming more intricate due to advancements such as value-added services, e-

commerce, and the expansion of warehouses. As a result, the planning and management of warehouse processes have become increasingly challenging (Faber, 2015a).

The study conducted states that inventory management has a positive and significant influence on distribution performance. Practices such as vendor managed inventory, bar-coding, and electronic point of sale were found to impact distribution performance. Implementing these inventory management practices can lead to improvements in distribution performance (Nyanumba, & Ndeto, 2021).

The study emphasizes the importance of efficient warehouse management in enhancing distribution performance. They argue that effective warehouse management practices, including proper layout design, accurate inventory control, optimized storage techniques, and efficient order picking strategies, contribute significantly to improved distribution performance outcomes. However, there is limited empirical research examining the specific impact of warehouse management practices on distribution performance in the Ethiopian context (Tadesse and Yismaw 2018).

Practical gap: as indicated by a research conducted on the supply chain practices of the agency, several constraints are observed, encompassing deficient communication, inadequate storage facilities, subpar fleet management practices, insufficient operational machinery, and the handling of pharmaceuticals by untrained drivers (Teketel, 2017).

Inefficient warehouse management practices can significantly influence distribution performance within Ethiopian Pharmaceuticals Supply Service (EPSS). Despite the critical role of effective warehouse management in ensuring timely and accurate distribution of pharmaceutical products, there is a lack of comprehensive research examining the specific relationship between warehouse management practices and distribution performance in the context of EPSS (Fekadu, Beshir, & Tegegne, 2019).

The existing literature primarily focuses on generic principles and best practices of warehouse management, without considering the unique challenges and requirements of pharmaceutical supply chains in Ethiopia. Hence, there arises a necessity to explore and comprehend the impact of warehouse management on distribution performance within EPSS, aiming to pinpoint areas

necessitating enhancement and augment the overall efficiency and efficacy of distribution procedures EPSS (Fekadu, Beshir, & Tegegne, 2019).

Policy Gap: the pharmaceutical supply chain in Ethiopia faces unique challenges. These challenges include limited transportation infrastructure, varying climatic conditions affecting storage requirements, geographic distances, and the need to adhere to strict regulatory guidelines for pharmaceutical storage and handling. These factors further emphasize the importance of effective warehouse management practices tailored to the specific context of EPSS. (USAID Global Health Supply Chain Program, 2021).

This research aims to provide recommendations for optimizing warehouse management practices, enhancing distribution performance, and ultimately improving the efficiency and effectiveness of pharmaceutical distribution in Ethiopia. The insights gained from this study can guide decision-making processes, aid in resource allocation, and contribute to the overall improvement of healthcare service delivery in Ethiopia. (USAID Global Health Supply Chain Program, 2021).

1.3 Objective of the Study

General Objective

To examine the effect of warehouse management on distribution performance in the case of the Ethiopian Pharmaceuticals Supply Service (EPSS).

Specific Objectives

- To determine the effect of receiving activity on distribution performance of EPSS.
- To determine the effect of put away activity on distribution performance of EPSS.
- To determine the effect of picking activity on distribution performance of EPSS.
- To determine the effect of dispatching activity on distribution performance of EPSS.
- To determine the effect of loading process on distribution performance of EPSS.

1.4 Research Questions

To achieve the stated objectives, the study will address the following research questions:

a. How the receiving activity has effect on the distribution performance?

b. To what extent does put away activity affect distribution performance?

c. What is the effect of picking activity on distribution performance?

d. What is the effect of dispatching activity on distribution performance?

e. How does loading process affect distribution performance?

1. 5 Significance of the Study

The significance of this study lies in its practical implications for EPSS. The findings will help EPSS identify areas of improvement in warehouse management practices, such as inventory control, storage procedures, order fulfillment, and logistics. By implementing these recommendations, EPSS can enhance their distribution performance, resulting in enhanced efficiency, reduced costs, and heightened customer satisfaction. Additionally, the study's findings can be applicable to other pharmaceutical supply chain organizations in Ethiopia or similar contexts, thereby contributing to enhanced supply chain performance and cost reduction across the sector.

Furthermore, the study's results will advance the knowledge base on warehouse management and distribution performance in the Ethiopian pharmaceutical industry. This research will fill the research gap and provide valuable data, insights, and recommendations that can guide future research endeavors and aid in evidence-based decision-making for warehouse management and distribution practices.

1.6 Scope of the Study

The study's scope within the Ethiopian Pharmaceuticals Supply Service (EPSS) context concentrated on examining the effect of warehouse management practices on distribution performance within EPSS. The study was specifically considered the following aspects:

EPSS Warehouse Operations: The research was examined the warehouse management practices implemented within EPSS, including Receiving, Put away, order processing, picking, Dispatch and Loading.

Distribution Performance Metrics: The study assessed various distribution performance indicators, such as Vehicle availability, Distribution cost, Average delivery date, and Proof of Delivery. These metrics will serve as the basis for assessing the effect of warehouse management practices on distribution performance within EPSS.

It is important to note that the scope of the study will be limited to EPSS and may not cover the entire pharmaceutical distribution system in Ethiopia. The research will focus on understanding the specific dynamics and practices within EPSS warehouses and their effect on distribution performance. The study period was from May to june 2024.

1.7 Limitations of the Study

The study may face certain limitations, including availability and access to data, potential biases in participant responses, and generalizability of findings to other contexts. However, efforts was be made to minimize these limitations through rigorous data collection and analysis techniques.

1.8 Operational Definition of Key Terms

Warehouse Management: refers to the set of practices and processes employed to efficiently and effectively manage the operations within a warehouse. (Council of Supply Chain Management Professionals (CSCMP).

Receiving: refers to the process of accepting and documenting incoming goods or materials from suppliers or other sources. (International Warehouse Logistics Association (IWLA)

Put away: is an activity of placing a product from receiving area to storage area to track its movement. (Chartered Institute of Logistics and Transport (CILT)

Picking: refers to the process of selecting and gathering the items or products from their respective storage locations within the warehouse. (Material Handling Industry of America (MHIA)

Dispatch: It involves preparing the picked items for shipment and arranging their delivery to the intended customers. (Institute of Logistics and Transport (ILT).

Loading: refers to the process of loading goods or products onto trucks, or other transportation

vehicles for delivery to Health Facilities or other destinations. (International Federation of Freight Forwarders Associations (FIATA).

Distribution Performance: refers to evaluating the overall effectiveness of the distribution process in fulfilling customer requirements and attaining targeted service levels. (Council of Supply Chain Management Professionals (CSCMP)

Vehicle availability: The percentage of delivery vehicles requested and availed based on the distribution schedule. (International Federation of Automotive Logistics (IFALOG)

Distribution cost: Total amount of expense /Total amount items distributed over specified period . (Chartered Institute of Procurement and Supply (CIPS)

Average delivery time: The number of days required between the STVs printed until Proof of Delivery (PoD) is collected at the hub. (Global Logistics and Supply Chain Strategies (GLSCS)

Proof of Delivery: Total Stock Transfer Voucher (STV) received by Health Facilities divided by total issued STV. (International Federation of Freight Forwarders Associations (FIATA)

1.9 Organization of the Study

The research was outlined as follows: Chapter one encompasses background of study, problem statement, Objective, significance, scope, Operational definition and Organization of the study. Chapter two was presented literature review which contains review of theoretical and empirical literatures.

The research methodology was be presented in chapter three containing description of the study area, research approach, research design, population & sampling, data collection techniques and analysis. Then ethical consideration and reference was included.

CHAPTER TWO

2. RELATED LITERATURE REVIEW

2.1 Introduction

This section reviews warehouse management and distribution performance related literatures. It aims to explore and synthesize the existing body of knowledge on the effect of warehouse management on distribution performance. It aims to identify and examine the various dimensions of warehouse management that have been studied in the context of distribution performance. This literature review aims to provide an overview of existing research on warehouse management and its effect on distribution performance. Conceptual Framework included in this section.

2.2 Theoretical Literature Review

Effective warehouse management encompasses a range of practices and strategies aimed at maximizing operational efficiency and customer satisfaction. Key practices include inventory management, order picking and packing, layout optimization, information systems integration, and labor resource planning (Benton, 2014). These practices are believed to contribute significantly to distribution performance by enhancing order accuracy, reducing lead times, minimizing stockouts, and improving overall responsiveness.

Effective warehouse management practices are closely linked to cost efficiency in distribution operations. Efficient utilization of warehouse space, labor, and equipment can significantly reduce operating costs (Bardi, 2013). By implementing practices such as slotting optimization, efficient routing, and labor productivity enhancement techniques, organizations can achieve cost savings, improve resource utilization, and enhance overall supply chain profitability.

The integration of technology within warehouse management processes has a significant impact on distribution performance. Advanced technologies such as warehouse management systems (WMS), barcode scanning, RFID (Radio Frequency Identification), and automation solutions enhance data accuracy, streamline operations, and enable real-time inventory visibility, resulting in improved distribution performance (Cohen & Roussel, 2013).

Effective warehouse management relies on strong collaboration and coordination between various stakeholders within the supply chain. Close coordination with suppliers, transportation providers, and other partners ensures smooth inbound and outbound flows, reduces lead times, and minimizes disruptions in the distribution process (Mangan et al., 2016).

The application of lean principles within warehouse management can lead to significant improvements in distribution performance. Lean practices such as just-in-time (JIT) inventory management, waste reduction, and continuous improvement methodologies (e.g., Kaizen) help eliminate non-value-added activities, optimize resource utilization, and enhance overall efficiency (Liker, 2014). These practices contribute to improved distribution performance through reduced costs, enhanced order cycle times, and increased flexibility.

Effective warehouse management practices contribute to quality control throughout the distribution process. By implementing robust inspection procedures, implementing quality assurance measures, and ensuring proper handling and storage of products, warehouses can reduce product defects, minimize returns, and enhance overall customer satisfaction (Gupta et al., 2019).

Warehouse management plays a crucial role in mitigating risks associated with distribution operations. By implementing appropriate safety measures, ensuring compliance with regulatory requirements and implementing disaster recovery plans, warehouses can minimize the impact of disruptions such as natural disasters, accidents, or supply chain disruptions. Proactive risk management practices contribute to improved distribution performance by minimizing downtime, ensuring business continuity, and safeguarding customer satisfaction (Fernie & Sparks, 2018).

Effective warehouse management involves a commitment to continuous improvement. Through the application of methodologies such as Six Sigma or Lean Six Sigma, warehouses can identify and eliminate process inefficiencies, reduce waste, and optimize operations (Pyzdek & Keller, 2014). Continuous improvement efforts contribute to enhanced distribution performance by streamlining processes, increasing productivity and reducing costs.

Cross-docking and consolidation practices within warehouse management can significantly

improve distribution performance. Cross-docking involves the direct transfer of goods from inbound to outbound transportation without intermediate storage, reducing handling and storage costs, as well as order cycle times (Coyle et al., 2017). Consolidation involves combining smaller shipments into larger ones, optimizing transportation efficiency and reducing transportation costs. Implementation of cross-docking and consolidation strategies enhance order responsiveness, reduce lead times, and improve overall supply chain efficiency.

2.2.1 Receiving

The receiving process is a critical component of warehouse management that directly affects distribution performance. An efficient receiving process ensures the accurate and timely receipt of incoming shipments. It involves verifying the quantity and quality of received goods, inspecting for damages or discrepancies, and updating inventory records (Bardi, 2013). Streamlining the receiving process minimizes delays, reduces errors, and enables faster availability of inventory for order fulfillment, ultimately improving distribution performance.

A well-organized receiving process prioritizes incoming shipments based on factors such as customer demand, order urgency, and production schedules. By establishing receiving priorities, warehouses can minimize delays in processing critical shipments and ensure that high-priority orders are fulfilled promptly (Mangan et al., 2016). This contributes to improved distribution performance by enhancing order fulfillment speed and customer satisfaction.

2.2.2 Put away

The put away process involves the proper placement of received goods into designated storage locations within the warehouse. Efficient space utilization is crucial for optimizing storage capacity and facilitating easy access to inventory (Bowersox et al., 2013). By organizing the put away process to maximize space utilization, warehouses can minimize congestion, reduce travel times, and improve overall operational efficiency. This, in turn, enhances distribution performance by enabling faster order picking and reducing handling costs.

The put away process requires careful consideration of storage allocation strategies. By defining logical and systematic storage locations based on factors such as product characteristics, demand patterns, and picking frequencies, warehouses can streamline inventory retrieval during order

fulfillment (Coyle et al., 2017). Proper storage allocation minimizes search times, reduces picking errors, and improves order accuracy, ultimately enhancing distribution performance.

2.2.3 Picking

The picking process involves retrieving items from their designated storage locations to fulfill customer orders. Efficient order consolidation is crucial for optimizing picking efficiency. By consolidating multiple orders into a single picking trip or batch, warehouses can minimize travel distances and reduce the number of trips required to retrieve items (Coyle et al., 2017). This improves picking productivity, reduces labor costs, and enhances distribution performance through faster order fulfillment.

Proper training and the establishment of standard operating procedures (SOPs) are essential for effective picking processes. Well-trained pickers who understand the warehouse layout, picking techniques, and safety protocols can perform their tasks more efficiently (Bardi, 2013). SOPs ensure consistency in picking operations, minimize errors, and enable smooth coordination between pickers and other warehouse functions. By investing in training and SOP development, warehouses can improve picking accuracy, reduce order discrepancies, and enhance distribution performance.

2.2.4 Dispatch

The dispatch process starts with order verification, where the accuracy and completeness of picked orders are confirmed before they are dispatched. This step involves checking the picked items against the corresponding customer orders and ensuring that all required items are included (Coyle et al., 2017). Order verification minimizes the risk of shipping errors, reduces returns or exchanges, and improves distribution performance by enhancing order accuracy and customer satisfaction.

Following the order picking process, items designated for a specific order must be consolidated and prepared for shipment. This may include additional value-added tasks such as labeling, tagging, assembly, testing, and packing into cartons. In cases where production postponement is implemented, these activities can be quite extensive (Rushton et al., 2022).

2.2.5 Loading

The loading process begins with careful planning of the loading sequence. This involves determining the order in which shipments are loaded onto trucks or other transportation vehicles. An optimized loading sequence considers factors such as delivery routes, delivery schedules, and shipment characteristics (Coyle et al., 2017). By planning the loading sequence effectively, warehouses can minimize loading time, streamline the loading process, and improve distribution performance by ensuring efficient and timely deliveries.

Techniques such as cross-docking, palletization, and containerization are commonly employed to streamline the loading process and maximize space utilization (De Koster et al., 2007).

2.3 Empirical Literature Review

In a study by Kamau et al. (2019), which examined warehouse management practices in Africa, it was found that efficient inventory management, proper storage layout design, and the utilization of technology were critical factors in improving distribution performance. The study emphasized the importance of adopting best practices tailored to the local context to overcome challenges unique to the African environment.

A study by Ahiadorme and Amoako (2019) examined warehouse management practices in Africa, highlighting the significance of factors such as efficient inventory management, proper storage layout design, and the use of technology. The study emphasized the need for tailored warehouse management practices to address the specific challenges faced by African organizations, including EPSS.

The pharmaceutical supply chain management in Africa is a topic of interest in recent research. In a study by Othman et al. (2020), challenges and opportunities in pharmaceutical supply chain management in Africa were explored. The research highlighted issues such as inadequate infrastructure, poor cold chain management, and supply chain visibility. Effective warehouse management practices were identified as critical for addressing these challenges and improving distribution performance.

The utilization of technology in warehouse management has gained attention in the African

context. A study by Njihia et al. (2021) explored the role of technology, such as warehouse management systems and automation, in improving warehouse operations and distribution performance in Africa. The study emphasized the potential of technology adoption to enhance efficiency and accuracy in inventory management and order processing.

2.3.1 Pharmaceutical Supply Chain in Ethiopia

The pharmaceutical supply chain in Ethiopia has received attention in recent studies. A research by Tadese et al. (2020) explored the challenges and opportunities of pharmaceutical supply chain management in Ethiopia. The study identified factors such as weak infrastructure, poor storage facilities, and inadequate supply chain management practices as hindrances to effective distribution performance. It stressed the need for improved warehouse management strategies to enhance the overall pharmaceutical supply chain.

Assessing supply chain performance is crucial for monitoring and improving the pharmaceutical supply chain in Ethiopia. Key performance indicators (KPIs) such as order fulfillment rate, stockout rate, lead time, and inventory turnover can provide insights into the effectiveness and efficiency of the supply chain (Berhanu et al., 2018). Evaluating these metrics can help identify areas for improvement and guide decision-making to optimize the supply chain operations.

Collaboration and partnerships between government agencies, NGOs, international organizations, and private sector entities play a crucial role in improving the pharmaceutical supply chain in Ethiopia. For instance, partnerships between the Ethiopian Ministry of Health and organizations such as the United States Agency for International Development (USAID) and the World Health Organization (WHO) have focused on capacity building, training programs, and technology implementation (Tadesse et al., 2018). These collaborations have contributed to improved supply chain performance and increased access to quality medicines.

Effective information systems and data management are essential for optimizing the pharmaceutical supply chain in Ethiopia. Implementing robust information systems can enable real-time tracking of inventory, facilitate demand forecasting, and support decision-making processes (Dessie et al., 2020). Data management practices that ensure data accuracy, integrity, and accessibility are crucial for monitoring supply chain performance, identifying bottlenecks,

and making informed decisions for improved efficiency.

2.3.1.1 Warehouse Management practices on Distribution Performance in Ethiopia

Although limited, there are studies that have examined the relationship between warehouse management and distribution performance in Ethiopia. A study by Cheru et al. (2018) investigated the impact of warehouse management practices on healthcare supply chain performance in Ethiopia. The findings highlighted the significant role of efficient warehouse management in improving distribution performance indicators, including order fulfillment accuracy and on-time delivery.

Warehouse management systems (WMS) are essential tools for enhancing warehouse operations and distribution performance. A study by Gebremariam et al. (2020) investigated the adoption and impact of WMS in the Ethiopian context. The research emphasized the positive influence of WMS on inventory accuracy, order processing time, and overall distribution performance.

Applying lean principles in warehouse management can lead to improved efficiency and distribution performance. A study by Yismaw and Adamu (2019) explored the application of lean principles in Ethiopian pharmaceutical supply chain management. The research highlighted the potential benefits of lean practices, such as waste reduction, improved order fulfillment, and enhanced customer satisfaction.

Measuring performance is essential for evaluating and improving warehouse management practices. In a study by Abate and Belete (2021), performance measurement frameworks for warehouse management in Ethiopia were examined. The research emphasized the importance of key performance indicators (KPIs) such as order fulfillment accuracy, on-time delivery, and warehouse utilization in assessing and enhancing distribution performance.

On time delivery

On-time delivery is a key performance indicator (KPI) used in distribution operations to measure the percentage of customer orders that are delivered within the promised or expected delivery window. It reflects the ability of a distribution system to fulfill customer orders reliably and meet service level agreements.

Here's a detailed explanation of on-time delivery from a distribution performance perspective, along with a formula for calculation:

Customer Expectations: On-time delivery is crucial for maintaining customer satisfaction and loyalty. Customers expect their orders to arrive when promised, and delays can lead to dissatisfaction, potential loss of business, and damage to the company's reputation.

Supply Chain Efficiency: Achieving high on-time delivery rates requires efficient coordination of various supply chain activities, including order processing, inventory management, picking, packing, loading, and transportation. Any disruptions or inefficiencies in these processes can result in delayed deliveries.

Vehicle availability

Vehicle availability is a key performance indicator (KPI) used in distribution operations to measure the percentage of time that vehicles are available and ready for use in transporting goods. It reflects the efficiency and reliability of a distribution fleet in meeting transportation demands.

Here's a detailed explanation of vehicle availability from a distribution performance perspective, along with a formula for calculation:

Fleet Utilization: Vehicle availability is crucial for maintaining the smooth flow of goods through the distribution network. A high level of vehicle availability ensures that transportation resources are effectively utilized and that customer orders can be delivered on time.

Operational Efficiency: Vehicle availability is closely tied to the efficiency of maintenance, repair, and scheduling processes within a distribution fleet. Effective maintenance planning, timely repairs, and proactive scheduling practices are essential for ensuring that vehicles remain operational and available when needed.

Distribution cost

Distribution cost refers to the expenses incurred in the process of delivering goods from the manufacturer or supplier to the end customer. It encompasses various elements such as

transportation, warehousing, inventory management, order processing, and handling. Understanding distribution costs is crucial for evaluating the efficiency and profitability of a distribution operation.

Here's a detailed explanation of distribution cost from a distribution performance perspective, along with a formula for calculation:

Transportation Costs: These include expenses related to moving goods from the point of origin to distribution centers, warehouses, and ultimately to customers. Transportation costs can include fuel, vehicle maintenance, driver salaries, insurance, and transportation equipment.

Warehousing Costs: Warehousing costs involve expenses associated with storing and managing inventory. This includes rent or mortgage payments for warehouse facilities, utilities, labor costs for warehouse personnel, equipment maintenance, security, and insurance.

Inventory Costs: Inventory costs encompass expenses related to holding and managing inventory. This includes the cost of purchasing and storing inventory, as well as costs associated with inventory carrying, such as storage space, handling, insurance, and obsolescence.

Order Processing Costs: Order processing costs involve expenses associated with receiving, processing, and fulfilling customer orders. This includes labor costs for order processing personnel, order picking and packing, order verification, documentation, and order tracking.

Handling Costs: Handling costs refer to expenses incurred in the handling and movement of goods within distribution facilities. This includes labor costs for handling personnel, equipment maintenance, packaging materials, and other related expenses.

Proof of Delivery

Proof of delivery (POD) is a critical process in distribution operations, providing confirmation that goods have been delivered to the intended recipient. It serves as evidence of successful delivery and is often required for billing, invoicing, and resolving disputes related to shipments.

Here's a detailed explanation of proof of delivery from a distribution performance perspective, along with a formula for calculation:

Confirmation of Receipt: Proof of delivery serves as confirmation that the recipient has received the goods in good condition and in accordance with the terms of the shipment. It typically includes details such as the recipient's signature, date and time of delivery, and any relevant notes or comments regarding the condition of the goods.

Verification of Fulfillment: POD acts as verification that the distribution operation has successfully fulfilled its obligations to deliver the goods to the customer. It provides assurance to both the sender and the recipient that the goods have been delivered as expected and can be used as evidence in case of disputes or discrepancies.

Billing and Invoicing: POD is often required for billing and invoicing purposes, especially in business-to-business transactions. It serves as documentation to support the issuance of invoices and facilitates the reconciliation of accounts receivable and accounts payable.

Dispute Resolution: In the event of disputes or discrepancies regarding a shipment, POD serves as a vital piece of evidence to resolve issues and establish accountability. It provides a record of the delivery process, including the identity of the recipient, the condition of the goods upon delivery, and any special instructions or requirements.

2.4 Research Gap

Despite the importance of warehouse management in the distribution of pharmaceutical products within the Ethiopian Pharmaceuticals Supply Service (EPSS), there is a lack of comprehensive research examining the specific effect of warehouse management practices on distribution performance. Existing literature tends to focus more broadly on supply chain management or specific aspects of warehouse operations, but there is a need for a study that specifically investigates the relationship between warehouse management and distribution performance in the context of EPSS. This research gap highlights the need for a detailed assessment of how effective warehouse management practices can contribute to improving distribution performance within the Ethiopian pharmaceutical supply chain.

2.5 Conceptual Framework

Based on the literature and problem statement provided earlier, distribution performance serves as the dependent variable, while receiving, putting away, order picking, loading, and dispatching act as the independent variables. The graphic below illustrates this relationship visually.

Figure 2.1: Conceptual framework

Source: A modified adoption from (Frazelle, 2002, Hailu K., 2019, Buzu A., 2021)

CHAPTER THREE

3. RESEARCH METHODOLOGY

This section focuses on the various techniques employed in a research undertaking to acquire significant data that aligns with the objectives of the study. The methodology encompasses an overview of the study area, research design, population and sampling, as well as the analysis of the gathered data.

3.1. Description of the Study Area

For this thesis investigation, the focus was on the EPSS head office, especially the Warehouse and Inventory Management (WIM) and Distribution and Fleet Management (DFM) directorates. These two departments play a crucial role in overseeing the outbound logistics operations of Pharmaceuticals. These teams include fleet management, distribution, inventory management, and warehousing Team.

3.2 Research Approach

The study adopted a mixed-methods research design, integrating both quantitative and qualitative approaches with a focus on quantifying and categorizing elements, alongside developing statistical tools and visual aids to depict observations derived from structured questionnaires or techniques.

3.3 Research Design

Descriptive and explanatory study design was used as it ascertains understand the phenomenon, determine its underlying causes, and identify potential solutions to address it. It assesses the cause and effect relationship between variables so that warehouse management activities and their effect on distribution performance will be studied. The study period was from April to Maya 2024.

3.4. Population and Sampling

3.4.1 Target Population

Target population was encompassing a diverse range of individuals engaged in various roles

within the warehousing team, inventory management team, distribution team, and fleet management team. This includes officers, team leaders, technical advisers and directors. From both WIM and DFM directorate a total number of 110 participants targeted for the study area.

Because of the limited size of the target population (110) within the study area, a **census** was employed in this study to ensure comprehensive and relevant information gathering.

3.4.2 Study Variables

Dependent Variable

- Distribution performance

Independent Variables

- Receiving
- Put away
- Picking
- Dispatch
- Loading

3.5. Source of Data

3.5.1. Primary Source

Primary data was collected from the warehouse, inventory management, distribution, and fleet management team. Using structured questionnaires that have closed-ended questions and open-ended questions.

3.5.2. Secondary Source

Standard operating procedures (SOPs), reports, and any other documents encountered by the researcher during data collection that are deemed valuable for enhancing the research was used as secondary sources of data in this study.

3.6. Data collection Procedures

To meet the given study aims, a clear research instrument was developed. Before commencing the data gathering process, the selected participants were contacted to obtain their consent. Each respondent were receiving the prepared, self-administered structured questionnaire after participant willingness has been confirmed. After a designated period, questionnaires were collected, and participants were acknowledged for their participation and their time. Additionally, a study of documents was conducted in order to obtain information regarding the effect of warehouse management on distribution performance. Before concluding, the investigator expressed gratitude to each respondent for their cooperation.

3.7. Data Analysis

Data analysis encompasses a variety of decisions and distinct procedures, some of which may be tailored to a specific research subject. It involves multiple tasks that may necessitate employing diverse statistical methods depending on the context. Initially, the collected data was assessed to ensure accuracy, consistency, and completeness. All the datas collected from respondents were analysed using SPSS (Statistical Package for Social Science) version 27. The study's findings were presented using certain approaches, including frequency distribution, mean, standard deviation, correlation, and regression.

3.8. Validity and Reliability

3.8.1 Validity

To verify the validity of the questionnaires, a sample of respondents were used to pilot test the data collection instruments. Readability, ambiguity, validity, and clarity of the statements and questions were all tested.

3.8.2 Reliability

Cronbach's test was conducted to assess the reliability of the instrument. Reliability refers to the consistency observed in repeated measurements of a particular phenomenon. Internal consistency pertains to the degree to which all items on a scale measure different facet of the same attribute. Cronbach's alpha is a widely used statistical measure that assesses the internal consistency or reliability of a set of items or variables within a scale or instrument. The value of Cronbach's alpha can range from 0 to 1, with higher values indicating stronger internal consistency. (Deniz and Alsaffar, 2013).

Table 3.1 Reliability test

Variables	**Number of items**	**Cronbach's Alpha**
Receiving Activity	11	0.954
Put away Activity	7	0.953
Loading Activity	6	0.953
Picking Activity	8	0.954
Dispatch Activity	6	0.953
Distribution performance	8	0.953
Total	**46**	**0.955**

Source: SPSS own survey (2024)

As the table showed below all the variables had cronbach’s alpha number greater than 0.70 which stated that all the variables are internally consistent and sufficiently reliable.

3.9. Ethical Consideration

Before beginning data collection, AAU SOC was formally obtained permission from the organization (EPSS) to conduct the study. Before enrolling individuals as respondents in the study, their consent was obtained prior to providing them with the research instrument. During data collection, interviewers briefed participants on the study's purpose, scope, and expected outcomes. All participant data was handled confidentially and ethically, ensuring that each individual's original concerns were accurately represented.

CHAPTER FOUR

4. DATA ANALYSIS, RESULTS AND DISCUSSION

The study's objectives, as outlined in the initial section, are followed by the data analysis conducted in this chapter, along with the findings derived from it and presented in the subsequent section. The warehouse team, inventory management team, distribution team, and fleet management team of the organization provided all of the data.

Prior to converting the data into a numerical format, data coding was conducted to represent each item and variable contained in the collected information. Following the completion of data coding with the aid of SPSS Version 27, graphs, tables, frequency distributions, and percentages were utilized to investigate, evaluate, and present the findings.

The Socio-demographic Data of Respondents is shown in the first portion of the survey, the second portion assesses the EPSS's warehouse management practices, and the final section examines the correlation and regression among independent and dependent variables. The data obtained was analyzed using the Statistical Package for the Social Sciences (SPSS Version 27).

4.1 Response Rate of the Study

The response rate refers to the ratio of valid responses received to all eligible respondents within the target demographic. The study revealed that 106 out of 110 completed and returned questionnaires were received, resulting in a response rate of 96%, with four (4%) remaining outstanding. With a response rate of 80% or higher, it is generally acceptable for researchers to consider their sample representative of the target population (Fincham, 2008). Hence, the receipt of 106 questionnaires was deemed satisfactory as it surpassed the typical threshold for response rates.

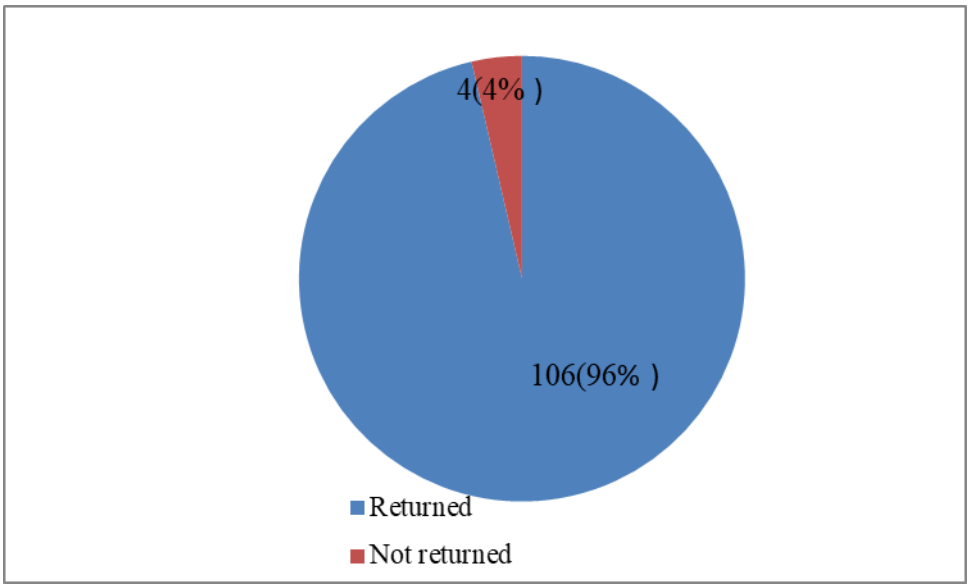

Figure 4.1: a response rate of the study

4.2 Socio-demographic characteristics of the respondents

Participants were requested to fill in their socio-demographic information including Gender, Age, Educational Qualification, Year of Experience, Working Directorate, and job position, and correspondingly the result is depicted here in the Table below.

Table 4.1 Socio demographic features

Socio-demographic Features	Sub division	Frequency	Percent (%)
Gender	Male	85	80.2
	Female	21	19.8
Age	Less than 25	30	28.3
	26-36 Years	33	31.1
	37-47 Years	37	34.9
	Above 47 Years	6	5.7

Educational Qualification			
	Diploma	15	14.2
	Degree	54	50.9
	Masters	37	34.9
	PHD	-	-
Year of Experience	Below 3 Years	46	43.4
	3-6 Years	16	15.1
	7-10 Years	8	7.5
	Above 10 Years	36	34.0
Working Directorate	Warehouse & Inventory Management	85	80.2
	Distribution and fleet management	21	19.8
Job Position	Director	2	1.9
	Advisor	13	12.3
	Team Leader	6	5.7
	Officer	67	63.2
	Warehouse Manager	18	17.0

Source: SPSS own Survey (2024)

As indicated in the table above, the study involved participation from both male and female respondents, comprising 80.2% and 19.8% of the total responses, respectively. Observing that men contributed to a larger proportion of responses, the researcher inferred that there were more male employees in the company compared to female employees.

A total of 37 (34.9%) of the replies were categorized by age group between the ages of 37 and 47, 33 (31.1%) were categorized by age group between the ages of 26 and 36, and 28 (30%)

were categorized by agegroup less than 25. Also, 6 (5.7 %) of the replies were categorized by age group 47. The results so show that middle aged staff made up most of the respondents.

While the questionnaire inquired about educational attainment up to the Ph.D. level, none of the respondents in this study reported holding a Ph.D. Nevertheless, the majority of responses, comprising 54 (50.9%) individuals, were from participants with a Degree, indicating their predominant presence in the sample. Additionally, 37 (34.9%) respondents held a Master's degree, while 15 (14.2%) had obtained a Diploma. This distribution suggests that all survey respondents possessed the requisite knowledge to understand and adequately respond to the questionnaire.

The majority of respondents in the study possessed working experience, with those having less than three years of experience comprising the largest group, accounting for 46 (43.4%) of the responses. This was followed by individuals with over ten years of experience, constituting 36 (34%) of the responses, and those with three to six years of experience, representing 16 (15.1%) of the respondents. Individuals with seven to ten years of experience made up the smallest group, comprising 8 (7.5%) of the responses. These findings suggest that a significant portion of the organization's personnel have relatively limited working experience. However, despite their shorter tenure, they appear to be motivated to work.

4.3 Descriptive Analysis

4.3.1. Descriptive statistics of warehouse management Practice

First, warehouse management practices at Ethiopian Pharmaceutical Supply Service were assessed to realize the effect of warehouse management practices on distribution performance. To gain insight into the organization's current warehouse management practices, respondents were questioned about five key components: receiving, put-away, order picking, dispatching, and loading.

The five-point Likert scale was used by respondents to consider the current state of warehouse management practices: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = highly agree. The warehouse management practices of the organization were examined using measures such as means and standard deviations. The mean represents the total of all individual averages within a specific distribution of responses. Means are interpreted as follows: 4.5–5 =

always practiced, 3.5–4.49 = very often practiced, 2.5–3.49 = occasionally practiced, 1.5–2.49 = rarely practiced, and 1–1.8 = never practiced. (Mohammedzen essa, 2021).

The standard deviation serves as a metric of dispersion, portraying the proximity or divergence of each respondent's opinions from the distribution mean. A low standard deviation signifies homogeneity in the data, indicating a high degree of similarity among respondents' viewpoints. Conversely, a high standard deviation indicates a broader range of perspectives from the distribution mean, reflecting diversity among respondents' viewpoints.

4.3.1.1 Receiving Activity

The study sought to investigate the receiving activity within the Ethiopian pharmaceutical supply service, and its findings are detailed in the table presented below.

Table 4.2 Descriptive Statistics of Receiving Activity

Receiving Activity	**N Statistic**	**Mean Statistic**	**Statistic Std. Deviation**
The receiving process in EPSS is well-documented and standardized to ensure efficient handling of incoming products.	106	4.08	0.829
EPSS receive clear and detailed information about expected deliveries in advance, allowing for proper planning and preparation.	106	3.73	0.655
The EPSS possesses adequate equipment for unloading materials.	106	3.44	0.957
The EPSS has sufficient space for loading/unloading materials.	106	3.32	0.911
The necessary documents and paperwork are readily available and organized upon arrival of received items.	106	3.87	0.705
The warehouse shelves allocated for each received material are sufficient for storage and putting away.	106	3.63	0.898

In EPSS warehouses, there is a distinct and well-defined receiving area	106	3.29	1.032
All members of the receiving team are well-trained in the receiving procedures.	106	3.45	1.061
There is advance notification regarding incoming goods to be received at the warehouses in EPSS	106	3.78	0.851
During the time of receiving goods, there are procedures for the cross-checking of the documents with the goods	106	3.84	0.977

Grand mean is 3.643

Source: SPSS own Survey (2024)

As the table above states for receiving activity, there is well-documented and standardized receiving process in EPSS to ensure efficient handling of incoming goods (M=4.08, SD = 0.829). This states that the receiving process in the EPSS is very often practiced as being well-documented and standardized. The mean score of 4.08 indicates this activity is consistently carried out to a high degree across the organization. This allows for the efficient and streamlined handling of incoming products at the EPSS warehouses.

EPSS receive clear and detailed information about expected deliveries in advance, allowing for proper planning and preparation (Mean: 3.73, SD: 0.655). It's clear from the analysis that The EPSS very often receives clear and detailed information about expected deliveries in advance, as indicated by the mean score of 3.73. This advanced notice enables the warehouse teams to properly plan and prepare for the receipt of these incoming goods.

The EPSS possesses adequate equipment for unloading materials (Mean: 3.44, SD: 0.957).This states that the EPSS the available equipment for unloading tasks is moderately adequate, rather than consistently sufficient across the organization, as shown by the mean score of 3.44. This indicates a moderate level of adequacy in the available equipment for unloading tasks.

The EPSS has sufficient space for loading/unloading materials (Mean: 3.32, SD: 0.911). It is

clear from this analysis that the available space for loading/unloading materials is moderately adequate, rather than consistently sufficient across the organization, as indicated by the mean score of 3.32. This reveals a moderate level of adequacy in the available space for these receiving activities.

The necessary documents and paperwork are readily available and organized upon arrival of received items (Mean: 3.87, SD: 0.705). This states the necessary documents and paperwork are very often readily available and organized when received items arrive at the EPSS warehouses. The mean score of 3.87 indicates there is a consistent practice. This supports the efficient processing of incoming goods.

The warehouse shelves allocated for each received material are sufficient for storage and putting away (Mean: 3.63, SD: 0.898).This states that shelving space in the EPSS warehouses is very often adequate for storing and putting away received materials, as indicated by the mean score of 3.63.

In EPSS warehouses, there is a distinct and well-defined receiving area (Mean: 3.29, SD: 1.032). It's clear from the analysis the EPSS warehouses have a somewhat inconsistent or occasional presence of a clearly defined and separated receiving area. A mean score of 3.29 on a scale where 5 represents the highest level of adherence indicates that the majority of the respondents or observations perceive the receiving area to be clearly defined and separated only some of the time, rather than consistently or always.

All members of the receiving team are well-trained in the receiving procedures (Mean: 3.45, SD: 1.061). This states that the members of the receiving team are generally well-trained in the receiving procedures at the EPSS warehouses. A mean score of 3.45 on a scale where 5 represents the highest level of training indicates that the majority of the respondents or observations consider the receiving team members to be adequately trained, though not necessarily at the highest level.

During the time of receiving goods, there are procedures for the cross-checking of the documents with the goods. (Mean: 3.84, SD: 0.977). This states that Procedures for cross-checking the documents with the received goods are very often practiced during the receiving

process at the EPSS, as indicated by the mean score of 3.84 of on a scale where 5 represents the highest level of practice indicates that the majority of the respondents or observations consider these procedures to be consistently followed.

The study on warehouse management practices in Nigeria, conducted by NAFDAC (National Agency for Food and Drug Administration and Control) in 2019 with international collaboration, reveals a similar performance level to the EPSS in Ethiopia. The grand mean for the Nigerian study is approximately **3.6**, which is very similar to the EPSS grand mean of **3.643.** Both systems exhibit moderate efficiency in their receiving activities, with common challenges in space, equipment, and training. The findings underscore the importance of improving these areas to enhance overall warehouse management practices in both countries.

4.3.1.2 The Put Away Activity

This study was aimed at examining the current status of put-away practice within the Ethiopian pharmaceutical supply service.

Table 4.3 Descriptive Statistics of put away Activity

Put Away Activity	**N Statistic**	**Mean Statistic**	**Std. Deviation Statistic**
Warehouse personnel are skilled to perform put away activities.	106	4.02	0.632
In the warehouse to do the put-away activity there is sufficient equipment.	106	3.64	0.807
When a product is placed in its location, the storage location of the product is properly recorded	106	4.21	0.7
The EPSS warehouse design/layout is convenient to perform put- away activities.	106	3.68	0.89
The design of the warehouse is easy to access items and convenient to load and unload	106	3.68	0.911
There is an established well-structured put-away process for all items received in EPSS warehouses	106	3.61	0.8

Grand mean is 3.807

Source: SPSS own Survey (2024)

The table also demonstrates warehouse personnel are skilled to perform put-away activities (Mean: 4.02, SD: 0.632). This states that the warehouse personnel at the EPSS are very often skilled in performing the put-away activities, as indicated by the mean score of 4.02 on a scale where 5 represents the highest level of skills indicates that the majority of the respondents or observations consider the warehouse staff to be highly competent in executing put-away tasks.

In the warehouse to do the put-away activity there is sufficient equipment. (Mean: 3.64, SD: 0.807). This states that the EPSS warehouses very often have sufficient equipment to support the put-away activities, as shown by the mean score of 3.64 on a scale where 5 represents the highest level of equipment sufficiency indicates that the majority of the respondents or observations consider the warehouses to be well-equipped to perform the put-away tasks..

When a product is placed in its location, the storage location of the product is properly recorded (Mean: 4.21, SD: 0.700). It's clear from the analysis that the mean score of 4.21 indicates a high level of adherence to the practice of properly recording the storage location of products when they are placed in the EPSS warehouses as indicated by the mean score of 4.21.

The EPSS warehouse design/layout is convenient to perform put-away activities (Mean: 3.68, SD: 0.890).This states that the design and layout of the EPSS warehouses are generally perceived as convenient for performing put-away activities. A mean score of 3.68 on a scale where 5 represents the highest level of convenience indicates that the majority of the respondents or (observations consider the warehouse design/layout to be quite suitable for put-away practices.

The design of the warehouse is easy to access items and convenient to load and unload (Mean: 3.68, SD: 0.911). This states that the design of the EPSS warehouses is generally perceived as easy to access items and convenient for loading and unloading activities. A mean score of 3.68 on a scale where 5 represents the highest level of ease and convenience indicates that the majority of the respondents or observations consider the warehouse design to be quite suitable for these tasks.

There is an established well-structured put-away process for all items received in EPSS warehouses (Mean: 3.61, SD: 0.800). This states that EPSS has a very often established and well-structured put-away process for all received items. A mean score of 3.61 on a scale where 5 represents the highest level of establishment and structure indicates that the majority of the respondents or observations consider the put-away process to be generally well-defined and consistently implemented across the organization.

The study conducted in South Africa by CSIR (Council for Scientific and Industrial Research) and the Department of Health, supported by WHO and USAID, reveals a slightly higher performance level (Grand mean 3.9) in put away activities compared to the EPSS in Ethiopia. South African warehouses benefit from better infrastructure, more advanced technology, and regular training programs. However, both countries face similar challenges, such as the need for additional equipment and optimized warehouse layouts. Improving these areas could further enhance the efficiency and effectiveness of put-away activities in both regions.

4.3.1.3 Loading Activity

The study sought to assess the current state of loading activity in the EPSS. The results of this inquiry are illustrated in the accompanying table.

Table 4.4 Descriptive Statistics of loading Activity

Loading Activity	**N Statistic**	**Mean Statistic**	**Std. Deviation Statistic**
The loading process in our warehouse is efficiently managed, contributing to overall distribution performance in EPSS.	106	3.83	0.762
There is effective coordination and communication between warehouse managers and the loading team to ensure smooth Operations.	106	3.7	0.938

There are appropriate loading equipment and resources available to support fast and accurate loading of products onto vehicles.	106	3.38	1.073
The loading area designed and organized to facilitate efficient movement, minimize congestion, and ensure safety during loading operations.	106	3.21	1.084
There are established protocols for handling special handling requirements, such as fragile or hazardous products, during the loading process	106	3.19	1.034

Grand mean is 3.462

Source: SPSS own Survey (2024)

The table shows the loading process in our warehouse is efficiently managed, contributing to overall distribution performance in EPSS (Mean: 3.83, SD: 0.762). This states that the loading process is very often efficiently managed at EPSS warehouses, contributing to the overall effectiveness of their distribution operations. The mean of 3.83 indicates this activity is consistently carried out well across the organization.

There is effective coordination and communication between warehouse managers and the loading team to ensure smooth Operations (Mean: 3.70, SD: 0938). This states that there is very often effective coordination and communication between warehouse managers and the loading team at EPSS to ensure smooth loading operations. The mean of 3.70 suggests this collaborative effort is strength for the organization.

There are appropriate loading equipment and resources available to support fast and accurate loading of products onto vehicles (Mean: 3.38, SD: 1.073). It’s clear from the analysis that the available loading equipment and resources at EPSS warehouses are occasionally sufficient to support fast and accurate loading of products onto vehicles. The mean of 3.38 indicates there is room for improvement in this area to fully optimize the loading process.

The loading area designed and organized to facilitate efficient movement, minimize congestion,

and ensure safety during loading operations (Mean: 3.21, SD: 1.084).This states that the loading areas at EPSS warehouses are occasionally designed and organized to facilitate efficient movement, minimize congestion, and ensure safety during loading operations. The mean of 3.21 suggests this is an area that could benefit from further optimization.

There are established protocols for handling special handling requirements, such as fragile or hazardous products, during the loading process. (Mean: 3.19, SD: 1.032). This states that the EPSS occasionally has established protocols for handling special requirements, like fragile or hazardous products, during the loading process. The mean of 3.19 indicates there may be room for improvement in this area to ensure consistent and effective handling of specialized goods.

The EPSS's grand mean of 3.462 for loading activities suggests that the Ethiopian pharmaceutical supply chain may have a stronger focus on managing its loading operations compared to the broader supply chain challenges observed Ghana (Agyepong et al., 2018).

4.3.1.3 Order Picking Activity

The study aimed at examining the Order picking in the Ethiopian pharmaceutical supply service, and accordingly, its results are presented here in the table below.

Table 4.5 Descriptive Statistics of order picking Activity

Picking Activity	N Statistic	Mean Statistic	Std. Deviation Statistic
Warehouse personnel are skillful in performing order Picking process.	106	3.73	0.941
Warehouse design/layout is convenient for an easy order picking process.	106	3.66	0.838
Items returned from the end-user due to an error in order-picking are high.	106	2.71	1.104
EPSS has adequate shelves for the goods in the warehouse to facilitate the order-picking process.	106	3.45	1.114

In EPSS order-picking is performed by gathering the item correctly by requested order.	106	3.88	0.752
The design of the warehouse system is properly done to improve customer service in the order-picking process	106	3.6	0.963
Items are picked from the storage area as exactly mentioned on the picking slip/issue order	106	3.93	0.734

Grand mean is 3.566

Source: SPSS own Survey (2024)

Warehouse personnel are skillful in performing order picking process (Mean: 3.73, SD: 0.941). This mean score of 3.73 falls within the "very often practiced" range, indicating the order picking skills of warehouse personnel are very consistently demonstrated across EPSS. It reveals consistent workforce carrying out the order picking, enables EPSS accurately fulfill customer orders and provide a high level of service.

Warehouse design/layout is convenient for an easy order picking process (Mean: 3.66, SD: 0.838). This states that the warehouse design and layout is also very often conducive to efficient order picking with a mean score of 3.66.

Items returned from the end-user due to an error in order-picking are high (Mean: 2.71, SD: 1.104). This mean of 2.71 falls in the "occasionally practiced" range, indicating there are some issues with picking accuracy leading to a moderate level of returns.

EPSS has adequate shelves for the goods in the warehouse to facilitate the order-picking process (Mean: 3.45, SD: 1.114). This indicates that the availability of adequate shelving to facilitate the order picking process is only occasionally sufficient across the EPSS warehouse network. In other words, there are times or locations where the shelving capacity and organization is not fully optimized to support efficient order picking.

In EPSS order-picking is performed by gathering the item correctly by requested order (Mean:

3.88, SD: 0.752). This mean of 3.88 falls in the "very often practiced" range, indicating order picking accuracy is very consistently maintained. This indicates that order picking accuracy, in terms of gathering the correct items per the customer's request, is being maintained at a very consistent and high level across the EPSS warehouse network.

The design of the warehouse system is properly done to improve customer service in the order-picking process (Mean: 3.6, SD: 0.963). With a mean of 3.6, the warehouse system design is very often optimized to support good customer service in the picking process. This indicates that the warehouse system design at EPSS is very often optimized to support good customer service in the order picking process.

Items are picked from the storage area as exactly mentioned on the picking slip/issue order (Mean: 3.93, SD: 0.734). This mean of 3.93 falls in the "very often practiced" range, demonstrating a high level of accuracy in executing picking instructions. This indicates that warehouse personnel at EPSS are very consistently and accurately picking items from the storage area as specified on the picking slips or issue orders.

The grand mean of 3.566 for picking activities in the EPSS is slightly higher compared to the overall logistics performance reported in the Nigerian study (3.49). This suggests the EPSS may be performing better in picking-related operations compared to the broader logistics activities in the Nigerian pharmaceutical supply chain.

4.3.1.5 Descriptive statistics of Dispatch Activity

The research results are presented in the table below, serving the purpose of investigating the existing practice of dispatch activity within the Ethiopian pharmaceutical supply service.

Table 4.6 Descriptive Statistics of Dispatch Activity

Dispatch Activity	**N Statistic**	**Meaning Statistic**	**Std. Deviation statistics**

The customer orders are packed into the correct-sized boxes or onto a pallet in a manner to prevent damage during transit.	106	3.64	1.007
The pharmaceuticals are properly packed so that it increases vehicle space utilization, facilitate ease of loading and receipt at destination.	106	3.59	1.067
The vehicles are loaded carefully and systematically on a first out/ last in basis to save time when unloading and prevent physical damage	106	3.58	0.827
In warehouse there is high commitment to make easy of shipping and transportation process.	106	3.75	0.84
Communication is successful in making ready the transportation and to inform the recipient	106	3.71	1.032

Grand mean is 3.654

Source: SPSS own Survey (2024)

The table shows the customer orders are packed into the correct-sized boxes or onto a pallet in a manner to prevent damage during transit (Mean: 3.64, SD: 1.007). The mean of 3.64 falls within the "very often practiced" range, indicating that EPSS very consistently packs customer orders into the appropriate sized containers to prevent damage during transit.

The pharmaceuticals are properly packed so that it increases vehicle space utilization, facilitate ease of loading and receipt at destination (Mean: 3.59, SD: 1.06). This states that EPSS very consistently packs products in a way that optimizes vehicle utilization and ease of handling.

The vehicles are loaded carefully and systematically on a first out/ last in basis to save time when unloading and prevent physical damage (Mean: 3.58, SDS0.827). The mean of 3.58 falls

within the "very often practiced" range, demonstrating that EPSS very frequently loads vehicles in a systematic manner to facilitate efficient unloading and prevent damage.

In warehouse there is high commitment to make easy of shipping and transportation process (Mean: 3.75, SD: 0.84). The mean of 3.75 falls within the "very often practiced" range, indicating that EPSS has a very strong commitment to optimizing the shipping and transportation process from the warehouse.

Communication is successful in making ready the transportation and to inform the recipient (Mean: 3.71, SD: 1.032). The mean of 3.71 also falls within the "very often practiced" range, showing that EPSS very consistently communicates effectively to prepare transportation and inform recipients.

The study conducted by Adeyemi and Salami in Nigeria, 2010 found out that dispatch activity has slightly lower grand mean (3.49) than EPSS in Ethiopia (3.654) states that the Ethiopian pharmaceutical supply chain may be performing better in terms of dispatch related operations compared to the Nigerian counterpart.

4.3.2 Descriptive statistics of Distribution Performance

The study aimed to examine the state of distribution performance in the Ethiopian pharmaceutical supply service, and, accordingly, its findings are presented here in the table below.

Table 4.7 Descriptive Statistics of distribution performance

Distribution performance	**N Statistic**	**Mean Statistic**	**Std. Deviation Statistic**
EPSS has well-defined key performance indicators (KPIs) in place to measure and evaluate distribution performance.	106	3.82	0.924

The distribution process in EPSS is efficient and ensures on time delivery of pharmaceutical products.	106	3.43	1.06
The distribution network of EPSS is well-designed to reach various regions and healthcare facilities in a timely manner.	106	3.61	1.056
There are established procedures and controls in place to schedule and allocate vehicles efficiently, considering factors such as delivery priorities, load capacity, and geographic proximity	106	3.6	0.943
There are mechanisms in place to track and analyze distribution costs, allowing the warehouse management team to identify cost-saving opportunities and implement appropriate measures.	106	3.55	1.061
There are established procedures and controls to verify the accuracy and completeness of delivery documentation, ensuring that all required information is captured and recorded.	106	3.87	0.967
Distribution team collaborates with the fleet management to implement preventive maintenance schedules and minimize unplanned vehicle downtime.	106	3.44	1.087

Grand mean is 3.617

Source: SPSS own Survey (2024)

EPSS has well-defined key performance indicators (KPIs) in place to measure and evaluate distribution performance (Mean: 3.82, SD: 0.924). The mean of 3.82 falls within the "very often practiced" range, indicating that EPSS has established KPIs to measure and evaluate the

performance of its distribution operations.

The distribution process in EPSS is efficient and ensures on-time delivery of pharmaceutical products (Mean: 3.43, SD: 1.06). The mean of 3.43 falls within the "occasionally practiced" range, suggesting that EPSS's distribution process is only moderately efficient, and on-time delivery is not consistently achieved.

The distribution network of EPSS is well-designed to reach various regions and healthcare facilities in a timely manner (Mean: 3.61, SD: 1.056). The mean of 3.61 falls within the "very often practiced" range, indicating that EPSS's distribution network is generally well-designed to reach various locations in a timely manner.

There are established procedures and controls in place to schedule and allocate vehicles efficiently, considering factors such as delivery priorities, load capacity, and geographic proximity (Mean: 3.6, SD: 0.943). The mean of 3.6 falls within the "very often practiced" range, showing that EPSS has well-established procedures and controls for efficient vehicle scheduling and allocation.

There are mechanisms in place to track and analyze distribution costs, allowing the warehouse management team to identify cost-saving opportunities and implement appropriate measures (Mean: 3.55, SD: 1.061). The mean of 3.55 falls within the "very often practiced" range, indicating that EPSS has mechanisms in place to track and analyze distribution costs to identify optimization opportunities.

There are established procedures and controls to verify the accuracy and completeness of delivery documentation, ensuring that all required information is captured and recorded (Mean: 3.87, SD: 0.967). The mean of 3.87 falls within the "very often practiced" range, demonstrating that EPSS has well-defined procedures and controls to ensure accurate and complete delivery documentation.

Distribution team collaborates with the fleet management to implement preventive maintenance schedules and minimize unplanned vehicle downtime (Mean: 3.44, SD: 1.087). The mean of 3.44 falls within the "occasionally practiced" range, suggesting that the level of collaboration between

the distribution team and fleet management is only moderate in terms of implementing preventive maintenance and minimizing vehicle downtime.

The Tanzanian study (Hiza et al., 2019) found challenges in the timely distribution of essential medicines, particularly in remote and underserved regions. Factors like inadequate transportation, poor distribution planning, and limited storage facilities contributed to these distribution issues. The EPSS's grand mean of 3.617 for distribution performance indicates relatively better distribution capabilities compared to the Tanzanian context.

4.4 Regression Analysis

Regression analysis is a statistical technique utilized to examine the relationships between a dependent variable and one or more independent variables. Given that the study incorporates five independent variables, it necessitates the application of multiple regression analysis. This method enables the establishment of a mathematical relationship between multiple independent variables and a dependent variable simultaneously. In this context, the analysis seeks to evaluate the impact of warehouse management practices, including receiving, put-away, loading, order picking, and dispatch, on the distribution performance of the Ethiopian Pharmaceuticals Supply Service.

4.4.1 Multiple linear regression assumptions

Multicollinearity Test

Multicollinearity refers to a situation where the independent variables in a multiple regression model exhibit exceptionally high intercorrelations, leading to distortions in the results of regression analysis. A correlation coefficient (r) of 1 indicates perfect multicollinearity among predictor variables, which can lead to misleading conclusions regarding the relationship between independent and dependent variables (Kim, 2019). Multicollinearity concerns are mitigated when the tolerance and variance inflation factors fall within the range of greater than 0.1 and less than 10, respectively (Kim, 2019), ensuring the integrity of the data analysis.

Table 4.8 Multicollinearity Test

	Collinearity Statistics	
	Tolerance	VIF
Receiving Activity	0.448	2.232
Put away Activity	0.314	3.182
Loading Activity	0.465	2.151
Picking Activity	0.493	2.027
Dispatch Activity	0.351	2.853

Source: SPSS own survey (2024)

The collinearity statistics provided suggest that there is some degree of correlation between the various warehouse activities, but the level of multicollinearity is not severe enough to be a major concern in the analysis. The Tolerance and VIF values indicate that the independent variables can be included in the analysis, but the interpretation of the individual effects should be done with appropriate caution and consideration of the potential interrelationships between the activities.

Normality test

The normality assumption in statistical analysis is supported by the mean of the residuals approaching zero. Furthermore, normality tests are employed to ascertain whether the data conforms to a normal distribution or to assess the likelihood of an underlying random variable being normally distributed (Gujarati and Porter, 2009). To verify data normality, tables and histograms are utilized as diagnostic tools.

Table 4.09 Normality test

Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Distribution performance	0.187	106	0.000	0.911	106	0.001
a. Lilliefors Significance Correction						

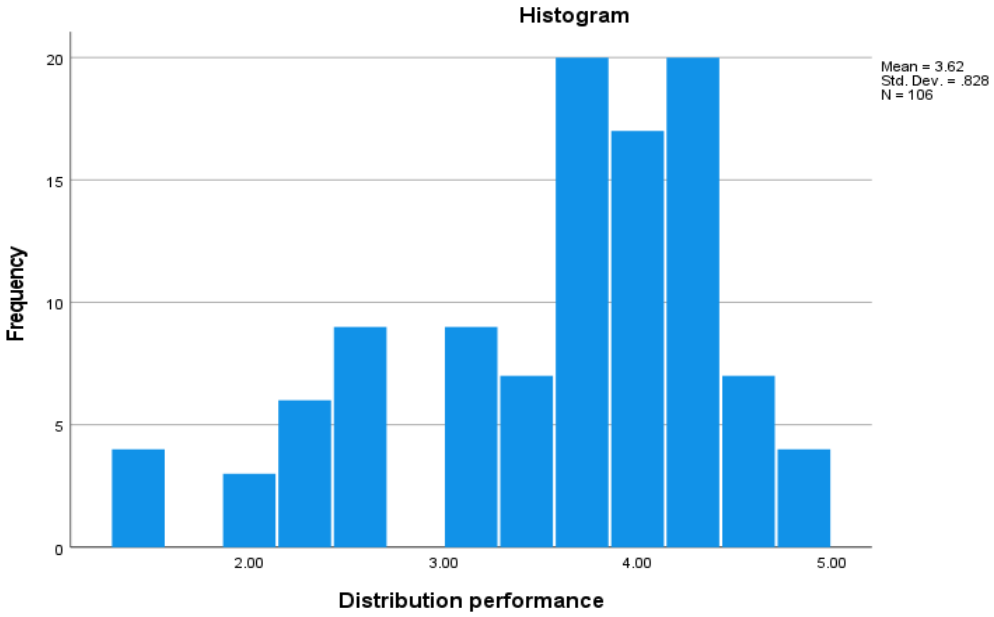

Figure: 4.2 Normal distribution histogram results

Source: SPSS own survey (2024)

Linearity test

When there is a linear relationship between the dependent and independent variables, multiple regressions can accurately predict that relationship (Shiau & Lee, 2010). The QQ plot residual, as illustrated in Figure 4.3 below, is the greatest tool for verifying this. The association between the dependent and independent variables is linear when Q-Q residuals plot a straight line. As a result, the data used for this study do not have a linearity problem.

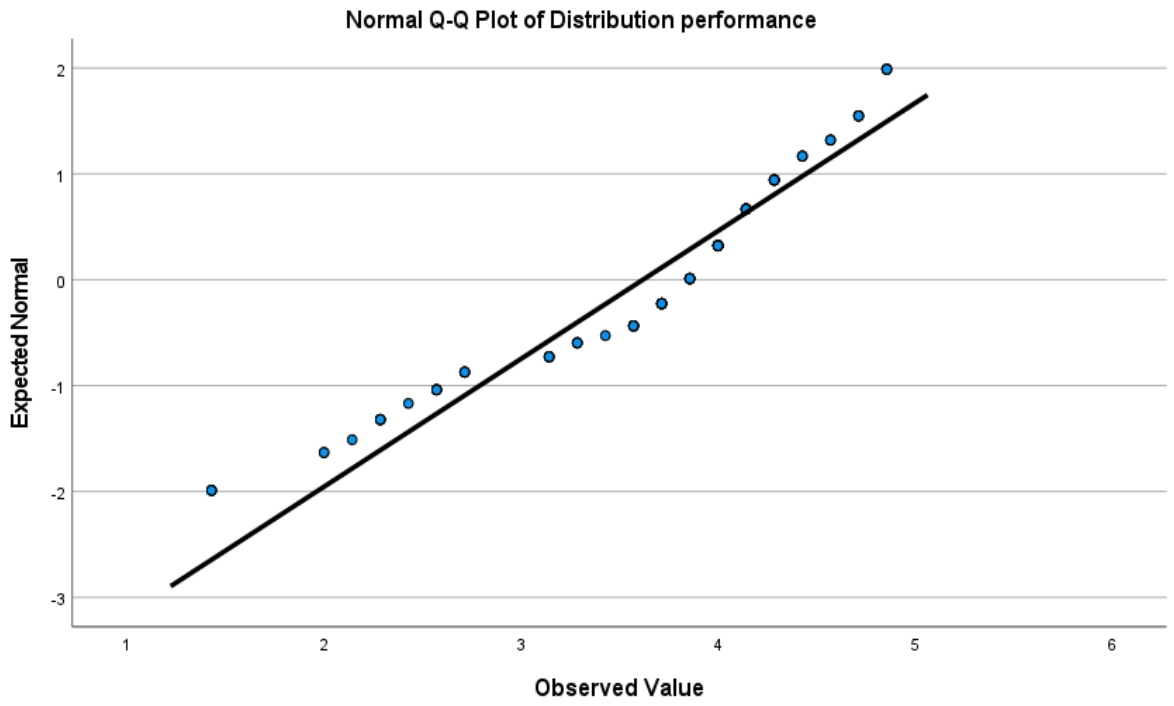

Figure 4.3 Normal Q-Q plot: linearity test result

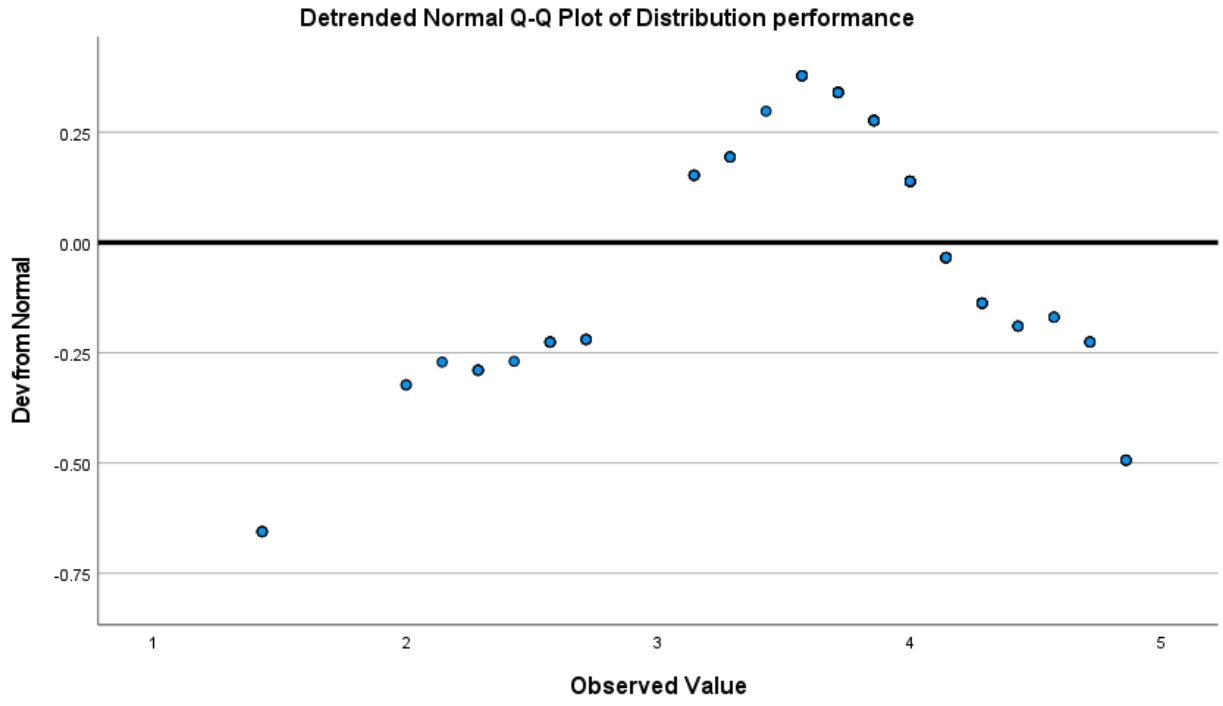

Figure 4.4 Detrended Normal Q-Q plot: linearity test result

Source: SPSS own survey (2024)

Coefficient of determination for regression analysis

Model Summary

Table 4.10 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.636[a]	.405	.375	.65484

a. Predictors: (Constant), Dispatch Activity, Receiving Activity, Picking Activity, Loading Activity, Put away Activity.

b. Distribution performance

The model summary provided gives us important information about the overall performance and fit of the regression model.

R represents the multiple correlation coefficient, which is the correlation between the observed values of the dependent variable and the predicted values based on the regression model. In this case, the R value is 0.636, which indicates a moderately strong positive correlation between the predictor variables (the warehouse activities) and the dependent variable (the distribution performance).

R Square, also known as the coefficient of determination, represents the proportion of the variance in the dependent variable that is explained by the independent variables in the model. The R Square value here is 0.405, which means that the model explains approximately 40.5% of the variance in the distribution performance.

The Adjusted R Square is a modified version of R Square that takes into account the number of predictors in the model and the sample size. The Adjusted R Square value of 0.375 suggests

that the model explains approximately 37.5% of the variance in the distribution performance, after adjusting for the number of predictors and the sample size.

The Std. Error of the Estimate is a measure of the average amount of error in the regression model's predictions. In this case, the Std. Error of the Estimate is 0.65484, which represents the average amount of deviation between the observed values of the dependent variable and the predicted values.

The model summary indicates that the regression model, which includes the five warehouse activities (Receiving Activity, Put away Activity, Loading Activity, Picking Activity, and Dispatch Activity) as predictors, is able to explain a significant portion of the variance in the distribution performance (37.5% after adjusting for the number of predictors and sample size).

The moderately strong multiple correlation coefficient (R = 0.636) suggests that there is a substantive relationship between the warehouse activities and the distribution performance.

The Std. Error of the Estimate of 0.65484 provides information about the accuracy of the model's predictions, indicating that the average deviation between the observed and predicted values is relatively small.

Analysis of Variance (ANOVA)

Table 4.11 ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	29.148	5	5.830	13.595	.000[b]
	Residual	42.881	100	.429		
	Total	72.029	105			

Source: SPSS own survey (2024)

a. Dependent Variable: Distribution performance

b. Predictors: (Constant), Dispatch Activity, Receiving Activity, Picking Activity, Loading Activity, Put away Activity

The ANOVA (Analysis of Variance) table provides information about the overall significance of the regression model.

The F-statistic is 13.595, which indicates that the overall regression model is statistically significant.

The Sig. value, also known as the p-value, represents the probability of obtaining the observed F-statistic or a more extreme value, given that the null hypothesis (no relationship between the predictors and the dependent variable) is true.

In this case, the Sig. value is 0.000, which means that the probability of obtaining the observed F-statistic or a more extreme value, if the null hypothesis is true, is less than 0.001

The ANOVA table indicates that the overall regression model is statistically significant ($p < 0.001$). This means that the set of warehouse activities (Receiving Activity, Put away Activity, Loading Activity, Picking Activity, and Dispatch Activity) included in the model collectively explain a significant amount of the variation in the distribution performance.

The F-statistic of 13.595 suggests that the regression model as a whole is effective in predicting the distribution performance, and the relationship between the warehouse activities and the distribution performance is unlikely to have occurred by chance.

The low p-value (Sig. = 0.000) provides strong evidence to reject the null hypothesis, indicating that at least one of the warehouse activities is a significant predictor of the distribution performance.

4.4.2 Regression coefficient

The regression coefficient displayed in the table illustrates the impact of warehouse practices on the warehouse performance of the Ethiopian pharmaceutical supply service. This coefficient

is measured in terms of standard deviations.

Table: 4.12 Regression Coefficients

Model		Unstandardized Coefficients	Std. Error	Standardized Coefficients	T	Sig.
1		B		Beta		
	(Constant)	0.402	0.498		0.808	0.421
	Receiving Activity	0.526	0.172	0.353	3.065	0.003
	Putaway Activity	0.124	0.205	0.083	0.606	0.546
	Loading Activity	-0.195	0.128	-0.172	-1.523	0.131
	Picking Activity	-0.15	0.156	-0.105	-0.958	0.34
	Dispatch Activity	0.557	0.14	0.52	3.991	0

Source: SPSS own survey (2024)

This table provides the regression coefficients for the model, which allow us to understand the individual effects of each warehouse activity on the distribution performance.

Standardized Coefficients (Beta)

The standardized coefficients, also known as beta coefficients, provide a measure of the relative importance of each predictor variable in the regression model.

Receiving Activity: The beta coefficient for Receiving Activity is 0.353, which means that a one-unit increase in the standard deviation of Receiving Activity is associated with a 0.353 increase in the standard deviation of the distribution performance, holding all other variables constant.

Dispatch Activity: The beta coefficient for Dispatch Activity is 0.52, which means that a one-

unit increase in the standard deviation of Dispatch Activity is associated with a 0.52 increase in the standard deviation of the distribution performance, holding all other variables constant.

Unstandardized Coefficients (B)

The unstandardized coefficients help to determine or interpret the influence of each predictor variable on the distribution performance.

Receiving Activity: The unstandardized coefficient for Receiving Activity is 0.526, which means that for every one-unit increase in Receiving Activity, the distribution performance is predicted to increase by 0.526 units, holding all other variables constant.

Put away Activity: The unstandardized coefficient for Put away Activity is 0.124, which means that for every one-unit increase in Put away Activity, the distribution performance is predicted to increase by 0.124 units, holding all other variables constant.

Loading Activity: The unstandardized coefficient for Loading Activity is -0.195, which means that for every one-unit increase in Loading Activity, the distribution performance is predicted to decrease by 0.195 units, holding all other variables constant.

Picking Activity: The unstandardized coefficient for Picking Activity is -0.15, which means that for every one-unit increase in Picking Activity, the distribution performance is predicted to decrease by 0.15 units, holding all other variables constant.

Dispatch Activity: The unstandardized coefficient for Dispatch Activity is 0.557, which means that for every one-unit increase in Dispatch Activity, the distribution performance is predicted to increase by 0.557 units, holding all other variables constant.

The regression coefficients indicate that Receiving Activity and Dispatch Activity have a positive and statistically significant effect on the distribution performance, while Loading Activity and Picking Activity have a negative but not statistically significant effect.

Put away Activity has a positive but not statistically significant effect on the distribution performance.

The standardized coefficients suggest that Dispatch Activity has the strongest relative impact on the distribution performance, followed by Receiving Activity, Loading Activity, Picking Activity, and Put away Activity.

The statistical significance of the coefficients (Sig. column) provides information about the likelihood that the observed relationships occurred by chance. The Sig. values for Receiving Activity (0.003) and Dispatch Activity (0.000) indicate that these effects are statistically significant at the 99% confidence level, meaning there is a very low probability that these relationships occurred by chance.

Based on the standardized coefficients (Beta) and their corresponding significance levels (Sig.), summary of the hypotheses stated below in table:

Convergence with existing literature:

Emphasis on key warehouse management practices: The study examines the core warehouse functions, such as receiving, put-away, loading, order picking, and dispatching, which are consistently identified in the literature as critical components of effective warehouse management.

Importance of warehouse management practices for distribution performance: The study's findings corroborate the established understanding that warehouse management practices have a significant impact on an organization's distribution performance.

Positive relationships between warehouse activities and distribution performance: The study's correlation analysis demonstrates that various warehouse activities, such as receiving, put-away, loading, picking, and dispatching, are positively and significantly correlated with distribution performance, aligning with previous empirical studies.

Relative importance of warehouse activities: The regression analysis highlights the varying degrees of influence that different warehouse activities have on distribution performance, with receiving and dispatching activities emerging as the strongest predictors, consistent with some previous research.

Deviations from existing literature:

Specific context: The study is conducted in the context of the Ethiopian Pharmaceutical Supply Service, which may have unique characteristics and challenges compared to other industries or geographical settings explored in the existing literature.

Relative importance of warehouse activities: While the study identifies receiving and dispatching as the most influential warehouse activities, some previous studies may have found different activities, such as put-away or order picking, to be more strongly associated with distribution performance, depending on the specific context and research settings.

Limitations in explaining variance: The study's regression model explains 40.5% of the variance in distribution performance, suggesting that there may be other factors beyond warehouse management practices that contribute to distribution performance, which are not addressed in this particular study.

Overall, the study's findings largely converge with the existing literature, reinforcing the critical role of effective warehouse management practices in enhancing distribution performance. The context-specific insights and the nuances in the relative importance of different warehouse activities provide valuable additions to the existing body of knowledge in this domain.

CHAPTER FIVE

5. SUMMARY OF KEY FINDINGS, CONCLUSION AND RECOMMENDATION

This study main goal was to examine the effect of warehouse management practices on the distribution performance of the Ethiopian Pharmaceuticals Supply Service. While also undertaking an evaluation of the organization's warehouse management practices. This section presents a summary of the significant findings, conclusions drawn from the study's data analysis, recommendations for enhancing EPSS warehouse management practices, and potential avenues for future research exploration.

5.1 Summary of key findings

This study put a significant effort to examine the effect of warehouse management practices on the organization's distribution performance. Additionally, this study aimed to assess the existing state of warehouse management practices, encompassing functions such as receiving, put-away, loading, order picking, and dispatching. It incorporates a literature review focusing on the theoretical framework of warehouse management practices and performance, along with empirical studies elucidating real-world applications pertinent to the research objectives.

In order to gather requisite data for analysis, a structured survey was distributed to a preselected sample of 110 participants within the Ethiopian Pharmaceutical Supply Service. A total of 106 responses, constituting 96% of the distributed questionnaires, were collected for subsequent examination.

Having attained a Cronbach's alpha score of 0.955, the internal consistency of the research questionnaires was assessed as being at a commendable and dependable level.

A descriptive statistical analysis was used to compute the organization's warehousing practices' overall mean.

The receiving process is well-documented and standardized (Mean = 4.08, SD = 0.829). Other notable aspects include advance information about deliveries (Mean = 3.73, SD = 0.655),

sufficient unloading equipment (Mean = 3.44, SD = 0.957), and availability of necessary documents upon item arrival (Mean = 3.87, SD = 0.705).

Warehouse personnel are skilled in performing put-away activities (Mean = 4.02, SD = 0.632). The recording of product storage locations is accurate (Mean = 4.21, SD = 0.7). The warehouse design is convenient for put-away activities (Mean = 3.68, SD = 0.89).

The loading process is managed efficiently, contributing to distribution performance (Mean = 3.83, SD = 0.762). Coordination and communication between managers and the loading team are effective (Mean = 3.7, SD = 0.938). There is room for improvement in loading equipment and resources (Mean = 3.38, SD = 1.073).

Personnel are skillful in performing order-picking processes (Mean = 3.73, SD = 0.941). The design and layout of the warehouse facilitate easy order picking (Mean = 3.66, SD = 0.838). There is an issue with high returns due to errors in order picking (Mean = 2.71, SD = 1.104).

Customer orders are packed correctly to prevent damage during transit (Mean = 3.64, SD = 1.007). Pharmaceuticals are packed to optimize vehicle space utilization (Mean = 3.59, SD = 1.067). Commitment to ease shipping and transportation processes is high (Mean = 3.75, SD = 0.84).

Pearson's correlation coefficients were computed to explore the relationships between the distribution performance of the organization and its warehouse management practices. Hence, the correlation result for dispatch activity demonstrates a very high positive and statistically significant correlation with distribution performance ($r = 0.569$, $p < 0.001$), then followed by put-away activity ($r = 0.526$), $P< 0.01$), Receiving activity ($r = 0.473$), $P< 0.01$), Picking activity has a correlation value of ($r = 0.383$), $P< 0.01$), followed by loading activity ($r = 0.359$), $p < 0.001$) all significantly correlate with distribution performance.

The performance of the Ethiopian Pharmaceutical Supply Service's warehouse is examined using the coefficient of determination to determine the effect of warehouse management practices on distribution performance. The regression analysis shows that 40.5% of the variance in distribution performance can be explained by the five independent variables ($R^2 = 0.405$).

The significant predictors are receiving activity (β = 0.353, p = 0.003) and dispatch activity (β = 0.52, p = 0.000), indicating their strong influence on distribution performance. Put-away activity, loading activity, and picking activity are not significant predictors.

The model summary indicates that the regression model, which includes the five warehouse activities (Receiving Activity, Put away Activity, Loading Activity, Picking Activity, and Dispatch Activity) as predictors, is able to explain a significant portion of the variance in the distribution performance.

The standardized coefficients (beta) indicate the relative importance of each predictor variable in the regression model. According to the study, one-unit increase in the standard deviation of Receiving , Put away, loading, picking and dispatch activity associated with a 0.353, 0.083, -0.172, -0.105, 0.52 respectively increase in the standard deviation of distribution performance.

The unstandardized coefficients provide the direct impact of each predictor variable on the distribution performance: for every one-unit increase in Receiving, put away, loading, picking and dispatch activity, distribution performance is predicted to increase by 0.526, 0.124, -0.195, -0.15, 0.557 units respectively

5.2 Conclusions

Based on the study's findings, the conclusions regarding the effect of warehouse management practices on distribution performance are elucidated as follows:

The receiving, put-away, and dispatching processes are well-managed, with skilled personnel, standardized procedures, and efficient coordination; however, the loading and order-picking processes, while generally effective, have some areas for improvement in equipment, resources, and reducing errors.

The regression analysis indicates that the five warehouse management practices collectively explain 40.5% of the variance in distribution performance. The moderately strong multiple correlation coefficient ($R = 0.636$) suggests that there is a substantive relationship between the warehouse activities and the distribution performance.

The study revealed that Receiving activity and dispatching activity are the two significant predictors of distribution performance, with receiving activity having a stronger influence.

In general, we can say that the study has provided evidence for the effect of warehouse management practices on the distribution performance as supported by the literature.

5.3 Recommendation

In light of the research outcomes, the researcher provided the following recommendations aimed at enhancing the distribution performance of the Ethiopian Pharmaceutical Supply Service:

Focus on Improving Receiving and Dispatching Processes: The EPSS warehouse and Inventory management team, in collaboration with distribution and fleet management team should continue to maintain and further strengthen the well-documented and standardized processes for receiving and dispatching activities by enhancing coordination and communication between warehouse managers, warehouse operatives and fleet management team. The reason is study found that the receiving and dispatching activities have the strongest positive and significant influence on the distribution performance of EPSS.

Address Issues in Order-Picking Process: The EPSS warehouse and Inventory management team should investigate the root causes of the high return rates due to errors in the order-picking process by providing the training and skill development of warehouse personnel involved in the order-picking process. The study revealed issues in the order-picking process, despite skilled personnel and a well-designed warehouse layout.

Enhance Loading Process Capabilities: The EPSS warehouse management team, in collaboration with general service department should consider investing in upgrading the loading infrastructure and resources to further optimize the loading process by procuring or upgrading loading equipment, such as forklifts, palletizers, or conveyors, to support faster and more efficient loading operations. The reason is enhancing the loading capabilities will enable EPSS to further streamline the loading operations and improve overall distribution performance.

Continuously Develop Put-Away and Storage Capabilities: The EPSS warehouse and inventory management team should maintain the strengths of its put-away practices, such as skilled personnel and accurate product storage location records, and explore opportunities to further enhance the convenience and efficiency of these activities by optimizing the warehouse layout and storage solutions to improve the accessibility and organization of products. Because

continuously developing and improving put away and storage capabilities will help EPSS to maintain and enhance the efficiency of their warehouse management operations.

Adopt a Holistic Approach to Warehouse Management: The EPSS management team, involving cross-functional departments among the warehouse, contract management, quantification and market shaping directorate and tender management should adopt a comprehensive and integrated approach to continuously improve its overall warehouse management performance by establishing a regular performance monitoring and review process to identify areas for improvement, implementing best practices and process refinements across all warehouse management activities, including receiving, put-away, storage, order-picking, loading, and dispatching.

By adopting a comprehensive strategy, EPSS can ensure that improvements in one area are aligned and integrated with the overall warehouse management performance, leading to more sustainable distribution performance enhancements.

5.4 Direction for Further Studies

Future researchers are advised to consider employing time series or panel research designs to explore cause-and-effect relationships and analyze the changes in variables over time. Additionally, further investigation is warranted to explore additional factors not addressed in this study but potentially influencing distribution performance.

Furthermore, this study utilized five elements as independent variables within warehouse management dimensions to examine their effects on distribution performance. This indicates that other variables related to warehousing dimensions were not included. Therefore, it is recommended that future researchers investigate additional elements of warehouse management dimensions and evaluate their impact on distribution performance.

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Appendix I

ADDIS ABEBA UNIVERSITY

COLLEGE OF BUSINESS & ECONOMICS

MA IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Dear Sir/Madam

I am Bereket Tezera, currently pursuing a master's degree in logistics and supply chain management at Addis Ababa University, College of Business and Economics, School of commerce. I am conducting research on the effect of warehouse management on distribution performance at EPSS. I want to express my sincere gratitude to your organization and you for your cooperation and enthusiasm in taking part in this important study. This survey aims to investigate the impact of current warehouse management practices on the distribution performance. I can assure you your response will also be treated with the utmost confidentiality. It will take you between 15 and 20 minutes to complete this survey.

Note:

- No need of writing your name;
- Indicate your answer with a checkmark (√) on the appropriate cell
- If you need further explanation please do not hesitate to contact me at +251-903181447 or tezerabereket7@gmail.com

Thank you in advance for your cooperation!

Bereket Tezera

ANNEX. Research Instrument/ Questionnaire

Part I: General Information and Demographic background of respondents

Please mark ✓ for your appropriate choice.

1. Gender: Male ☐ Female ☐

2. Age

☐ Less than 25 years

☐ 26-36 years

☐ 37-47 years

☐ Above 48 years

3. Educational qualification

☐ Diploma

☐ Degree

☐ Masters

☐ PhD

Others (specify) ----------

4. How long have you been working in the organization?

☐ Below 3 years

☐ 3-6 years

☐ 7-10 years

☐ Above 10 years

5. In which directorate are you working currently?

☐ Warehouse and Inventory Management

☐ Distribution And fleet Management

6. What is your job position?

☐ Director

☐ Advisor

☐ Team leader

☐ Officer

If other, please specify----------

PART II: Main Questionnaire

Please indicate your choice by putting the check mark (√) on the appropriate cell.

Where; 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

6. Please indicate the degree to which you agree with the following statements regardin g Warehouse management and distribution performance in your organization.

No.	***Variables***	***Score***				
	Receiving Activity	***1***	***2***	***3***	***4***	***5***
6.1	The receiving process in EPSS is well-documented and standardized to ensure efficient handling of incoming products.					
6.2	EPSS receive clear and detailed information about expected deliveries in advance, allowing for proper planning and preparation.					
6.3	The EPSS has sufficient equipment to unload materials.					

6.4	The EPSS has sufficient space for loading/unloading materials.					
6.5	The necessary documents and paperwork are readily available and organized upon arrival of received items.					
6.6	The shelves for each received material in the warehouse are adequate to store and put away					
6.7	There is a clearly defined separated receiving area in EPSS Warehouses					
6.8	All members of the receiving team are well-procedures.					
6.9	There is a pre-notification of the incoming goods that will be received in the warehouses					
6.10	During the time of receiving goods, there are procedures for the cross-checking of the documents with the goods					
Put-way Activity		***1***	***2***	***3***	***4***	***5***
6.11	Warehouse personnel are skilled to perform put away activities.					
6.12	In the warehouse to do the put-away activity there is sufficient equipment.					
6.13	When a product is placed in its location, the storage location of the product is properly recorded					
6.14	The EPSS warehouse design/layout is convenient to perform put-away activities.					
6.15	The design of the warehouse is easy to access items and convenient to load and unload					

6.16	There is an established well-structured put-away process for all items received in EPSS warehouses					
Loading Activity		***1***	***2***	***3***	***4***	***5***
6.17	The loading process in our warehouse is efficiently managed, contributing to overall distribution performance in EPSS.					
6.18	There is effective coordination and communication between warehouse managers and the loading team to ensure smooth Operations.					
6.19	There are appropriate loading equipment and resources available to support fast and accurate loading of products onto vehicles.					
6.20	The loading area designed and organized to facilitate efficient movement, minimize congestion, and ensure safety during					
6.21	There are established protocols for handling special handling requirements, such as fragile or hazardous products, during the					
Picking Activity		***1***	***2***	***3***	***4***	***5***
6.22	Warehouse personnel are skilful in performing order Picking process.					
6.23	Warehouse design/layout is convenient for an easy order picking process.					
6.24	Items returned from the end-user due to an error in order-picking are high.					
6.25	EPSS has adequate shelves for the goods in the warehouse to facilitate the order-picking process.					
6.26	In EPSS order-picking is performed by gathering the item correctly by requested order.					

6.27	The design of the warehouse system is properly done to improve customer service in the order-picking process					
6.28	Items are picked from the storage area as exactly mentioned on the picking slip/issue order					
Dispatching Activity		***1***	***2***	***3***	***4***	***5***
6.29	The customer orders are packed into the correct-sized boxes or onto a pallet in a manner to prevent damage during transit.					
6.30	The pharmaceuticals are properly packed so that it increases vehicle space utilization, facilitate ease of loading and receipt at destination.					
6.31	The vehicles are loaded carefully and systematically on a first out/ last in basis to save time when unloading and prevent physical					
6.32	In warehouse there is high commitment to make easy of shipping and transportation process.					
6.33	Communication is successful in making ready the transportation and to inform the recipient					
No.	***Distribution Performance***	**1**	**2**	**3**	**4**	**5**
6.34	EPSS has well-defined key performance indicators (KPIs) in place to measure and evaluate distribution performance.					
6.35	The distribution process in EPSS is efficient and ensures on time delivery of pharmaceutical products.					
6.36	The distribution network of EPSS is well-designed to reach various regions and healthcare facilities in a timely manner.					
6.37	There are established procedures and controls in place to schedule and allocate vehicles efficiently, considering factors such as delivery priorities, load capacity, and geographic proximity					

6.38	There are mechanisms in place to track and analyze distribution costs, allowing the warehouse management team to identify cost-saving opportunities and implement appropriate measures.					
6.39	There are established procedures and controls to verify the accuracy and completeness of delivery documentation, ensuring that all required information is captured and recorded.					
6.40	Distribution team collaborates with the fleet management to implement preventive maintenance schedules and minimize unplanned vehicle downtime.					