ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

FACTORS AFFECTING MEDICAL DEVICE PROCUREMENT PERFORMANCE: THE CASE OF ETHIOPIAN PHARMACEUTICAL SUPPLY SERVICE

BY

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DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is original work of my own, has not been presented in any of other universities, and that all sources of material used for the thesis have been duly acknowledged.

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CERTIFICATION

This is to certify that Jia Uga Fayyissa has conducted this research work on the topic entitled "FACTORS AFFECTING MEDICAL DEVICE PROCUREMENT PERFORMANCE: THE CASE OF ETHIOPIAN PHARMACEUTICAL SUPPLY SERVICE" under my supervision. This work is original in nature and it can be submitted for the partial fulfillment of the requirements for the award of the degree of Master of Arts in Logistics and Supply Chain Management.

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Abbreviation and acronyms

EPSS: Ethiopian pharmaceuticals supply Service

FMOH: Federal Ministry of Health

WHO: World Health Organization

LMIC: Low- and Middle-Income Countries

EPSA: Ethiopian pharmaceuticals supply Agency

PSTP: Pharmaceuticals supply transformation plan

SPSS: Statistical packages for social science

CMD: Capital Medical Device

RMD: Routine Medical Device

RFP: Request for proposals

RFQ: Request for quotations

IFPSM: International Federation of Purchasing and Supply Management

HSTP: Health Sector Transformation Plan

ROI : Return on Investment

Abstract

The general objective of this study was to identify the factors affecting medical devices procurement performance in the case of the Ethiopian Pharmaceuticals Supply Service. This research paper used both an explanatory research design and a quantitative research technique. The research included all employees who participated in the acquisition of medical equipment at EPSS, whether in a direct or indirect capacity. Data on procurement performance was collected using a census sample method. This investigation involved both descriptive and inferential data analysis. The response rate for the survey was 96%, with 96 valid responses out of 100 surveys. Upon computing Pearson's product-moment correlation coefficient, it was found that there exists a significant and robust positive correlation between environmental, organizational, technical, and behavioral factors. Through multiple linear regression analysis, the adjusted R^2 coefficient of determination indicated that 85% of the variability in the procurement performance of medical devices was accounted for by the predictor variables (organizational factors, environmental factors, technical factors, and behavioral factors). This suggests that there was a significant overall model fit. Based on the study findings, the investigator concludes that a strong and positive association exists between procurement performance and behavioral factors, whereas a very strong and positive association exists between procurement performance and organizational factors, environmental factors, and technical factors. Additionally, at a 1% level of statistical significance, the elements that had the greatest impact on the procurement performance of medical devices were organizational, environmental, technological, and behavioral factors. The study suggested that in order to guarantee the supply of reasonably priced, high-quality medical products, the organization should focus on improving procurement performance by reducing the influence of these elements.

Key Words: Medical device procurement performance, Factors affecting medical device procurement, Medical device procurement in Ethiopia, Ethiopian pharmaceutical supply service.

CHAPTER ONE
INTRODUCTION

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

1.1 Background of the study

The process of buying, locating, and obtaining medical device for use in healthcare settings is referred to as medical device procurement. This covers every action required to determine whether medical devices are necessary, choose the best equipment, negotiate contracts with suppliers, and oversee the supply chain to guarantee the devices are delivered on time and at a reasonable price (WHO, 2010).

According to the World Health Organization (WHO) there are indeed over 10,000 types of medical devices currently in use worldwide (WHO, 2022). These devices play a crucial role in healthcare, aiding in diagnosis, treatment, monitoring, and rehabilitation. As technology advances, the complexity of these devices continues to grow, enabling more precise and efficient medical interventions. From simple tools like thermometers and stethoscopes to sophisticated imaging machines and implantable devices, the diversity of medical technology contributes significantly to patient care and overall health outcomes (EPSA, 2020).

The World Health Organization (WHO) states that while medical devices are necessary for providing high-quality healthcare and come at a major financial cost to the system, little is understood about the efficient procurement of these devices. There are currently very few international comparison studies on the laws governing the purchase of medical equipment (Medical Journal the republic of Iran, 2022).

Assessing the needs of the healthcare organization and doing market research to find possible suppliers and accessible medical equipment are usually the first steps in the procurement process. After weighing its alternatives, the company may decide to ask for bids from suppliers by releasing an international open bid, a national open bid, a request for proposals, or a request for quotations (Center for Global Development, 2022).

In order to support patient care and enhance healthcare outcomes, effective medical device procurement seeks to guarantee that healthcare organizations have access to dependable, secure, and reasonably priced medical devices (Globalization and Healthcare, 2021).

The efficacy and efficiency of the procedure for obtaining medical equipment for healthcare institutions is referred to as the medical device procurement performance. However, a number

of variables that might significantly affect the entire procurement process can either positively or adversely affect the performance of medical device procurement. Demand-based procurement, staff training, Quality and Compliance, warehouse organization, behavioral factor, environmental factor, organizational factors, foreign currency, technology and innovation, and adherence to policies and guidelines are just a few of the aspects it involves (intelligence drive innovation, 2023).

Depending on how the procurement institute or organization applies them, such elements might have a favorable or negative impact on the medical device procurement performance (PSTP II, 2022). As Ethiopian Pharmaceutical Supply Service is the principal procurement institute of pharmaceuticals and medical devices in Ethiopia, this research paper will investigate and assess some of the elements and their influence on the procurement performance of medical device.

Ethiopian Pharmaceutical Supply Service (EPSS), which is a public enterprise established in 2007 G.C (1999 E.C), under proclamation No. 553/2007. Which is responsible for the procurement, storage, distribution, and management of pharmaceuticals and medical devices for the public health sector. The Ethiopian Pharmaceutical Supply Service (EPSS) operates through a network of 19 hubs, which are located in different regions of the country, and serve as the main points of contact for the health facilities. The Ethiopian Pharmaceutical Supply Service (EPSS) procures medical devices from various sources, such as local manufacturers, international manufacturer, international suppliers, and donor agencies, and distributes them to the health facilities through a pull and push system (FPPPA, 2021). Procurement performance, as determined by a number of factors including lead-time, cost, quality, compliance, and satisfaction, is a crucial indicator of the effectiveness and efficiency of the procurement process in the Ethiopian Pharmaceutical Supply Service (USAID, 2023).

However, the procurement of medical devices is often hampered by various factors, which can result in increased costs, reduced quality, increase procurement lead-time, affect end users satisfaction and compromised patient safety, and ultimately affect the health system performance and the health status of the population. These procurement performance indicators in Ethiopian Pharmaceutical Supply Service are shocking, particularly when it comes to the purchase of medical devices. According to the contract management directors report (the directorate in charge of overseeing the procurement, contracting, and performance management of suppliers and vendors), the organization's procurement lead-time for medical devices takes longer than reasonable, is sometimes not affordable, and the qualities are also not up to par with the expected ones. Due to this, there is a complaint from the health facility side (MOH, 2023).

Therefore, this study aimed to identify and analyze the factors that affected the procurement performance of medical devices by the EPSS and to propose possible solutions and recommendations to improve the situation. This was the main aim of this research proposal.

1.2 Statement of the problem

Seventy percent of medical devices in low-income countries are broken, unused or unfit for purpose; the absence of safe, effective and well-functioning medical devices impairs health service provision, leads to poor patient outcomes and poses substantial health system and national security risks (WHO, 2015). Therefore, to overcome this the high percentage of non-functional medical devices in low-income countries, it needs to identify the direct link between procurement practices and the functionality of medical devices. The main goal of procurement processes is to ensure that public funds are used in the most economical and efficient manner while also delivering high-quality products and services within the specified budget and timeline. One of the key procurement principles is to maximize economy, efficiency, and effectiveness by obtaining items at the correct time, place, and price (Jarvis, 2018).Undiscriminating procurement processes are at the heart of this issue (Global Health, 2017). In countries that are building and expanding their healthcare systems, medical device often represent a considerable part of the total health care expenditure, ranging from 20 to 60%. Currently, EPSS procures health commodities worth of 10.5 billion (World Bank, 2018). This huge amount of money has to be spend on cost effective manner to provide reliable services at an agreed standard and price.

According to (WHO, 2015) the procurement of medical devices is a crucial process for the health system performance and the health status of the population, especially in low- and middle-income countries, where the demand for health services is high, but the resources are scarce. This results in delays and ultimately affect the health outcomes of the patients, the productivity of the health workers, and the sustainability of the health system. Ethiopia is one of the low- and middle-income countries that faces the challenge of procuring medical devices for its health system. However, the Ethiopian Pharmaceutical Supply Service (EPSS) procurement lead-time is longer than expected, quality is reduced and cost is also not affordable. These challenges affect the availability, accessibility, and affordability of medical devices for the health facilities, and ultimately affect safety of health care delivery (HSTP-II). Therefore, it is important to identify and analyze the factors that affect the procurement performance of medical devices by the Ethiopian Pharmaceutical Supply Service (EPSS), and to propose possible solutions and recommendations to improve the situation.

1.3 Research Questions

- What is the effect of Organizational Factors on medical device procurement performance of EPSS?
- What is the effect of Environmental Factors on medical device procurement performance of EPSS?
- What is the effect of Technical Factors on medical device procurement performance of EPSS?
- What is the effect of Behavioral Factors on medical device procurement performance of EPSS?

1.3.1 The General Objective

The general objective of this study is

- To identify the factors affect medical devices procurement performance in the case of the EPSS.

1.3.2 Specific Objectives

The specific objectives for this research proposal are:

- To explain Organizational Factors on the procurement performance of medical devices by the EPSS.
- To explain Environmental Factors on the procurement performance of medical devices by the EPSS.
- To explain Technical Factors on the procurement performance of medical devices by the EPSS.
- To explain Behavioral Factors on the procurement performance of medical devices by the EPSS.

1.4 Scope of the study

The scope of this research was to analyze and measure factors affecting medical device procurement performance in terms of procurement lead-time and affordability of the cost of medical devices in the case of Ethiopian pharmaceuticals supply service. Conceptually, the medical device procurement performance was an activity associated with product selection based on the clinical service to be provided, organizational factors, environmental factors, technical factors, behavioral factors, and managing the contract as per award given and the delivery of goods into the location of the buyer, which was warehousing (John Snow, 2017).

The study did not include Hubs, Outbound logistics (in case of Ethiopian pharmaceutical supply service) health facilities and external stakeholders practice, and this paper included only organizational factors, environmental factors, technical factors, and behavioral factors effects on procurement lead time, procurement quality, and affordability (cost) due to time and budgetary constraints.

1.5 Significance of the study

The research will contribute to the existing knowledge and literature on the procurement of medical devices in low- and middle-income countries, especially in Ethiopia, where there is a lack of empirical studies on this topic. It will provide useful insights and information on the factors that affect the procurement performance of medical devices by the EPSS, and how these factors can be addressed or mitigated. At the end, it will propose possible solutions and recommendations to improve the procurement performance of medical devices by the EPSS, which can help to enhance the availability, accessibility, and affordability of medical devices for the health facilities, and ultimately improve the quality and safety of health care delivery.
The research will benefit the EPSS, the MoH, the health facilities, the medical device suppliers and manufacturers, and the patients, as the stakeholders in the procurement process, by providing them with evidence-based and practical guidance and feedback on how to improve the procurement of medical devices. This research will also benefit researchers, policymakers, practitioners, and academicians who are interested in procuring medical devices in low- and middle-income countries by providing them with a case study and a reference for further research and action.

1.6 Definition of key terms

Medical devices: A medical device is any instrument, apparatus, machine, implant, or similar article that is used to diagnose, prevent, monitor, treat, or alleviate a medical condition or disease. Medical devices can range from simple tools like thermometers and blood pressure monitors to complex devices like pacemakers, MRI machines, and robotic surgical systems. It is also any appliance, apparatus, software, material, or other article that may be used in isolation or combination (as defined by the manufacturer) by individuals for a medical purpose (Medical Devices: Definition, Classification, and Regulatory Implications by Jeffrey K. Aronson).
Procurement: According to the WHO, procurement is "the process of acquiring goods, works, and services, covering both acquisitions from third parties and from in-house providers. The process spans the whole cycle, from choosing adequate procurement methods, sourcing

suppliers, and evaluating their offers up to the award of contracts, phases of contract administration, and physical (Medical Device) and site (the place where the device will be installed) inspections (Public Procurement: Theory, Practices, and Tools).

Procurement performance: Procurement performance is defined as "the measurement of the results achieved by the procurement function in relation to the objectives and targets set by the organization" by the International Federation of Purchasing and Supply Management. Numerous factors, including cost, quality, timeliness, and customer satisfaction, may be used to gauge the effectiveness of procurement (Journal of Logistics, Informatics, and Service Science).

Ethiopian Pharmaceutical Supply Service (EPSS): Ethiopian Pharmaceutical Supply Service is "a public enterprise established in 2007 G.C (1999 E.C) and change its name under proclamation No. 553/2007, with the objective of ensuring the availability and accessibility of pharmaceuticals and medical devices for the public health sector. The Ethiopian Pharmaceutical Supply Service is responsible for the procurement, storage, distribution, and management of pharmaceuticals and medical devices for the public health sector. The Ethiopian Pharmaceutical Supply Service operates through a network of 19 hubs, which are located in different regions of the country, and serve as the main points of contact for the health facilities. The Ethiopian Pharmaceutical Supply Service procures pharmaceuticals and medical devices from various sources, such as local manufacturers, international suppliers, and donor agencies, and distributes them to the health facilities through a pull and push system"(EPSA, 2021).

1.7 Organization of the Study

These research proposals will organize into three chapters. Chapter one involves an introduction that comprises the background of the study with a special focus on procurement performance of medical devices in particular; problem statement, research question, and objective; the significance of the study; the scope of the study and definition of terms. The second chapter examines literature about factors affecting medical device procurement performance, which consists of a theoretical literature review and an empirical literature review to postulate the conceptual framework. The third chapter covers the research methodology, which includes the description of the study area, research approach, research design, population & sampling, data collection procedures, data analysis, validity, reliability, and ethical considerations.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Introduction

Public procurement financial records for 15-30% of the gross domestic products (GDP) for many countries in the world (UNDOC, 2013). While public procurement represents an estimated 15% of gross domestic products in Organization for Economic Cooperation and Development, countries and up to 25% of gross domestic products in developing countries (OECD, 2017).

Effective procurement process should be efficient, transparent and accountable to achieve its objective (Njeru, 2015). Recent studies in public procurement revealed that public procurement effectiveness leads efficient management of public money, which is obtained from taxpayers. This totally enhances the overall public sector effectiveness (Abebe, 2012).

Maintained that there is a link between procurement process, efficiency, effectiveness and performance. Procurement performance starts from purchasing efficiency and effectiveness in the procurement function in order to change from being reactive to being proactive to attain set performance levels in an entity. Procurement performance is not an end in itself but a means to control and monitor the procurement function. For any organization to change its focus and become more competitive, performance is a key driver to improving quality of services (Van Weele, 2013).

Fraud and corruption are commonplace in the procurement of health care commodities due to the substantial financial stakes involved. To boost sales and profit margins for their own gain, special interests, suppliers, procurement staff, and others may try to sway product choices, control order quantities, and sway supplier selection and contract award decisions. By regularly implementing both worldwide best practices for transparent procurement and national procurement laws and procedures, procurement professionals may support an open procurement process (USAID (2011), The Logistics Handbook).

2.2 Definition of Concepts

Procurement performance is the process of ensuring that the products or services obtained fulfill the requirements and expectations of the company. It is a crucial component of any organization's operations since it may guarantee that resources be used wisely and that essential

things are quickly acquired. It refers to the evaluation and measurement of the effectiveness, efficiency, and overall success of a procurement function within an organization (Davis, 2018). Additionally, a wide range of variables can influence Procurement Performance, including organizational structure, environmental impacts, medical device technical specification complexity and political situations. According to Davis there are three main components of procurement performance. They are procurement planning, procurement execution, and post-procurement management, which will be explaining in detail.

Procurement Planning involves gaining a deep understanding of the organization has needs and wants as well as identifying suitable supply sources.

Procurement Execution is stage involves entering into contracts with suppliers to obtain the needed items or services, keeping track of and managing supplier performance, and guaranteeing that products satisfy organizational standards.

Post-Procurement Management is stage includes addressing and resolving any problems that might have come up during the procurement process, keeping track of the finances to make sure that it was spent properly, and making any necessary changes to policies or procedures.

2.3 Medical device procurement

Purchasing medical device and giving patients high-quality care is known as medical device procurement. It entails buying these products from suppliers or manufacturers to guarantee that healthcare institutions have access to the best equipment and supplies available. Purchasing medical equipment from manufacturers and distributors entails choosing, placing, and receiving the items. In order to make sure that medical devices are meeting the needs of the healthcare organization, it also entails assessing and tracking their performance (Ayoti, 2012). An effective medical device procurement strategy can offer many benefits for procuring organizations. First, it can help to purchase at the lowest possible prices. Second, an effective medical device procurement strategy can help to purchasing the best quality medical devices. Third, an effective medical device procurement strategy can help to ensuring that medical devices purchase in a timely manner. According to UN Procurement Practitioner's Handbook (2017) Strategic medical device procurement develop through the following steps:-

Evaluate Current Processes: Developing an effective medical device procurement plan begins with evaluating the current purchasing processes. This means assessing the current procurement procedures and identifying the areas that require modification. This analysis should include an assessment of the types of medical device that are currently being purchased, their prices, their quality, and the efficiency of the procurement procedure.

Analyze The Market: The second step is to look at the medical device market. This means looking into the various types of medical devices that are available on the market, figuring out how much they cost, and assessing their quality. This study can help identify potential vendors or suppliers that can provide the best medical goods at the most competitive prices.

Set Goals: Establishing goals and objectives for procurement is the third phase. This entails figuring out what kinds of medical devices need to be bought, how much needs to be bought, and how much the products should cost. This will make it easier to guarantee that the procurement procedure is effective, economical, and centered on fulfilling the requirements of the healthcare business.

Create Timelines: The fourth step is creating a schedule for the procurement. This means planning a timeline for the purchase and delivery of medical device.

Decide The Budget: Make a procurement budget to find out how much money may be allocated for the acquisition of medical devices. This will increase the likelihood that the institution will be able to afford the essential acquisitions of medical device, as well as a cost-effective procurement process.

Define a plan: This means outlining the steps that will be taken to ensure that the procurement process is successful. This plan should specify the sorts of medical device that will be purchased, the quantity and cost of each item, the date of purchase, and the total amount of money that will be spent on the procedure.

Review the plan: Assess and close follow-up on the procurement plan's efficacy. This entails evaluating the procurement plan's efficacy and pinpointing its shortcomings. The kinds of medical equipment that will be bought, their prices, their quality, and the effectiveness of the procurement procedure should all be considered in this evaluation.

2.4 Measures of Medical Device Procurement Performance

Measures of medical device procurement performance in LMICs refer to the metrics and indicators used to evaluate the effectiveness and efficiency of the procurement process for medical devices. These measures help assess the performance of procurement activities and provide insights into areas of improvement (Martin R., 2018). Here are some commonly used measures of medical device procurement performance:

Cost Savings: This measure evaluates the procurement team's ability to secure medical devices at the lowest possible cost. It compares the actual purchase price of devices to the projected or benchmarked cost, highlighting cost-saving opportunities (UNFPA, 2017).

Supplier Performance: This measure assesses the performance of suppliers based on factors such as on-time delivery, product quality, responsiveness to inquiries, and adherence to contract terms. It ensures that suppliers meet the required standards and deliver products as expected (Lebrun DG., 2023).

Contract Compliance: This measure evaluates the extent to which procurement activities align with established contracts and agreements. It ensures that procurement processes follow the contractual terms, including pricing, delivery schedules, and quality requirements (UNOPS, 2021).

Lead Time: Lead-time measures the time taken from the initiation of a purchase request to the receipt of the medical device. It assesses the efficiency of the procurement process in terms of speed and responsiveness (UNDP, 2018).

Inventory Management: This measure evaluates the effectiveness of managing medical device inventory. It includes metrics such as stock turnover rate, stock outs, and carrying costs of inventory. Efficient inventory management ensures that medical devices are available when needed while minimizing holding costs (Kaura et al. 2015).

Supplier Diversity: This measure assesses the procurement team's efforts to engage diverse suppliers, including small businesses, minority-owned businesses, and women-owned businesses. It promotes inclusivity and supports the development of a robust supplier base (Hong et al., 2018).

Customer Satisfaction: This measure captures feedback from internal stakeholders (e.g., healthcare providers, clinicians) regarding the quality, availability, and suitability of medical devices procured. It helps gauge the overall satisfaction level with the procurement process and the devices supplied (Sharma, 2016).

Procurement Cycle Time: Measure evaluates the time taken to complete the entire procurement process, from requisition to receipt of the medical devices. It assesses process efficiency and identifies bottlenecks that can be addressed to expedite procurement (Kisurkat, 2016).

Return on Investment (ROI): ROI measures the financial return or cost-effectiveness of the medical device procurement process. It compares the benefits gained from the procurement activities, such as cost savings or improved patient outcomes, to the investment made in procuring the devices (Makokha, 2018).

2.5 Review of Theoretical Literatures

2.5.1 Quality Management Theory

The theory of quality management, first introduced by Edwards Deming in 1986, emphasizes the significance of the plan-do-Check-Act cycle, which is fundamental to continuous improvement. It underscores the importance of monitoring and consistently decreasing product variations. The planning stage encompasses establishing objectives and tasks; the execution stage integrates these activities into the process to make them tangible; the evaluation stage entails assessing and examining the results; and the adjustment stage involves identifying what needs to be modified to achieve ongoing enhancements (Deming, 1986).

The strategy is based on the idea of making continuous improvements to enhance quality and reduce costs. Deming thought that managers were often responsible for quality issues, so he emphasized the importance of management at both the individual and organizational levels. He stated that many quality issues arose from inefficient processes, procedures, and systems, which individuals could not control until they were given authority (Jarvis, 2018). Deming states that among the fourteen management principles, bidders ought to be selected based on quality rather than just the amount offered by the tender. According to the 1986 idea, the price cannot imply anything if there is no indication of the quality of the product being purchased. The inescapable outcome of insufficient quality control methods and procurement bodies' inclination to prioritize the bidder who presents the lowest price is substandard quality and excessive expense. Organizations should collaborate with bidders to ensure that their medical gadgets and services are of the highest caliber, according to Deming (1986) and Ishikawa (1985).Quality-related tender management activities, particularly the performance of the procurement, are encouraged to ensure effective competition and fairness among bidders, thus achieving best value for money. To guarantee the organization's incoming stocks are of the highest quality, tender management is a crucial task (Moncka et al., 2016). More generally, Dean and Bowen (1994) contended that in Quality Management, there are three basic principles and respective practices and techniques. These principles are:

- **Customer focus** is compatible with the value generation model of production.
- **Continuous improvement** is compatible both with Aristotelian epistemology and with process metaphysics.
- **Teamwork** is compatible with process metaphysics.

Therefore, from the above concepts, affected procurement performance will affect the quality of medical device.

2.5.2 Transaction Cost Theory

Oliver Williamson first presented the transaction cost idea in 1979. The organization's main objective is to reduce total medical device transaction costs, as per Williamson's (1979) perspective on transaction cost theory. This theory addresses topics including the organization's purpose for existing, how it should manage activities, and how it sets boundaries. However, it also says that systems with limited bargaining, like markets, may not be as effective at allocating resources as hierarchical organizations, like businesses.

Procurement is defined as obtaining goods, works, consultancy, or other services through purchasing, hiring, or other contractual means (Ethiopian Public Procurement Proclamation No. 649/2009). The technical supplier solicitation process is a key part of the procurement cycle, and it includes planning and strategy, specification, methods of procurement, sourcing, obtaining offers, evaluation, and contract award and management (CIPS/UNDP 2019, P. 6). Costs will arise from our evaluation of the procurement performance for medical equipment and services. Accordingly, by improving processes like planning, tender preparations, and tender assessments, a procuring body should aim to reduce the cost of awarding a contract to a supplier, who would return after carrying out each procurement. Therefore, transaction costs have an impact on whether to pick market exchange or vertically improve procurement performance operations. For this reason, this theory is relevant to studies that explain the conditions under which a business can handle medical device economic transactions openly and the conditions under which such transactions should be handled internally. Consequently, government health institutions may rely on a sustainable supplier to finish a big contract or to keep a consistent, secure flow of medical products into their facilities (Jarvis, 2018).

2.5.3 Carters ’10 Cs’ Theory

Ray Carter introduced a theory in 1995 that provided guidelines on the criteria outlined in the tender document and was then used to evaluate bidders in both the technical and financial ev aluation stages of the medical device tendering process. This allowed for the awarding of a co ntract to the most qualified and capable bidder. The Carters' comprehensive set of "10 Cs" criteria includes cost, cash, capacity, competency, consistency, commitment, compatibility, control, communication, and compliance. These criteria’s are:

- **Competency:** Is the supplier good at what they do?
- **Capacity:** Do they have enough people and machines to make what we need?
- **Commitment:** Will they keep making good stuff all the time?
- **Control:** Can they manage their business well, so they do not mess up?

- **Cash:** Are they good with their money, so they stay in business?
- **Cost:** Is their price for things not too high and not too low?
- **Consistency:** Will the stuff they make always be just as good?
- **Culture:** Do they work in a way that is nice and fair to everyone?
- **Clean**: Are they careful not to hurt the environment?
- **Communication:** Can we talk to them easily and do they understand us?

First, the planning stage looks at and defines the specific standards that each of these criteria will require be categorizing, basing on the principles of effective competition, fairness, accountability, and openness. Achieving value for money involves not only adhering to a clear description of the requirements but also following guidelines and proclamations of national a nd international procurement legislation that was designed in accordance with the nature of th e medical device.

Carter's criteria are strong when considering tender management operations from every angle. They contribute to the creation of an efficient and successful procurement performance by ch oosing bidders who can fulfill the required delivery, have overall financial stability, consisten tly deliver and improve quality, such as process capability or track record reliability, are dedi cated to key values like cost or quality management, have control systems to monitor and ma nage resources properly, have reduced costs in the aspect of price and whole life cycle cost, a nd more (Jarvis, 2018).

Carter's idea thereby contributed to the value of this study by avoiding the time, expense, effort, quality, and humiliation associated with awarding a contract to a vendor who subsequently proves to be unable to complete the assignment because of cash flow problems, company failures, or other factors.

2.5.4 Factors Affecting Medical Device Procurement Performance

Medical device procurement performance is a critical aspect of healthcare systems, especially in low- and middle-income countries (USAID, 2021). Some factors that influence this performance includes:- Organizational, Environmental, Technical and Behavioral

2.5.4.1 Organizational factors

Organizational factors play a crucial role in influencing procurement performance. These factors can affect the efficiency, effectiveness, and overall success of the procurement process (Ismail et al., 2018). Here are some key organizational factors that influence procurement performance:

Supplier relationships is crucial for effective medical device procurement performance. By building strong and collaborative partnerships with suppliers, medical device procurement teams can enhance communication, improve product quality, ensure timely delivery, and drive cost savings. Which involve cultivating partnerships that are beneficial for both the buying organization and the supplier. Effective supplier relationship management is a key component of successful procurement, as it allows companies to establish trust and build long-term alliances with suppliers. This leads to better communication, lower costs, improved reliability, and risk reduction. Effective supplier relations are rooted in open and consistent communication. Building a platform for transparent dialogue aids in understanding each other's needs, concerns, and expectations. Regular performance evaluation and providing constructive feedback to suppliers are critical in improving services and addressing any issues. It helps in reinforcing positive practices and rectifying shortcomings, contributing to the continuous enhancement of services and products (15 Vendor Relationship Management Tips to Increase Procurement ROI, Tradogram, by Gabriel Swain).

Strategic supplier relationship is the process of developing and maintaining long-term and mutually beneficial partnerships with the suppliers of goods and services, such as medical devices, in order to achieve the strategic goals and objectives of the organization in LMICs(Sillanpää, Ilkka;2015). Strategic supplier relationship involves the following elements: supplier selection, supplier evaluation, supplier development, supplier integration, and supplier performance measurement (2007 International Conference on Management Science and Engineering, ICMSE'07, 20 August 2007 through 22 August 2007, pp. 826.). Supplier selection is the process of identifying, screening, and choosing the most suitable and qualified suppliers that can meet the requirements and expectations of the organization(Journal of Purchasing and Supply Management, vol. 19, no. 4, pp. 1-17.). Supplier evaluation is the process of assessing and monitoring the performance and capabilities of the suppliers, based on various criteria, such as quality, cost, delivery, innovation, and sustainability (Krause, Scannell & Calantone 2000, Carr, Pearson 1999). Supplier development is the process of providing support and assistance to the suppliers, in order to improve their performance and capabilities, and to address their weaknesses and problems (Krause, Handfield & Tyler 2007). Supplier integration is the process of aligning and coordinating the activities and processes of the organization and the suppliers, in order to enhance the collaboration and communication, and to reduce the conflicts and risks (Journal of Operations Management, vol. 23, no. 3-4, pp. 371-388.). Supplier performance measurement is the process of collecting and analyzing the data and information on the outcomes and impacts of the supplier relationship, in order to provide feedback and

recognition, and to identify the areas of improvement and opportunities (Journal of Operations Management, vol. 25, no. 1, pp. 42-64.). This relationship will strengthened through-

Mutual Trust: Mutual trust in a supplier relationship refers to the establishment of a strong and reliable bond between a buyer and a supplier, built on transparency, honesty, and confidence. It involves both parties having faith in each other's integrity, capabilities, and commitment to fulfilling their respective roles and responsibilities. Mutual trust is essential in LMICs for fostering a successful and long-lasting supplier relationship. Key aspects of mutual trust in a supplier relationship include Transparency and Open Communication, Reliability and Consistency, Shared Goals and Objectives, Conflict Resolution and Long-Term Perspective (Carter, 2018).

Collaboration: A collaborative supplier relationship is a business relationship between two organizations where both parties work together to improve the quality of products and services while also reducing costs, especially in LMICs. This type of relationship is beneficial for both parties involved, as it helps create a more efficient supply chain. In order to maintain a collaborative supplier relationship, both organizations need to be committed to communication and collaboration. When it comes to business, the term “collaborative supplier relationship” can mean different things to different people. For some, it may simply refer to working with suppliers in a more efficient and cost-effective manner. However, for others, it may entail developing long-term, strategic relationships with key suppliers in order to jointly achieve business objectives. Regardless of how it is defined, there are many benefits to be gained from collaborating with your suppliers. Perhaps the most obvious benefit is that it can lead to cost savings. By collaborating with suppliers on projects, you can eliminate waste and duplication of effort, which can ultimately lead to lower costs for both parties. View suppliers as partners rather than mere vendors. Collaborate on product development, quality improvement, and cost-saving initiatives. Involve them in decision-making processes (Kim, 2019).

Performance Metrics: Performance metrics play a crucial role in evaluating and managing supplier relationships. They provide objective measures to assess supplier performance, identify areas for improvement, and make informed decisions. Some common performance metrics used in supplier relationships are: defect rate, inspection failure rate, customer satisfaction rating, delivery metrics, cost metrics, responsiveness metrics, and innovation metrics. Establish clear performance metrics and key performance indicators (KPIs) as well as regularly evaluate supplier performance based on quality, delivery times, responsiveness, and flexibility to strengthen relationships (Jim Hilbert, 2021).

Risk Management: An essential component of business operations in LMICs for companies that depend on outside suppliers for supplies or services is risk management in supplier relationships. Businesses may reduce the likelihood of interruptions, safeguard their interests, and improve the robustness of their supply chain by managing the risks connected to their supplier relationships. Recognize the possible dangers connected to suppliers. Create backup strategies to reduce risks and guarantee operations (Ian Bryce, 2022).

Supplier Development Programs*:* Supplier development programs are initiatives designed to improve the performance and capabilities of suppliers for the benefit of the buying organization. These programs focus on building strong relationships, enhancing communication, and providing training and assistance to suppliers. Implementing a supplier development program in LMICs can bring several benefits, including increased efficiency and production, reduced costs, enhanced buyer-supplier relationships, and the creation of shared value. By focusing Supplier development program initiatives designed to improve the performance and capabilities of suppliers for the benefit of the buying organization. These programs aim to enhance the buyer-supplier relationship, drive collaboration, and create shared value. By investing in supplier development, organizations can achieve increased efficiency, reduced costs, and align their supply chains with sustainable development goals (Jenks 2017). Procurement planning, staff competency, procurement procedure, resource allocation, ethical leadership, and transparency are other organizational aspects that affect procurement performances. Planning for procurement include determining the needs of the company, establishing goals, and creating plans to satisfy those needs. Planning effectively guarantees that procurement operations are in line with the aims and objectives of the company (Njeru, & Willy, 2020). Staff competency refers to the abilities, expertise, and proficiency of procurement personnel for effective procurement operations. Professional employees are capable of negotiating contracts, managing supplier relationships, and making well-informed procurement decisions (Makokha, 2018). The term "procurement procedure" describes the method of obtaining products, services, or labor from outside vendors, usually by means of a negotiation or competitive bidding process. Procurement processes are streamlined and provide consistency, transparency, and regulatory compliance when they are well-defined and standardized. Efficient procurement operations may be carried out with the help of clear processes, which also minimizes errors and delays (Rowlinson, 2019). Allocation of resources, including budget, technology, and human resources, is crucial for procurement performance. Insufficient resources can hinder the procurement process, leading to delays, inefficiencies, and compromised outcomes (WHO, 2021). Ethical leadership sets the tone for procurement

practices within an organization. Leaders who prioritize integrity, transparency, and fairness in procurement processes create a culture of trust and accountability, positively affecting procurement performance (Jarvis, 2019). Transparency in procurement processes promotes fairness, accountability, and trust. Openness and clear communication throughout the procurement cycle contribute to improved supplier relationships, reduced corruption risks, and enhanced procurement performance in LMICs(Datche, 2019).

Quality and Compliance: To guarantee patient safety and regulatory compliance, medical devices must adhere to strict quality and regulatory requirements. Within the realm of medical devices, a crucial and all-encompassing structure is in place to guarantee the security, effectiveness, and dependability of these gadgets over the course of their whole existence. A strict and methodical approach to quality assurance is becoming more and more necessary as medical devices develop and are included into contemporary healthcare procedures. Medical device quality assurance is a broad term that refers to a variety of procedures, guidelines, and standards that work together to maintain the best possible standards for product quality, patient safety, and regulatory compliance. In order to guarantee that medical devices are created, produced, and distributed in a way that satisfies strict quality standards and legal requirements, manufacturers and regulatory agencies implement a systematic and extensive set of processes, procedures, and activities known as medical device quality assurance. Ensuring the safety, effectiveness, and dependability of medical devices at every stage of their lifecycle rom design and development to production, distribution, and post-market surveillance is the main objective of medical device quality assurance. Teams in charge of procurement should evaluate suppliers' quality control procedures, credentials, and adherence to pertinent legislation, such as those set forth by the Singapore Health Science Authority, the Australian Therapeutic Goods Administration, or the Japanese Ministry of Health. Working with vendors that can offer medical equipment that are compliant and of the highest quality is essential (Miranda McLaren, 2022).

2.5.4.2 Environmental factors

Environmental factors can have a significant impact on procurement performance. These factors include Political instability and insecurity, economic fluctuations and inflation, Social and cultural diversity and preferences, and Legal and regulatory barriers and constraints (PPDA, 2016). These factors have had costly consequences for any public entity, and the country at large especially in LMICs. Organizations should not use financial performance as the sole metric to evaluate the effectiveness of the procurement function; rather, intangible performance indicators such as the caliber of the products and services acquired, the

promptness with which orders are delivered, customer satisfaction, dependability, flexibility, and employee caliber should all be taken into account. A buyer and one or more suppliers vying for the contract are considered the two parties involved in procurement, each with distinct objectives (Flak, 2018).

A. Political instability and insecurity: - Political instability and insecurity can have significant effects on procurement performance (Julius, 2021). These effects can disrupt supply chains, increase costs, and hinder the ability to secure necessary goods and services. Here are some key effects of political instability and insecurity on procurement performance:

Disruption of Supply Chains: Political instability and insecurity can lead to disruptions in transportation, logistics, and infrastructure, making it difficult to transport goods and materials (Jie Lu, 2020). This can result in delays, shortages, and increased lead times for procurement.

Increased Costs: Political instability can lead to economic instability, currency fluctuations, and inflation. These factors can increase the costs of imported goods and materials, making procurement more expensive. Additionally, increased security measures and insurance cost may be necessary to mitigate risks in unstable environments (Robinson, J. A., 2019).

Limited Supplier Options: In politically unstable regions, suppliers may face challenges in maintaining operations, meeting demand, or ensuring consistent quality. This can limit the pool of reliable suppliers, reducing competition and potentially increasing costs for procurement (Rahmandad, H., 2019).

Uncertain Regulatory Environment: Political instability can result in frequent changes in regulations, policies, and trade agreements. This uncertainty can make it difficult for procurement professionals to navigate compliance requirements and plan. It may also lead to increased bureaucracy and corruption, further complicating procurement processes (International Journal of Operations & Production Management, 2021).

Weakened Business Relationships: Political instability and insecurity can strain relationships with suppliers, making it harder to establish and maintain long-term partnerships. Trust and communication may be compromised, leading to difficulties in negotiating contracts, resolving disputes, and ensuring reliable delivery (Lamprecht, 2021).

Increased Risk of Fraud and Corruption: In politically unstable environments, the risk of fraud and corruption can be higher. Unstable governments and weak institutions may lack effective oversight and enforcement mechanisms, making it easier for unethical practices to occur. This can undermine the integrity of procurement processes and increase the risk of receiving substandard goods or services (Jarvis, 2018).

B. Foreign Currency: The effect of foreign currency on the procurement performance of medical devices can be significant. The medical device company collaborated with Citi on a supply chain finance program, providing access to suppliers to monetize their receivables with the bank. The program was rolled out to qualified suppliers across Asia in a systematic manner, seamlessly reaching local currency as well as approved foreign currency suppliers. Many large-volume suppliers were already on the Citi platform, expediting their access to the program. The platform also allows flexibility for changes in invoice currency. Fluctuations in currency exchange rates can influence the cost of importing medical devices, which in turn can affect procurement decisions and overall performance (Manufacturers Prepare for Risks in Foreign Currency Markets, by Mary Henehan, 2022). Some key points to consider in foreign currency:

Cost of Medical Devices*:* When a country's currency weakens against the currency of the country from which medical devices are imported, the cost of those devices increases. This can lead to higher procurement costs for healthcare providers and potentially influence their budgets and financial performance (International Trade Administration, Israel Country Guide, 2019).

Financial Performance: The effect of foreign currency on procurement performance can ultimately influence the financial performance of healthcare organizations. Higher procurement costs due to unfavorable exchange rates can put pressure on profitability and financial sustainability (Trade and Investment Factsheets: Germany, 2023).

2.5.4.3 Technical Factors

Technical factors affecting procurement performance in LMICs (low- and middle-income countries) can have significant implications for the efficiency and effectiveness of the procurement process (Kinyanjui, 2021). Here are some key points about the effect of technical factors on procurement performance: -

Technology and Innovation The medical device industry is rapidly advancing, with significant technological advancements on the horizon that have the potential to revolutionize health care delivery. Despite challenges like regulatory hurdles and concerns over data security, the benefits of medical device technology are significant, with the potential to improve patient outcomes, reduce health care costs, and address health disparities. As the industry continues to evolve, medical device businesses continue to invest in research and development, adapt to changing market conditions, and prioritize patient safety and data security to ensure continued success (Outcomes of Public Procurement in Technology Development of Medical Devices, International Archives of Health Sciences, 2020). To compete in such an innovative world and select appropriate medical devices for health facilities, procurement entities should leverage

technology and embrace innovation to optimize procurement performance. By implementing electronic procurement systems, utilizing data analytics for demand forecasting, and adopting digital platforms for supplier management, we can enhance efficiency and streamline the procurement process.

Lack of technical expertise: LMICs may have a shortage of skilled procurement professionals with the necessary technical expertise to effectively utilize procurement technologies. This can result in difficulties in implementing and managing complex procurement systems, leading to suboptimal performance and potential errors (WHO, 2021).

Challenges in the supply chain: LMICs often face challenges in accurately forecasting device needs, procuring and distributing devices, and managing donations. Limited infrastructure can make transporting and delivering equipment challenging, leading to reduced availability, quality, and safety of devices (Kasper, 2016).

Increased Supplier Selection Challenges: The complexity and diversity of medical equipment can add to the difficulties of the procurement process. Healthcare companies must carefully consider and choose suppliers who can fulfill their unique demands and specifications, given the variety of equipment available (Rajapakshe, 2020).

Increased Supply Chain Risks: The complexity of medical devices can introduce additional risks to the supply chain. Procuring diverse devices from multiple suppliers may lead to challenges in managing inventory, ensuring timely delivery, and maintaining quality control (Farrington, 2016).

In addition, the limited availability and accessibility of local and international suppliers and manufacturers of medical devices in LMICs can have significant effects on procurement performance. These effects can include delays in procurement, increased costs, and challenges in meeting the demand for medical devices (Yellow Handbook, 2021).

Demand-based procurement: Medical device procurement refers to a procurement strategy that focuses on meeting the actual demand for medical devices. This approach aims to align the procurement process with the needs and requirements of healthcare providers and patients (Springer, 2019). By considering the specific demand for medical devices, demand-based procurement offers several benefits. Such as:

Improved resource allocation*:* Demand-based procurement allows for better allocation of resources by ensuring that medical devices are procured based on the actual needs of healthcare

facilities. This helps prevent overstocking or understocking of medical devices, leading to more efficient use of resources (Deliv Res., 2015).

Enhanced patient care: By aligning procurement with the demand for medical devices, healthcare providers can ensure that they have the necessary equipment to deliver high-quality patient care. This includes having the right devices available when needed, reducing delays in treatment, and improving patient outcomes (Expert Rev Pharmacoecon Outcomes Res. 2019).

Cost savings: Demand-based procurement can lead to cost savings by avoiding unnecessary purchases and reducing inventory-holding costs. By accurately assessing the demand for medical devices, healthcare facilities can optimize their procurement processes and avoid excess inventory or wastage (BMC Public Health, 2016).

Increased flexibility and responsiveness: Demand-based procurement allows healthcare facilities to adapt to changing needs and priorities. By regularly assessing demand and adjusting procurement plans accordingly, healthcare providers can respond to emerging healthcare challenges and ensure they have the right devices available to meet patient needs (Nyeko S., 2020).

***Stakeholder engagement*:** Demand-based procurement involves engaging various stakeholders, including healthcare providers, patients, and procurement agencies. This collaborative approach ensures that the procurement process considers the perspectives and input of those directly involved in patient care, leading to more informed and effective procurement decisions. (Health Research Authority Decision: 2016).

2.5.4.4 Behavioral Factors

Behavioral factors play a crucial role in shaping the performance of procurement activities. The application of behavioral economics can effectively influence supplier selection and enhance decision-making processes, leading to optimized outcomes. However, it is important to acknowledge that there are also adverse consequences associated with behavioral factors that can impede the overall procurement performance (Muya et al., 2019). The impact of behavioral factors on procurement performance encompasses various aspects.

Biases in supplier selection: Cognitive biases such as anchoring, confirmation bias, or familiarity bias can influence procurement teams during supplier selection. These biases can lead to suboptimal choices and limit the exploration of new suppliers or competitive costs (Hinson and McCue, 2019).

Heuristics in decision-making: Mental shortcuts, known as heuristics, can simplify the decision-making process but can also lead to errors in judgment. Relying solely on reputation

or past interactions without thorough assessment may restrict innovation and hinder cost-effectiveness (World Health Assembly, 2017).

Lack of transparency: Lack of transparency in supply chain operations can lead to inefficiencies and potential fraud or corruption. When information about failures or unethical practices is hidden, it can undermine trust and negatively affect procurement performance (Kakwezi & Nyeko, 2019).

Ineffective negotiation strategies: Behavioral factors can influence negotiation strategies, such as anchoring too high or too low, which can result in unfavorable terms or missed opportunities. Ineffective negotiation techniques can lead to higher costs, delays, or subpar supplier agreements (Cousins, 2023).

Resistance to change: Loss aversion, the inclination to prioritize the avoidance of losses rather than the pursuit of gains, may result in reluctance towards change within procurement teams. Such reluctance has the potential to impede the integration of new suppliers or cutting-edge solutions, thereby constraining opportunities for enhanced performance (Van Weele, 2016).

Lack of collaboration and communication: Behavioral factors such as solo thinking, lack of collaboration, or poor communication within procurement teams can hinder performance. These factors can lead to misalignment, delays, and missed opportunities for cost savings or value creation (Shaw, 2020).

2.5.4.5 Supply chain management

The optimization of medical device procurement performance is heavily dependent on effective supply chain management. This encompasses a wide range of activities and processes involved in the sourcing, manufacturing, distribution, and delivery of medical devices. Its significance in medical device procurement lies in its ability to enhance efficiency, reduce costs, improve visibility, mitigate disruptions, ensure quality, and foster collaboration and communication among stakeholders. The medical device supply chain, which is a complex network comprising the production, distribution, and delivery of a diverse array of medical devices used in patient care, involves various entities such as manufacturers, suppliers, distributors, healthcare facilities, and regulatory bodies (Mason, 2018).

Every element of the supply chain, starting from the acquisition of raw materials and components to the production of the devices, their promotion, and functionality, is overseen by strict quality and safety regulations. Organizations like the Food and Drug Administration in the United States guarantee that devices adhere to set standards and establish regulations that cover all facets of the supply chain. Through efficient supply chain management, healthcare

institutions can enhance their procurement efficiency and guarantee the presence of top-notch medical devices as required (Medical Device Supply Chain Strategy, 2023).

2.6 Relationship between the Factors and Measures of Medical Device Procurement Performance

The relationship between factors affecting medical device procurement and procurement performance is crucial for optimizing healthcare delivery in low and middle-income countries (S. Nyeko, 2019). Here are some commonly used measures of the relationship between the factors and measures of medical device procurement performance:-

Supplier Management: the management and relationship may directly affect all Lead-time, quality, and expense with suppliers. The procurement process as a whole, as well as the lead-time, quality, and cost of deliveries, can be impacted by variables including supplier selection, teamwork, and communication. Consequently, the performance of medical device procurement is directly impacted by factors affecting procurement. (Asmsalu Keno, 2017).

Sustainability Initiatives: Increasing focus on sustainability and environmental responsibility can influence procurement cost, quality and lead-time. Organizations may prioritize sourcing materials or services from suppliers that meet specific sustainability criteria, which can require additional research and evaluation (Fazer and Fiskars, 2022)

Organizational Factors: Organizational factors (e.g., leadership, governance, policies) play a significant role in both procurement and performance. Effective procurement policies and practices enhance performance by ensuring timely access to quality devices (Juma, 2019).

Environmental Factors: The external environment (e.g., regulatory frameworks, market dynamics, and technological advancements) affects procurement decisions. Adaptation to environmental changes impacts performance (e.g., adopting new technologies, complying with regulations) (Arbe Bashuna, 2018).

Life-Cycle Considerations: Procurement decisions influence the entire life cycle of medical devices. Properly selected devices (based on local needs, maintenance capacity, and cost-effectiveness) lead to better performance over time (WHO procurement handbook, 2017).

2.7 Empirical Review

The factors affecting the procurement performance of medical devices in low- and middle-income countries are the various internal and external conditions and circumstances that

influence the efficiency and effectiveness of the procurement process of medical devices in these countries.

There have been numerous studies that have been conducted on factors affecting public procurement performance in Africa and other parts of the world. (Kiage, 2023) An empirical study on factors affecting procurement performance in the Kenyan public sector pointed out that the most important factor was found to be procurement planning, followed by contract management, as pointed out by most of the respondents. This was because good plans result in effectiveness and efficiency in achieving projected results. (Mamiro, 2020) agrees with these findings and concludes that one of the major setbacks in public procurement is poor planning and management of the procurement process, which include needs that are not well identified, predictable, unrealistic budgets, and the inadequacy of the skills of staff responsible for procurement. The study found out that there was poor contract management at the sector characterized by delays in payments to suppliers which hampers greatly on their service delivery, lack of proper controls in management of contracts where the user was left alone to manage and monitor own projects without participation of procurement function. Similarly, the study found out that were no project progress reports filed with management. (Boniface, 2019) Conducted an empirical research on factors influencing public procurement performance in the Kenyan public sector pointed out the Management of procurement life cycle in Kenyan public sector was the highest dimension enhancing positive procurement performance and the use of open tendering as the most preferred method of procurement.

According to Senait, Asefa et el (2016) the study on Factors Affecting Manufacturing Company Procurement Performance found that staff competence and resource allocation were the most related factors affecting procurement performance for that specific manufacturing company, and it suggested that more research be done on the remaining two variables, procurement procedures and procurement planning. A study that was conducted on identify the factors that determine procurement performance of University concluded that staff competency, procurement performance was influenced significantly by top management support and the work environment (Asmsalu Keno, 2017).

The finding of an empirical study of Singapore Manufacturers on Business Environment, Operations Strategy, and Performance identified there were links between environmental elements such labor availability, competitive antagonism, and market dynamism, as well as the operations strategy choices influenced by competitive priorities. When confronted with the same environmental stimuli, the findings also show that high performers prioritize different competing priorities than low performers. In addition to addressing important questions about

the role of the environment in explaining operations strategy, the research shows that environmental variables can be used to effectively control for industry impacts in a variety of operations strategy empirical investigations. The study conducted by (Sylvia C. W., 2015) concludes that information technology, ethics, and employee competency all have a favorable impact on the procurement function at the Kenyan institutes under investigation.

This thesis aims to bridge the critical knowledge gap in the procurement of medical devices within low- and middle-income countries by systematically investigating the specific challenges and environmental factors that influence procurement performance. Through targeted empirical research, this study seeks to develop a contextual framework that enhances procurement strategies and policy recommendations, thereby improving the accessibility and quality of medical devices in resource-constrained healthcare settings.

Therefore, from the above-mentioned literature and empirical review, the research gap is that they all focus on general procurement practices and do not address the area of medical device procurement performance.

2.8 Conceptual or Theoretical Framework of the Study

The main concept of the study is the procurement performance of medical devices by the Ethiopian Pharmaceutical Supply Service (EPSS), which is the dependent variable of the study. It is measured by various criteria, such as cost, quality, procurement lead-time, and customer satisfaction.

The main variables of the study are the factors that affect the procurement performance of medical devices by the Ethiopian Pharmaceutical Supply Service (EPSS), which are the independent variables of the study.

The main source of the study is the theoretical and empirical literature on the procurement of medical devices in low- and middle-income countries, which is the literature review of the study. They provide the background and context for the study and support or challenge the framework of the study.

The following diagram can illustrate the conceptual or theoretical framework of the study:

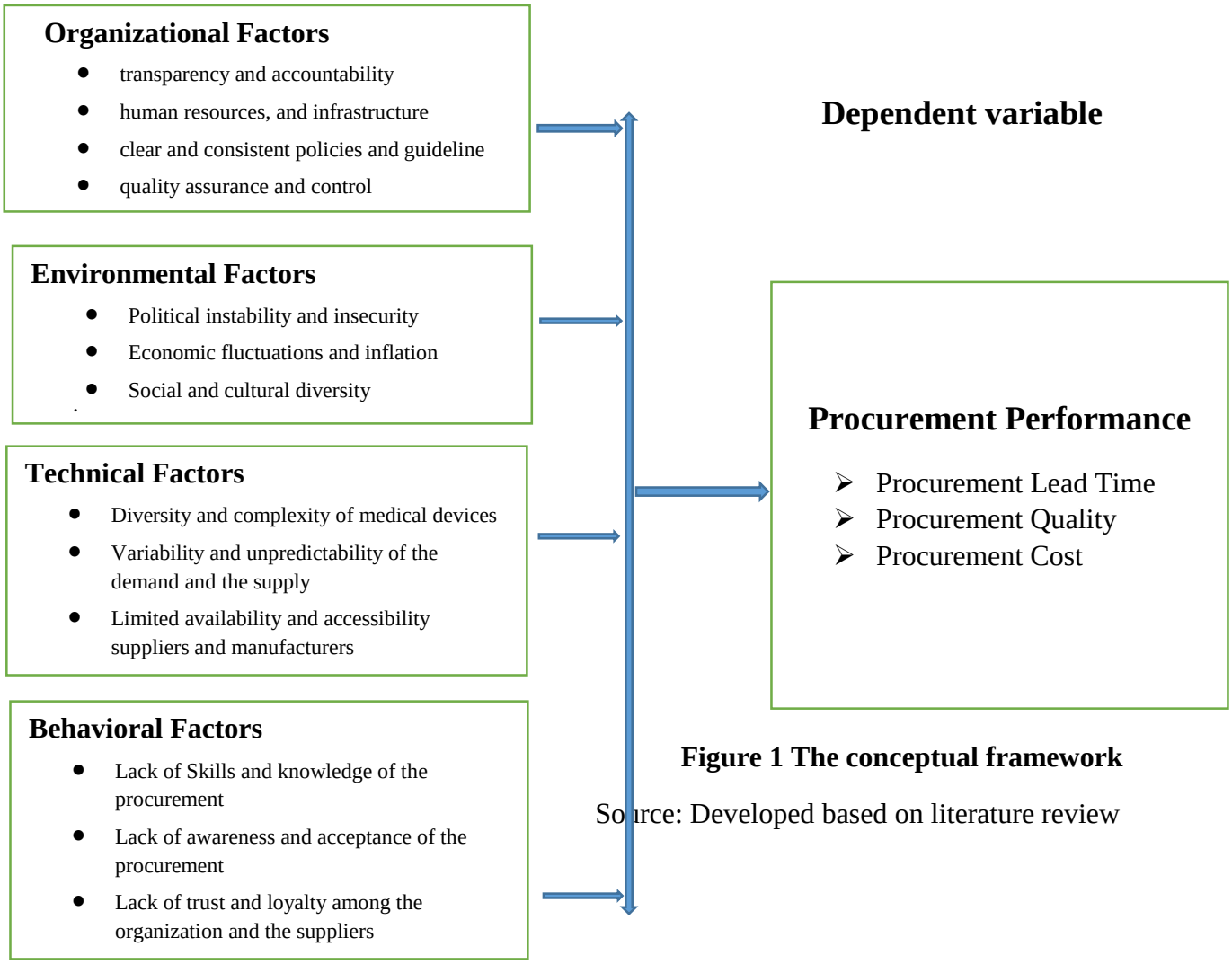


Figure 1 The conceptual framework

Source: Developed based on literature review

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The research strategy and technique utilized to accomplish the study's goals are presented in t his chapter. In order to accomplish the goals of the research, it contains a description of the study area, research strategy, research design, study population, data source and type, data col lection process, data analysis, validity and reliability testing, and ethical issues.

3.2 Description of study area

The Ethiopian Pharmaceuticals Supply Service (EPSS), formerly known as the Ethiopian Pharmaceuticals Supply Agency (EPSA), is a governmental pharmaceuticals supply service established by proclamation number 553/2007 in September 2007. Its mission is to supply quality-assured pharmaceuticals to public health facilities at an affordable price in a sustainable manner (PSTP II, 2021). The EPSS oversees the healthcare supply chain for the public sector. Its main responsibilities include the quantification, procurement, storage, and distribution of pharmaceuticals, medical supplies, devices, and reagents through 19 hubs located across the nation. The EPSS operations generate around USD 1.5 billion in revenue each year (PSTP II, 2021). This study focuses on the variables influencing the Ethiopian Pharmaceuticals Supply Service's performance in medical equipment procurement. The service key functions are divided into two categories: outbound logistics, which includes distribution, fleet managemen t, inventory and warehouse management, and tender management directorates; and inbound l ogistics, which includes quantification and market shaping, contract management, and tender management directorates (PFSA BPR, 2016). With reference to the Ethiopian Pharmaceutical Supply Service, which is in charge of maintaining quantification and procurement procedures for medical equipment that are both sustainable and quality-
assured, the study concentrated on the variables influencing the procurement performance of medical devices.

3.3 Research approach

The research employs a quantitative approach to generate numerical data that can be turned into numbers. This approach focuses on counting and classifying aspects, as well as developing statistical tools and figures to characterize the observed phenomena through structured questionnaires or techniques. Quantitative data is more suitable for highly structured research that can be statistically measured (V. Chinnathambi, 2023). The quantitative approach tends to

yield generalized findings by subjecting the generated data to rigorous quantitative analysis in a formal and rigid fashion.

3.4 Research Design

The research design is the conceptual structure within which the research is conducted. It constitutes the blueprint for the collection, measurement, and analysis of data. This study begins with the purpose of understanding a problem or condition and ends with the goal of establishing a causal effect between variables to understand how one variable influences or causes changes in other variables. Explanatory research, as defined by Athumani (2012), is a study design used to figure out what is going on, why it is going on, and what can be done to solve it. Therefore, this study employs an explanatory research design that examines the causes and reasons for the subject in order to assess the factors that affect the procurement performance of medical devices. This design is important in determining the knowledge and views of the respondents. The explanatory design is used to investigate phenomena that are not well understood or explained (Scribbr, 2021). The research strategy is a case study focusing on the Ethiopian Pharmaceuticals Supply Service (EPSS) as the unit of analysis. Surveys and documentation are used to provide a comprehensive and in-depth understanding of the procurement performance of medical devices by the EPSS.

3.5 Population and Sample

3.5.1 Target Population

The study population is the operational definition of the target population (Henry, 2015; Bickman & Rog, 2015). The target population for this research consists of all staff (including officers, team leaders, technical advisors, and directors) involved either directly or indirectly in the procurement of medical devices at the Ethiopian Pharmaceuticals Supply Service. This includes staff from the quantification and market-shaping unit, tender management unit, contract management unit, and other cross-sectional units. The target population of this research is defined as 100 professional staff who directly participate in the procurement of medical devices (inbound logistics of the Ethiopian Pharmaceuticals Supply Service). This includes 20 staff from the quantification and market-shaping directorate, 25 staff from the tender management directorate, 50 staff from the contract management directorate, and 5 technical advisors from the inbound logistics director's office.

3.5.2 Sampling Technique

Since the sample size is small, the study employs a census population sampling technique to gather the required and relevant information for the quantitative data.

3.6 Data Sources

3.6.1 Primary data sources

Primary data sources are the data sources collected directly by the researcher for the specific purpose of the research. The primary data sources for this research proposal include:

Surveys: Surveys use standardized and structured questionnaires to collect quantitative and qualitative data from a large and representative sample of the population. The surveys in this study target the staff of the Ethiopian Pharmaceuticals Supply Service as the main respondents. The surveys measure the factors affecting the procurement performance of medical devices by the EPSS, as well as the procurement performance itself, using various scales and indicators such as the Likert scale, rating scale, and key performance indicators (KPIs).

3.6.2 Secondary data sources

Secondary data sources are the data sources collected by other researchers or organizations for other purposes but that are relevant and useful for the research. The secondary data sources for this research proposal include:

Documents: Documents are the data sources that contain written or printed information and evidence related to the research topic. The documents for this research proposal include the official reports, publications, policies, and guidelines of the Ethiopian Pharmaceutical Supply Service, the FMoH, the WHO, and other relevant organizations, as well as the academic articles, books, and journals on the procurement of medical devices in low- and middle-income countries. The documents provide the background and context for the research and support or challenge the research findings.

3.7 Data Collection Procedures

The data collection process considered various factors that influence procurement performance. To investigate these factors, a structured questionnaire was utilized, employing a 5-point Likert scale rating system for both independent and dependent variables, ranging from 1 (very low) to 5 (very high). The research instrument was meticulously designed to ensure clarity and eliminate any potential ambiguity, aligning with the specific objectives of the study. Prior to

commencing data collection, the selected participants were duly informed and their consent was obtained. Subsequently, the self-administered structured questionnaire was distributed to each respondent, taking into account his or her willingness to participate. After a designated period, the questionnaires were collected, accompanied by expressions of gratitude for their valuable time and contribution. Ultimately, the investigator thanked each response for their cooperation. The study subjects provided the primary data, which was gathered and carefully reviewed for consistency and completeness before analysis started.

3.8 Data analysis

The process of analyzing data involves making many judgments and doing certain activities t hat could be exclusive to a given study. Specifically, data analysis encompasses a range of tasks that may require the utilization of many statistical methods in diverse contexts. First, the gathered data was examined to look for any mistakes and make sure it was accurate and comprehensive. After the data was checked, the descriptive data was analyzed and coded using IBM Statistical Package for the Social Sciences (SPSS) version 25. To understand the correlations between the many variables investigated in this study, the data analysis comprised frequency distribution, percentage, mean, standard deviation, product-moment Pearson's correlation, analysis of variance, and bivariate analysis. In order to gain a comprehensive understanding of the data we have collected, descriptive statistics instruct us on how to portray information both numerically and graphically. The paper reports that the relationships and variables influencing the performance of medical equipment procurement were examined using Pearson's correlation and multiple regression analysis, which comprises ANOVA and summary models in inferential statistics.

3.9 Validity and Reliability test

3.9.1 Validity test

According to Kothari (2004), validity—which indicates how effectively an instrument measures what it claims to measure—is the most important prerequisite for research. To verify the validity of the questionnaires, the data collection tool was piloted on a subset of respondents. The readability, ambiguity, and clarity of the statements and questions were asse ssed. During the pilot study, the researcher was able to clarify certain terminology; therefore, the tools needed to be improved and altered properly.

3.9.2 Reliability test

The investigator supervised the data collecting process and examined completed questionnair es to resolve any discrepancies. Data collectors received training on the instruments and proto cols used for gathering data. The Cronbach's test was employed to evaluate the instrument's dependability. The consistency shown in several observations of the same phenomena is known as reliability.

The degree to which each item on a scale measures a different feature of the same attribute is known as internal consistency. According to Alsaffar et al. (2013), a Cronbach's alpha value falls between 0 and 1, with a value of 0.7 or above denoting internally consistent and trustworthy data. A pilot test was carried out on 15 people to confirm the instrument's reliability after experts examined the questionnaire; however, these subjects were not included in the final research. The questionnaire was then modified in light of the input that was obtained in order to guarantee a Cronbach's alpha of 0.7 or better. The item-total statistics for Alpha are detailed in Table 1.

Table 1: Reliability Test

No.	Variables	Number of items	Cronbach's alpha
1	Organizational Factors	5	0.756
2	Environmental Factors	3	0.702
3	Technical Factors	4	0.712
4	Behavioral Factors	4	0.723
5	Procurement performance Indicators	5	0.743
6	Procurement performance rating with regard to five R's	5	0.744
Total		**26**	**0.73**

Source: SPSS own survey (2024)

As seen in the above table, the result indicated that the value of Cronbach's Alpha for all variables was above 0.70. Therefore, all variables are sufficiently reliable and internally consistent.

3.10 Ethical consideration

The AAU SOC formally corresponded with the organization (EPSS) via letter to acquire offic ial authority to carry out the research prior to starting data collection. Prior to distributing the research tool, consent was obtained from each participant before they were added to the study as respondents. Interviewers explained the purpose, parameters, and anticipated results of the research during data collection. Participants provided all essential information, which was managed confidentially and ethically to avoid misrepresenting the participants' original concerns. Additionally, respondents guaranteed me the confidentiality of any information collected for the study. No specific person was identified based on the comments of the respondents in any reports or publications in order to preserve their anonymity.

3.11 Summary

This chapter presents the research design and methodology for the study. It described the study area, research approach, research design, study population, data sources, data collection procedure, data analysis, validity and reliability tests, and ethical considerations. The research employs a quantitative approach with an explanatory research design. The primary data was collected through surveys, and the secondary data was collected through document review. The data was analyzed using quantitative and qualitative data analysis techniques.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSIONS

In light of the research objectives and questions posed in the first chapter of the study, this ch apter examines the data collected and explains the findings. The primary data used in all of the data sets came from individuals who worked in the organization's contract management, tender management, and market-shaping units, both directly and indirectly. Data coding was produced to represent each item and variable so that the collected data could be converted into a numerical representation. Thus, following the completion of the data coding, tables, charts, frequency distributions, and percentages were used to evaluate, discuss, and present the findings. The respondents' sociodemographic data is displayed in the first part of the questionnaires. Regression analysis between independent and dependent variables is presented in the final section, whereas performance aspects of medical device procurement for EPSS are included in the second portion. Statistical Package for Social Science software (SPSS) was used to compute the analysis of the data that was gathered.

4.1 Response Rate of the Study

The ratio of valid replies to all eligible respondents in the sampled population is known as the response rate. As a general rule of thumb, the researcher might say that representations of the target population are appropriate and acceptable if the response rate is 80% or above (Fincham 2008, P. 2). The study discovered that 96 out of 100 questionnaires were accurately completed and returned for processing, as seen in the graph below, giving the study a 96% response rate. Four (4%) of the surveys have not been sent back. Because 96 surveys received more responses than the typical thumb rule for response rates, they were thus considered suffi cient.

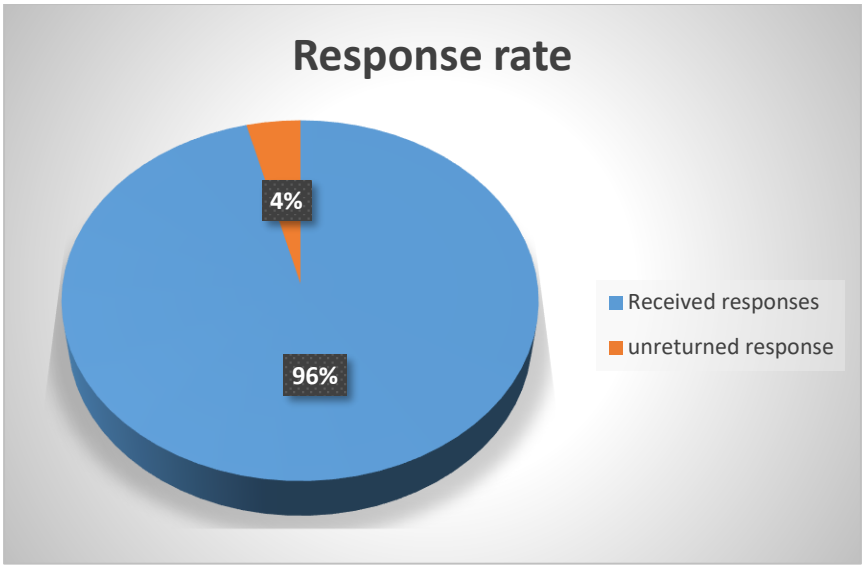


Figure 2: Response rate of the study

Source: SPSS own survey (2024)

4.2 Socio-demographic Characteristics of the Respondents

Respondents were asked to fill in their socio-demographic information, including gender, educational qualification, year of experience, working directorate, and job position, and correspondingly, the result is depicted here in the table below.

Table 2: Socio-demographic information

Socio-demographic character	Sub category	Frequency	Percent (%)
Gender	Male	63	66
	Female	33	34
Educational qualification	Diploma	0	0
	Degree	85	88
	Masters	11	12
	PhD	0	0
Working Directorates	TMD	26	27.08
	QMSD	20	20.84
	CMD	50	52.08
Year of experience	Below 3 years	58	60.42
	3 to 6 years	15	15.62
	7 to 10 years	16	16.67
	Above 10 years	7	7.29
Job Position	Director	0	0
	Team leader	16	16.67
	Advisor	5	5.21
	Officer	75	78.12

Source: SPSS own survey (2024)

Men made up 66% of the replies, while women made up 34%, as can be seen in the above tab le. The results show that both men and women took part in this study.

Despite the fact that the questionnaire asked for educational qualifications at the diploma and Ph.D. levels, no respondent was included in this study. On the other hand, 11 (12%) respondents had a master's degree, whereas 85 (88% of the replies) were from those with a degree, and this group dominated the response. This suggests that every respondent had a sufficient level of knowledge to comprehend and complete the survey. Among the organizational experience, respondents with experience of below 3 years accounted for 58 (60.42%) and dominated the others, followed by the experience of 7 to 10 years accounted for 16 (16.67%), 3 to 6 years accounted for 15 (15.62%), and above 10 years of experience accounted for 7 (7.29%) of the responses. Experts from TMD and QMSD made up 26 (27.08%)

and 20 (20.84%) of the replies, respectively, while respondents from CMD accounted for 50 (52.08%) of the responses and dominated the other directorates. Regarding their occupation and response rate, even though the questionnaire asked about director's response, they are not answering. Officers make up the majority of respondents, with an officer level rating of 75 (78.12%), followed by team leaders 16 (16.67%) and advisors 5(5.21%).

In general, the socio-demographic profiles of respondents reveal that the majority of them have significant expertise, implying that they could provide credible information about the subject.

4.3 Medical Device Procurement Performance Factors

First, the Ethiopian Pharmaceuticals Supply Service evaluated its medical device procurement procedure in order to identify the variables influencing its performance. As a result, the respondents were asked to demonstrate the performance metrics for medical device procurement in their company. The four variables that make up the medical device procurement factors are the following: technical, behavioral, environmental, and organizational.

Likert scales were used as the main instrument in this study questionnaire because they provi de five possible answers to a statement or question and allow respondents to determine their p ositive-to-negative strengths. As Wade M. Vagias (2016). Anchors for Likert-type scale responses. The most widely used indicator of central tendency, the mean, was used in this study's research by the Clemson International Institute for Tourism & Research Development , Department of Parks, Recreation, and Tourism Management. This led to the determination of the means for the Likert scales, which have a strong disagree at 1 and a strong agree at 5.

Given that $4 \div 5 = 0.80$ is the greatest number on the scale, the range is defined as $(5 - 1 = 4)$ and then divided by five to obtain the minimum and maximum length of the 5-point Likert-type scale. Then, as seen below, the maximum of this cell was calculated by adding one, the lowest value on the scale. Respondents scored the factors in the questionnaire on a Likert scale from 1 to 5, where 1 represented strongly disagreeing and 5 represented strongly agreeing. The Likert scale has a five-point average.

Table 3: Decision rule summary

Mean Result	Result	Result Interpretation
1 – 1.6	Strongly disagree	Very uninfluential
1.61 – 2.4	Disagree	Uninfluential
2.41– 3.2	Neutral	Moderately influential
3.21 – 4.00	Agree	Influential
4.01 – 5.00	Strongly agree	Very influential

Source: SPSS own survey (2024)

4.3.1 Organizational Factors on Medical Device Procurement Performance

The study aimed to examine the effect of organizational factors on medical device procurement performance in the Ethiopian pharmaceutical supply service, and, accordingly, its findings are presented here in the table below.

Table 4: Organizational factors on medical device procurement performance

Items	N	Mean	Std. Deviation
There is shortage of allocating budget for medical device in EPSS	96	4.45	0.647
Procurement staffs responsible for medical device procurement Show inability to apply procurement principles and guidelines.	96	4.40	0.571
There is lack of transparency in the procurement of medical devices in EPSS.	96	4.05	0.731
Securing the right price is hampered by the organization's lack of coordination with suppliers.	96	3.58	0.890
Unnecessary urgencies in medical device procurement is common in EPSS	96	3.79	0.794
Average Mean & Standard Deviation	**96**	**4.05**	**0.727**

Source: SPSS own survey (2024)

As the result above in Table 4 shows, the average mean 4.05 recorded for organizational factors on medical device procurement performance implying questions relating falls under very influential, and also as the descriptive statistics depicted, mean standard deviation was 0.727

shows responses were more varied. This suggests that research participants felt that organizational characteristics have an impact on procurement performance. A study conducted at a Kenyan public institution (Sylvia C. W., 2021) found that organizational characteristics significantly affect procurement success, which lends credence to this. The results of this study also corroborated the notion that factors that negatively affect procurement effectiveness include a lack of funding, staff incompetence, a lack of openness, the organization's failure to coordinate with suppliers, and needless hurry.

4.3.2 Environmental Factors on Medical Device Procurement Performance

The study's objectives were to investigate how environmental factors affected the performanc e of medical device procurement in the Ethiopian pharmaceutical supply service. As a result, the table below presents the study's findings.

Table 5: Environmental factors on medical device procurement performance

Items	N	Mean	Std. Deviation
Medical device procurement lead-time increased due to political instability in the country.	96	4.43	0.557
Medical device price has increased due to inflation in foreign currency exchange rates.	96	4.53	0.522
Ethiopia\s legal and regulatory system limited the number of suppliers participating in tender	96	4.28	0.601
Average Mean & Standard Deviation	**96**	**4.41**	**0.56**

Source: SPSS own survey (2024)

The results of Table 5 above show that environmental variables have an average mean of 4.41 , indicating that the questions associated with this are quite influential. Additionally, the mean standard deviation of the descriptive statistics is 0.56, indicating that the data points are less variable and more closely spaced from the mean. This implies that respondents to the poll agreed that environmental factors affect procurement performance. This study provided more support for the idea that the country's legislative and regulatory structure, political instability, and variations in foreign exchange rates all have a significant influence on procurement performance.

4.3.3 Technical Factors on Medical Device Procurement Performance

The study's objectives were to investigate how technical factors affected the performance of medical device procurement in the Ethiopian pharmaceutical supply service. As a result, the table below presents the study's findings.

Table 6: Technical factors on medical device procurement performance

Items	N	Mean	Std. Deviation
There is loss of quality for medical devices due to failure to use standardized medical device specifications	96	3.92	0.816
There is limited number of both local and international medical device suppliers.	96	4.24	0.818
There is failure to monitor procurement performance for medical device.	96	4.67	0.592
The country's lack of medical device manufacturers leads to longer times.	96	4.57	0.538
Average Mean & Standard Deviation	**96**	**4.35**	**0.691**

Source: SPSS own survey (2024)

Table 6's result above indicates that technical factors have an average mean of 4.35, which suggests that the questions related to these factors are highly influential. The descriptive statistics also show that the mean standard deviation is 0.691, which suggests that the data points are relatively close to the mean and have less variability. This suggests that participants in the study concurred that technical aspects have an impact on procurement performance. This study also provided evidence in favor of that a nation's procurement performance is greatly impacted by the absence of medical device manufacturers, a shortage of both domestic and foreign medical device suppliers, and the usage of non-standardized medical device requirements.

4.3.4 Behavioral Factors on Medical Device Procurement Performance

The study's objectives were to investigate how behavioral variables affected the performance of medical device procurement in the Ethiopian pharmaceutical supply service. As a result, the table below presents the study's findings.

Table 7: Behavioral factors on medical device procurement performance

Items	N	Mean	Std. Deviation
The medical device procurement team lacks the desired skills.	96	2.06	0.558
The procurement team lacks awareness of medical devices to secure the right price.	96	2.27	0.589
There is lack of trust between EPSS and the suppliers of medical device procurement.	96	2.75	0.725
Corruption causes a decrease in quality in the procurement of medical devices.	96	4.01	0.852
Average Mean & Standard Deviation	**96**	**2.773**	**0.681**

Source: SPSS own survey (2024)

Table 7's result above indicates that behavioral factors have an average mean of 2.773, which suggests that the questions related to these factors are moderately influential. The descriptive statistics also show that the mean standard deviation is 0.681, which suggests that the data poi nts are relatively close to the mean and have less variability. This suggests that participants in the research concurred that behavioral variables have a minor impact on procurement perform ance. The notion that corruption and a lack of confidence between EPSS and its suppliers have a greater influence on the efficacy and quality of medical equipment procurement was also bo lstered by this study. On the other hand, the influence of the procurement team's inexperience and ignorance on procurement performance is not very great.

4.4 Medical Device Procurement performance Indicators

The data from the research, which looked at how well the Ethiopian Pharmaceuticals Supply Service handled medical device procurement, is shown in the table below.

Table 8: Performance indicators for medical device procurement

Items	N	Mean	Std. Deviation
There is improper utilization of resources for medical device procurement in EPSS	96	2.63	0.794
In EPSS, operational costs for medical device managements are higher in comparison to the cost of medical devices.	96	3.36	0.884
The price paid by EPSS for medical devices are not acceptable when compared with international prices.	96	3.24	0.803
Procurement performance measurement at the end of the fiscal budget year is not common in EPSS.	96	2.72	0.843
EPSS'S trust decreased due to supply of defective medical devices to health facilities.	96	3.46	0.790
Average Mean & Standard Deviation	**96**	**3.13**	**0.603**

Source: SPSS own survey (2024)

The table gives details on a number of performance metrics linked to the purchase of medical devices inside an EPSS, or enterprise purchasing system. The average mean score of 3.13 indicate a considerable level of discontent or problems with medical device procurement within EPSS. It is imperative that the business attend to these signs and take the necessary action in order to boost confidence in the provided device, lower expenses, and increase performance.

4.5 Procurement performance rating concerning 5 R's

Table 9: Procurement performance rating with regard to five R's on medical device

Items	N	Mean	Std. Deviation
With Right Quality: - the performance of procurement in terms of providing quality medical device at required level.	96	3.71	0.753
At Right Time: - the performance of procurement in terms of managing procurement lead-time.	96	2.80	0.749
At Right Price: - the performance of procurement in terms of securing the right price	96	3.54	0.695
From the Right Source: - the performance of procurement in terms of awarding the right source.	96	3.85	0.458
Right Quantity: - the performance of procurement in terms of acquiring the right quantity.	96	3.95	0.569
Average Mean & Standard Deviation	**96**	**3.57**	**0.6448**

Source: SPSS own survey (2024)

In terms of the 5 Rs and their effect on procurement performance, an average mean of 3.57 is noted. When it comes to delivering medical products of the appropriate quality, EPSS's procurement performance is strong. However, it still needs work when it comes to scheduling purchases or managing them with little notice. It is good for acquiring the right quantity, securing the right price, and awarding the right source. In order to meet the organization's demands in terms of quantity and quality as well as time and amount, it is desirable that the m edical devices are suitable and that they are purchased at the lowest possible cost.

Procurement performance refers to how well a particular endeavor or activity has been executed. It ultimately comes down to meeting or surpassing the needs and expectations of the people involved in the project. To increase procurement performance, the aforementioned five rights must always be taken into consideration.

4.6 Tests and Statistical Analysis

The researcher used inferential analysis, which is concerned with multiple tests of significanc e for normality, autocorrelation, and multi-collinearity, to assess the validity of the data. The information was divided into group questions according to the testable constructs. At the end, a standard multiple regression analysis was performed. The outcomes of the testing and data analysis are as follows:

4.6.1 Normality Test

There are several sizes and forms available for frequency distributions. Therefore, it is essential to provide some generic descriptions for common types of distributions. Our data should ideally be distributed symmetrically around the middle of each score. Because of this, the distribution ought to seem the same if we draw a vertical line across its center on both sides. The bell shaped curve on this distribution is what makes it unique and is known as a normal distribution. The greatest bars in the histogram are all grouped around the central value, indicating that the majority of scores are concentrated around the distribution's center. Field (2006). Skewness values in a normal distribution are 0. Skew values above or below 0 in a distribution field indicate a departure from normal (Field, 2009). The table below illustrates how the skewness is getting closer to zero, while figure 3 of the normal distribution further demonstrates how nearly normal the data is. It was discovered that every variable was normal.

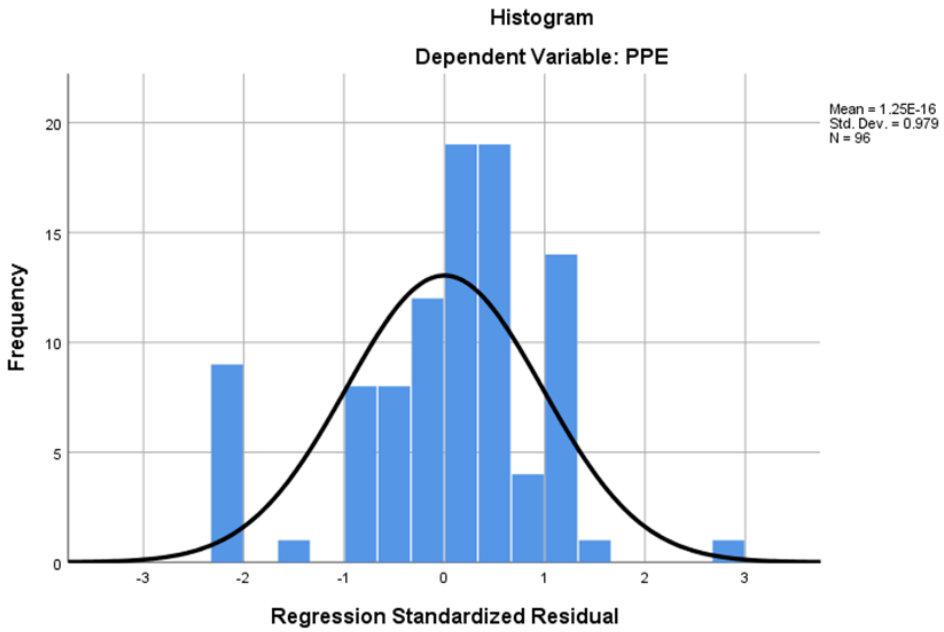
Table 10: Tests of normality Procurement performance

	N Statistic	**Skewness**		**Kurtosis**	
		Statistic	**Std. Error**	**Statistic**	**Std. Error**
Organizational Factors	96	-.474	.246	-.518	.488
Environmental Factors	96	-.316	.246	.431	.488
Technical Factors	96	-.196	.246	-.939	.488
Behavioral Factors	96	-.636	.246	.296	.488
Procurement Performance Indicator	96	-.440	.246	-.974	.488
Valid N (listwise)	96				

Source: Survey Result (2024)

The tall bars on the graph represent the most common scores, which are distributed skewedly and non-symmetrically at one end of the scale. Positively skewed distributions have frequent scores grouped at the lower end, whereas negatively skewed distributions have frequent scores clustered at the upper end, with the tail pointing towards lower, more negative evaluations.

Figure 3: Normal distribution of the data

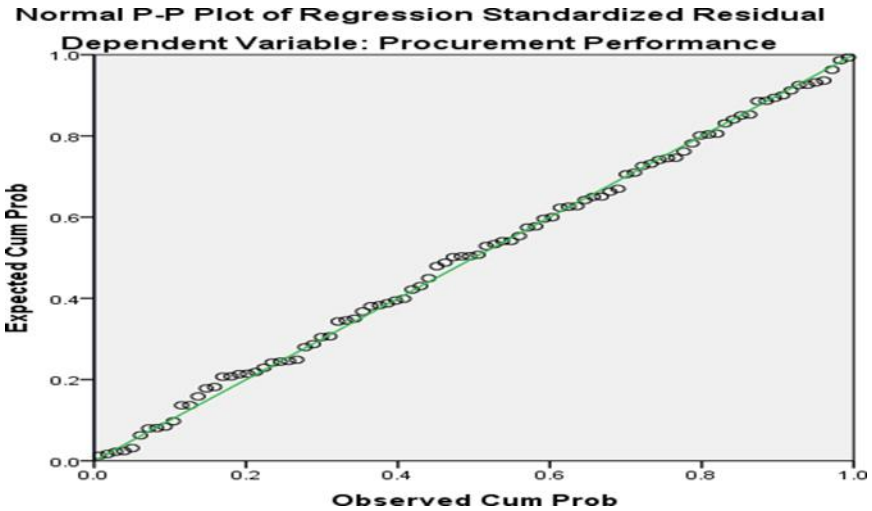


Where: PPE = Procurement Performance

4.6.2 Linearity Test

Osborne (2002, P. 1) states that only linear correlations allow for the efficient estimation of th e link between independent and dependent variables using multiple regressions. Furthermore, linearity defines the dependent variable (procurement performance) as a linear function of the independent variable.

Figure 4: Linearity test



Source: SPSS own survey (2024)

The probability plot, as seen in the preceding image, is inclined, leading us to believe that the dependent and independent variables have linear connections.

4.6.3 Multi-Collinearity Test

Regression analysis findings are misrepresented when there is a significant degree of inter-correlation between independent variables in a multiple regression model, a phenomenon kno wn as multi-collinearity. Inferences about the link between the independent and dependent variables are erroneous if the predictor variables are perfectly multi-collinear, as indicated by a value of r = 1 (Kim 2019, P. 559).

As per the statements of several practitioners, the most dependable measures of the level of m ulticollinearity among the independent variables are the Variation Inflation Factor (VIF) and t olerance (O Brien 2007, P. 673).

Kim (2019, P. 559) states that some researchers also advise that the tolerance value should be more than 0.2, indicating that the data is free of multicollinearity difficulties, if the tolerance and variance inflation factors are bigger than 0.1 and fewer than 10, respectively.

Table 11: Multi-collinearity test

Model	**Independent Variables**	**Collinearity Statistics**	
		Tolerance	**Variation Inflation Factor (VIF)**
1	Organizational Factor	.575	1.738
	Environmental Factor	.615	1.626
	Technical Factor	.646	1.548
	Behavioral Factor	.631	1.585

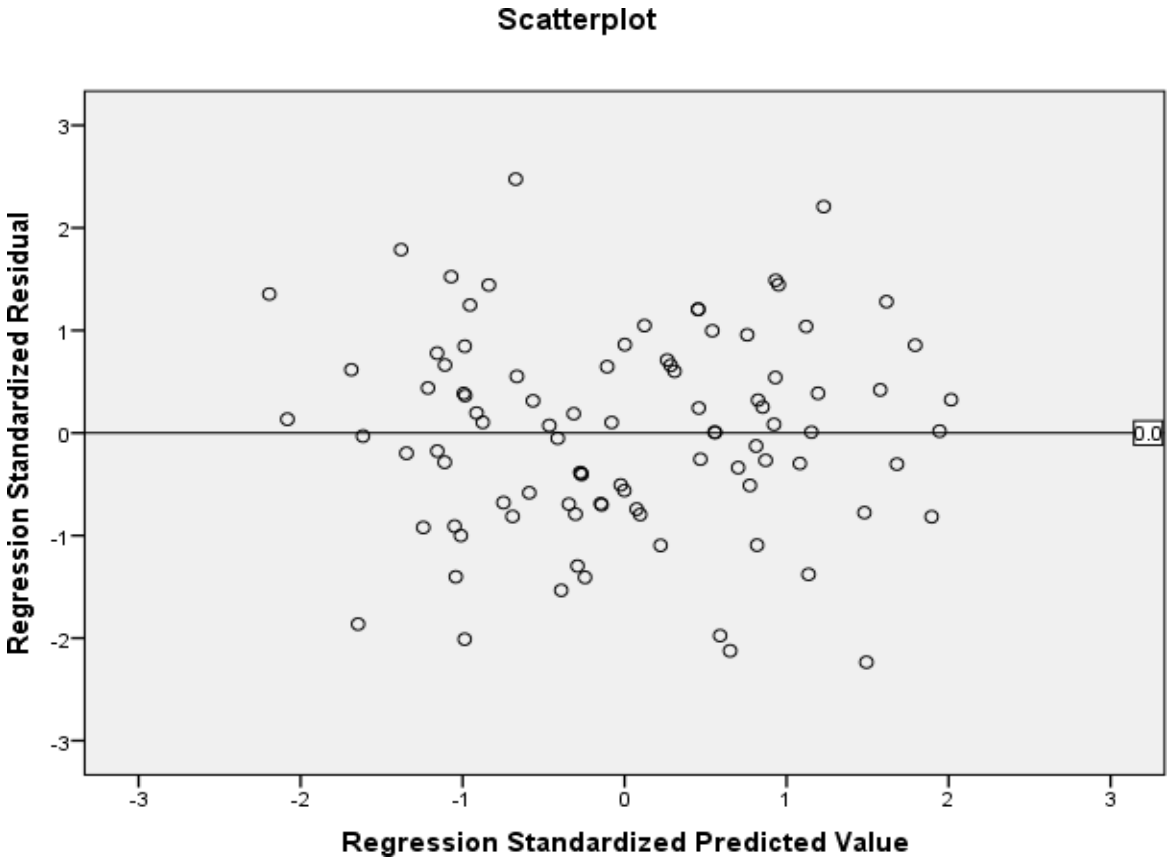
Source: SPSS own survey (2024)

The tolerance values in the preceding table vary from 0.575 to 0.646, while the variance inflat ion factor's value falls between 1.548 and 1.738. Consequently, there are no problems with multi-collinearity because the predictor variables are neither very high nor overlapped with one another, as evidenced by the reported values of tolerance, inflation factors, and variation.

4.6.4 Homoscedasticity Test

As per Williams (2013, P. 9), homoscedasticity is characterized by the homogeneity of varian ce assumptions or a constant finite variance that holds true for all levels of the predictor varia bles, or independent variables. The assumption may be checked is usually by looking at a scatter plot of standardized residuals or errors by regression of the standardized projected value.

Figure 5: Homoscedasticity test



Source: SPSS own survey (2022)

The plots above demonstrate how residuals are dispersed randomly about the horizontal line (zero point) or, if they are spread equally, do not noticeably deviate from the typical plot (Osb orne 2002, P. 4).

4.7 Regression Analysis

Regression-standardized coefficients, which have a range of values from 0 to 1, indicate how much of the variance in a dependent variable can be statistically explained by the independent variable (Saunders et al., 2012). R square indicates how much of the variance in the dependent

variable is explained by the regression model from our sample, Field (2006), whereas the adjusted value indicates how much of the variance in the dependent variable would have been explained if the model had been derived from the population from which the sample wa s taken. Below is a discussion of the regression coefficients (R) and R square for the study:

Table 12: Coefficient of determination (R^2)

Model Summary[b]				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.927[a]	.859	.850	.233
a. Predictors: (Constant), Behavioral Factor (BF), Environmental Factor (EF), Technical Factor (TF), Organizational Factor (OF)				
b. Dependent Variable: Procurement Performance (PPE)				

A fair degree of prediction is warranted by the multiple correlation coefficient value of 0.927, denoted by "R" in the model summary above, which shows a very strong relationship betwee n the independent and dependent variables. The coefficient of determination (R square value) study is used to determine the effects of such factors on the procurement performance of the Ethiopian Pharmaceutical Supply Service. Adjusted R squared is a more accurate and exact estimate than R2, as it may decrease when less significant components are added, unlike R sq uared, which is only able to grow.

With an adjusted R-square value of 0.85, the model explains 85% of the variance in medical device procurement performance. This can be explained by the ability of a linear combination of all predictor variables (factors affecting the procurement of medical devices); further research is necessary to fully understand the remaining factors, which contributed approximat ely 15% of the change or influence on the procurement performance of the organization but were not included in this study.

Generally, the four variables of factors affecting medical device procurement performance, namely: organizational factors, environmental factors, technical factors, and behavioral factors, are good explanatory variables in predicting the organization’s procurement performance.

4.8 Model Generalization

The generalization stage is another crucial one; if our model's findings cannot be used widely, we will have to restrict the model's applicability to the sample size, Field (2006).

The adjusted R square, which ideally has a value that is comparable to or less than the R squa

re, indicates how well the model can be applied to a given population. The adjusted value also indicates the amount of variance in the dependent variable that could be accounted for if the population from which the sample was drawn was used to build the model.

The model generalization value is calculated using the difference between R square and modi fied R square (Field, 2006). Consequently, the model generalization summary of procurement performance is produced using the difference between adjusted R square and R square. The modified R square and R square values are.850 and.859, respectively, based on table 12. As a result, the difference between R square and corrected R square is.859-.850=0.009, or around 0.9 percent shrinkage. This shrinkage suggests that the model would explain approximately 0.9% less variance in the outcome if it were developed from the population rather than a sample. As a result, we may conclude that when this model is applied to the entire population, the outcome has just 0.9% variance.

4.9 Multiple Regression Analysis

A mathematical model that illustrates the relationship between variables and may be used to p redict the value of the dependent variable given the value of the independent variable or varia bles is created statistically using regression analysis (Kothari, 2014).

A sort of association study known as multiple regression analysis examines the effects of two or more independent variables at the same time on a single dependent variable that is interval -scaled (William and Barry, 2010). The three primary forms of multiple regression processes are statistical (stepwise), hierarchical, and standard (multiple regression) (Ho, 2006). The normal multiple regression approach was employed in this investigation, which entails si multaneously adding each of the independent variables to the regression equation. Regression analysis results are analyzed, and regression models for each dependent variable are created, as there are no cutoff values for the model R square value to accept or reject the regression model, according to William and Barry (2010). In order to determine if the independent variables or procurement factors such as organizational, environmental, technological, and behavioral factors had an impact on the dependent variables or procurement performance, multiple regression analysis was employed in this study. Examining the direct effects of variables that affect procurement performance in the Ethiopian pharmaceutical supply service was the goal of this multiple regression study.

4.10 Analysis of Variance /ANOVA/ Test

ANOVA tests indicate if the model's prediction of the outcome is considerably better than rel ying on the mean as a "best guess" (Field, 2006). Since the ANOVA model suggests that at least one group mean differs from another, it is more likely to be significant. ANOVA is the statistical method to apply for analyzing the impact of a less-than interval independent variable on an at-least-interval dependent variable. According to William and Barry (2010), the model should be rejected, and no further action should be taken if the F test result is not significant. On the other hand, a very low significance value (usually less than 0.05) suggests that your co efficient is unlikely to have occurred by accident. Abebe Aberu (2012) stated this. If the coefficient of multiple determinations exceeds 0.05, it can be considered a result of pure chance. The ANOVA table and test results are therefore displayed and examined in the next sections.

Table 13: ANOVA Table

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	28.406	5	5.681	104.417	.000[b]
	Residual	4.679	86	.054		
	Total	33.085	91			
a. Dependent Variable: Procurement Performance						
b. Predictors: (Constant), Organizational factor, Environmental factor, Technical Factor, and Behavioral Factor						

Table 13 above displays the procurement performance ANOVA test result; take notice of the F value At P0.001, 104.417 is significant. The results lead to the conclusion that the model measures the dependent variables effectively and procurement performance is significant at 85.5 percent of the variance (R square). Moreover, the coefficient value is unlikely to have happened by accident because the significant value P is extremely small (less than 0.01).

4.11 Regression Coefficients or Model

The effects of behavioral, technological, environmental, and organizational factors on the Eth iopian Pharmaceuticals Supply Service's procurement performance are described by the regre

ssion coefficients shown in Table 14.The standard deviation is the measuring unit for regressi on coefficients.

Table 14: Regression coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		ß	Std. Error	Beta		
1	(Constant)	-1.038	.193		-5.390	.000
	Organizational Factor	.268	.085	.221	3.146	.002
	Environmental Factor	.338	.077	.275	4.374	.000
	Technical Factor	.317	.086	.253	3.699	.000
	Behavioral Factor	.217	.075	.177	2.872	.005
a. Dependent Variable: Procurement Performance						

Source: SPSS own survey (2024)

Standardized Coefficient (Beta)

The most relevant predictor variables may be identified using the standardized coefficients. Consequently, the study evaluates the impact of many independent variables, which are factor s that influence procurement performance, on the dependent variable, which is procurement p erformance. As seen in the above table, the environmental elements have the greatest standardized coefficient (Beta = 0.275), followed by the technical components (Beta = 0.253) , organizational factors (Beta = 0.221), and behavioral factors (Beta = 0.177). Out of the four-predictor variables, environmental factors had the largest relative impact on the success of me dical device procurement.The predictive variables of organizational factors, environmental fa ctors, technological factors, and behavioral factors of the organization are statistically signific ant in predicting the procurement performance of the organization since all independent varia bles have a P value less than 0.01.

Unstandardized Coefficient (ß)

The impact of each predictor variable on the medical device procurement performance may be ascertained or interpreted with the use of the unstandardized coefficients. The general

regression model for procurement performance was equated as follows using the unstandardized coefficients (ß1, ß2, ß3, ß4) from the evaluated regression model as coefficients:

$Y = ß_0 + ß_1X_1 + ß_2X_2 + ß_3X_3 + ß_4X_4 + e$

Where;

Y = Procurement Performance (PP)

$ß_0$ = Constant factor = -1.038, e = Error

X_1 = Organizational Factor (OF), $ß_1$ = Organizational Factor Coefficient = 0.268

X_2 = Environmental Factor (EF), ß2 = Environmental Factor Coefficient = 0.338

X_3 = Technical Factor (TF), $ß_3$ = Technical Factor Coefficient = 0.317

X_4 = Behavioral Factor (BF) $ß_4$ = Behavioral Factor Coefficient = 0.217

Therefore, the equation is written as;

Y = -1.038 + 0.268X1 + 0.338X2 + 0.317X3 + 0.217 X4 + e

The constant factor (ß0 = -1.038) indicates that, in the absence of any other variables in the model, the procurement performance of the Ethiopian Pharmaceuticals Supply Service would be -1.038.

The research indicates that the organization's procurement performance will increase by 26.8 0% with each unit increase in organizational parameters. In addition, a unit increase in technical factors yields a 31.70 percent rise in procurement performance, while a unit increase in environmental variables yields a 33.80 percent gain. Lastly, procurement performance might improve by 21.70% for every unit increase in behavioral variables.

The organizational, environmental, technological, and behavioral elements that influence pro curement success were all significant at the P-value of less than 1%. The four independent factors are statistically significant in predicting procurement performance, according to the regression coefficient values. Stated differently, an increase in units or a modification to the predictor factors results in an improvement in a medical device's procurement performance. Consequently, these results provide compelling evidence for the efficacy and efficiency of th e procurement performance of the Ethiopian Pharmaceuticals Supply Service.

4.12 Discussions of the result

As stated in chapter one, the objective of this study is to identify the factors affecting medical device procurement performance in the case of Ethiopian Pharmaceuticals Supply Service. The descriptive statistics results for factors affecting medical device procurement performance revealed that environmental factors were occasionally affected with a near-high-end moderate extent mean value (M = 4.41, SD = 0.56), followed by technical factors (M = 4.35, SD = 0.691), and organizational factors (M = 4.05, SD = 0.727), but behavioral factors were occasionally affected with a near-low-end moderate extent mean value (M = 2.773, SD = 0.681).

Therefore, the organizational, environmental, technical, and behavioral factors that were prev iously mentioned as influencing medical device procurement performance have the strongest positive and statistically significant relationship with the medical device procurement perfor mance of Ethiopian Pharmaceuticals Supply Service.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATION

The study's objective from the start has been to look into the factors affecting the organization's procurement performance for medical devices. Therefore, an overview of significant findings, conclusions made from the study's findings, and recommendations for improving the Ethiopian Pharmaceuticals Supply Service's medical device procurement performance, as well as future investigation areas of the study, are presented in this chapter.

5.1 Summary of the Findings

This study put a lot of effort into looking at the factors affecting the procurement performance of the organization. This research involved a literature review that included theories of factors affecting procurement performance, as well as empirical studies that revealed real practices in light of the research objectives.

A structured questionnaire was disseminated to the pre-determined sample of 100 respondents in the Ethiopian Pharmaceuticals Supply Service to gather the necessary data used for the analysis of this study. Among the hundreds of disseminated questionnaires, ninety-six (96) were returned with a response rate of 96%. With an overall Cronbach's alpha of 0.73, the internal consistency of the research questionnaires was judged to be in a good and reliable range. Accordingly, to meet the objective, the researcher has developed a questionnaire from the relevant literature to collect and analyze the opinions of the study sample. The following findings are obtained.

5.1.1 Organizational Factors

From the findings, the majority of respondents indicated that organizational factors have affected procurement performance.

- The average mean score for organizational factors on medical device procurement performance was 4.05.
- The standard deviation for organizational factors was 0.727, indicating varied responses.
- Organizational related challenges accounts for 26.80% of variations in procurement performance.

5.1.2 Environmental Factors

From the findings, majority of respondents indicated that environmental factors in the organization affected procurement performance.

- The average mean score for environmental factors on medical device procurement performance was 4.41.
- The standard deviation for environmental factors was 0.56, indicating less variability in responses.
- Environmental related challenges accounts for 33.80% of variations in procurement performance.

5.1.3 Technical Factors

From the findings, majority of respondents indicated that technical related questions have a positive impact on procurement performance.

- The average mean score for technical factors on medical device procurement performance was 4.35.
- The standard deviation for technical factors was 0.691, indicating moderate variability in responses.
- Technical related challenges accounts for 31.80% of variations in procurement performance.

5.1.4 Behavioral Factor

From the findings, the majority of respondents indicated that behavioral-related challenges affected procurement performance.

- The average mean score for behavioral factors on medical device procurement performance was 2.773.
- The standard deviation for technical factors was 0.681, indicating moderate variability in responses.
- Behavioral related challenges accounts for 21.80% of variations in procurement performance.

5.1.5 Multi-Collinearity Test

- Tolerance values ranged from 0.575 to 0.646, indicating no significant multi-collinearity issues.
- Variation Inflation Factor (VIF) values ranged from 1.548 to 1.738, further supporting the absence of multi-collinearity.

5.1.6 Regression Analysis

- The multiple correlation coefficient (R) between the independent and dependent variables is 0.927, indicating a strong relationship.
- The coefficient of determination (R^2) is 0.859, meaning that 85.9% of the variance in Procurement Performance can be explained by the regression model.
- The adjusted R^2 is 0.850, providing a more accurate estimate that considers the addition of less significant components.

5.2 Conclusions of the study

This research paper highlights the importance of effective procurement processes, in the context of medical device procurement. The findings emphasize that procurement performance plays a crucial role in ensuring efficient, transparent, and accountable utilization of resources in healthcare organizations.

The procurement performance should be viewed as a means to control and monitor the procurement function rather than an end in itself. By focusing on efficiency and effectiveness in procurement planning, execution, and post-procurement management, organizations can enhance their overall competitiveness and improve the quality of services provided.

Furthermore, the result acknowledges the challenges of fraud and corruption in healthcare procurement and emphasizes the need for implementing transparent procurement practices and adhering to national procurement laws. By doing so, procurement professionals can support an open procurement process and mitigate the risks associated with special interests and unethical practices. It also discusses the measures of medical device procurement performance, ranging from cost savings and supplier performance to contract compliance and customer satisfaction. These measures provide valuable insights into evaluating the effectiveness and efficiency of procurement activities and identifying areas for improvement.

Moreover, the result reviews the theoretical literature on quality management, emphasizing the significance of continuous improvement and quality control in procurement processes. It underscores the role of management in ensuring quality outcomes and highlights the importance of selecting bidders based on quality rather than solely on price.

5.3 Recommendations of the study

The study recommended that the Ethiopian Pharmaceuticals Supply Service should have to give more attention in the area of those mentioned independent factors (organizational factor, environmental factor, technical factor, and behavioral factor). Because by doing so, the procurement performance of the organization can be significantly improved from its current state to its optimum level. The study revealed that those factors have a significant impact on the procurement performance of the organization. Therefore, it is recommended that the Ethiopian Pharmaceuticals Supply Service should:

Enhance quality and lead time of medical device procured by standardizing specification, using inclusive tender procedure, and taking measure through monitoring procurement performance of medical at the end of fiscal year.

Enhance Transparency and Accountability: Public procurement processes should prioritize transparency and accountability to ensure the effective management of public funds. Implementing worldwide best practices and national procurement laws and procedures can support an open procurement process and mitigate the risk of fraud and corruption.

Improve Procurement Performance: Ethiopian pharmaceutical supply service should focus on improving procurement performance as a means to control and monitor the procurement function. This can be achieved by enhancing purchasing efficiency, effectiveness, and overall performance levels. Emphasizing performance as a key driver can lead to improved quality of services and increased competitiveness.

Develop an Effective Medical Device Procurement Strategy: Ethiopian pharmaceutical supply service should establish an effective medical device procurement strategy to optimize their procurement processes. This strategy should involve evaluating current processes, analyzing the market for medical devices, setting clear goals and objectives, creating timelines, defining a budget, and outlining a detailed plan for the procurement process.

Collaborate with Bidders and Suppliers: Ethiopian pharmaceutical supply service should foster collaborative relationships with bidders and suppliers to ensure the procurement of high-quality medical devices and services. Quality-related tender management activities, effective competition, and fair evaluation of bidders can help achieve the best value for money.

Enhance value for money culture of the organization by hiring qualified professionals, giving timely awareness of the principle and guidelines of procurement, and building trust with suppliers.

5.4 Suggestions for further study

This research looked at four independent variables: organizational factor, environmental factor, technical factor, and behavioral factor, all of which have a significant impact on the organization's procurement performance given its constraints. Hence, further research is needed to look at the other elements that are not covered in this study that can affect procurement performance. In addition, the idea for further research is to address the challenges related to procurement performance factors in the Ethiopian Pharmaceuticals Supply Service, as well as their mitigation and improvement techniques. Furthermore, more research should be done on other private businesses to see if these findings are general.

REFERENCES

[1]. Alsaffar & Deniz 2013, 'Assessing the Validity and Reliability of a Questionnaire on Dietary Fibre-related Knowledge in a Turkish Student Population', *International Centre For Diarrhoeal Disease Research, Bangladesh*, vol. 31, no. 4, PP. 497-503.

[2]. Anteneh, G. (2015). "Assessment on Procurement Planning and Implementation: Effectiveness in Ethiopia: The Case of Ministry of Urban Development, Housing and Construction".

[3]. Ayoti 2012, 'Factors Affecting Effectiveness in Tendering Process in Public Sector, the Case of Nyeri County, Kenya', *A Master's Thesis*.

[4]. Athumani 2012, 'Assessment Of Effectiveness Of Tendering Process In The Public Sector, The Case Of Ministry Of Health And Social Welfare', *A Master of Thesis.*

[5]. Azeb Semahegn, (2017), Assessment of health commodities inventory management practices and challenges: the case of zewditu memorial hospital, addis ababa, Ethiopia, AAU, 41-42

[6]. Barsemoi, Mwangagi, and Asienyo, 2014, 'Factors influencing procurement performance in private sector in Kenya. International Journal of Innovation and AppliedStudies', 9(2), p.632.

[7]. Batenburg, R., &Versendaal, J. (2006, January).Alignment Matters - Improving businessfunctions using the procurement alignment framework. Retrieved Dec 05 2016, from Archive library Utrecht University

[8]. Carter (2018). *Procurement and supply environments,* Uk: The Chartered Institute of Procurement & Supply (CIPS).

[9]. Carter, (1995). "The ten Cs of effective supplier evaluation," Purchasing and Supply Management, 44-45

[10]. PFSA (2017). Pharmaceuticals Supply Process-Reengineering (PSPR).

[11]. Davis, 2014, 'Review of procurement practices in Ireland

of medical devices', *ResearchGate,* PP. 1-33.

[12]. Deming, (1986). Out of the Crisis, MIT Center for Advanced Engineering Study, Cambridge, MA

[13]. Diaconu, Chen, Cummins, Moyao, Manaseki, & Liford, 2017, 'Methods for medical device and equipment procurement and prioritization within low- and middle-income countries, findings of a systematic literature review', *Globalization and Health*, vol. 13, no. 59, PP. 1-16.

[14]. EPSA, 2015, Pharmaceutical warehouse operations training manual, Ethiopia.

[15]. Erixon, Guildea, Guinea, & Lamprecht, 2021, 'China's public procurement protectionism and Europe's response, the case of medical technology', *European centre for international political economy*, P. 1-43.

[16]. Ethiopian Public Procurement Proclamation (No 649/2009).

[17]. The Federal Public Procurement and property Administration Agency Directive (2010)

[18]. GHTF final document (2012). Definition of medical device.

[19]. Githinji & Moronge 2018, 'Influence Of Procurement Methods on Procurement Performance in Public Hospitals in Kenya. A Case of Kenyatta National Hospital', *the strategic journal of business and change management*, vol. 5, no., 2, PP. 2122-2145.

[20]. Graves, 2011, 'Global best practices in medical device procurement: A road map to system success', *Journal of medical marketing,* vol. 11, no. 2, PP. 101-108.

[21]. Guidelines Relating To the Application of the Council Directive 93/42/EEC on Medical Devices (2010). European Commission, P5.

[22]. Jarvis, (2019). *Ethical and responsible sourcing.*UK: The Chartered Institute of Procurement & Supply (CIPS).

[23]. Jarvis, (2018). *Ethical procurement and supply.*UK: The Chartered Institute of Procurement & Supply (CIPS).

[24]. Jayathilaka, & Rajapakshe, 2020, 'Factors influencing tender hit rate: A case study based on Medical division of ABC holdings (Pvt) Ltd. Srilanka', *Open access library journal,* vol. 7, no. 7006, PP. 1-11.

[25]. Kaura, Prasad, and Sharma, 2015, Service quality, service convenience, price andfairness, customer loyalty, and the mediating role of customer satisfaction. Internationaljournal of bank marketing.

[26]. Kisurkat, (2016), *Effect of tendering on organizational performance: A survey of publicinstitutions in kajiado country*. A master of thesis.

[27]. Kim, 2019, 'Multicollinearity and misleading statistical results', *Korean Journal of Anesthesiology*, vol. 72, no. 2, PP. 558-569

[28]. Kinyanjui, 2021, 'Influence of bid evaluation criteria on performance function performance of kiambu county government of Kenya', *IOSR Journal of Business and Management (IOSR-JBM),* vol. 23, no. 5, PP. 43-55.

[29]. Lyson and Farrington, (2006). *Purchasing and Supply Chain Management*, Seventh Edition. (7th Ed). The Chartered Institute of Purchasing and Supply: FT Prentice Hall, Chapter 6, PP. 181-206.

[30]. Mason, (2018). *Contract administration*, Uk: The Chartered Institute of Procurement & Supply (CIPS).

[31]. Matto, 2021, 'Records management and performance of procurement management units in Tanzania: a case study, *Records management journal*, vol. 32, no. 1, PP.75-95

[32]. Ministry of finance (2018). e-GP strategy and roadmap, Ethiopia.

[33]. Monczka, R., Handfield, R., Giunipero, L., & Patterson, J. (2016). Purchasing & supply chain management (6th Ed.). SouthWestern Cengage Learning.

[34]. Mordecai, 2017, 'Analysis of Factors Contributing To Poor Performance of Procurement Functions in Local Government Authorities', *European Journal of Logistics, Purchasing and Supply Chain Management*, vol. 5, no. 3, PP. 41-52.

[35]. Moronda, 2014, 'Factors Affecting Tendering Process in Public Sector: The Case Of Ministry Of Health And Social Welfare', *A Masters Dissertation at Mzumbe University*.

[36]. Mutoro, Namusonge, & Makokha, 2018, 'Factors Affecting Procurement Planning in Bungoma Country Government in Kenya', *European Journal of Business and Management*, vol. 10, no. 10, PP. 24-33.

[37]. Muya, Wanjiru, & Datche, 2019, 'Effects of Tender Management practices on Procurement Performance at Kenya Ferry Services', *IJARKE Business & Management Journal*, vol. 1, no. 4, PP. 233-240.

[38]. Myriam, Kasper, & Luis, 2016, 'Effects of procurement practices on quality of medical device or service received, a qualitative study comparing companies', *BMC Health Services Research*, vol. 16, no. 362, PP. 1-13.

[39]. Njeru, & Willy, 2014, 'Effects Of Procurement Planning On Procurement Performance: A Case Study Of Agricultural Development Corporation, Nairobi', *International Journalof Business and Commerce,* vol. 3, no. 12, PP. 58-68.

[40]. Obrien, 2007, 'A caution regarding rules of thumb for variance inflation factors',

[41]. *Springer education and language*, vol. 41, PP. 673-690.

[42]. Osborne, 2002, 'Four assumptions of multiple regressions

that researchers should alwaystest', *practical assessment, research and evaluation, vol. 8, no. 2, PP. 1-5.*

[43]. Perago Information System (2021). e-GP procurement tendering module user manual.

[44]. FPPPA SBD (2011). Health Sector Goods Standard Bidding Document.

[45]. The US FDA regulation (21 CFR: parts 800-1050 and 1-99): USA

[46]. USAID (2006). Procurement strategies for health commodities.

[47]. USAID | DELIVER PROJECT. (2011). *The Logistics hand book: A practical guide forthe supply chain management of health commodities*. Arlington, Va.

[48]. USAID | DELIVER PROJECT. (2013). Procurement Performance Indicators Guide

[49]. The European Commission of the Council Directive 93/42/EEC (2010)

[50]. UNDP (2018). Value proposition in health procurement.

[51]. UNDP/CIPS (2019) introductory certificate in public procurement, level 2 trainingmanual.

[52]. UNOPS (2021). Quality assurance policy. Procurement of medicines, medical devicesand other health products.

[53]. USAID Deliver Project (2013). Addressing public health procurement bottlenecks, lessonfrom the field.

[54]. Walker, and Rowlinson, 2008, Procurement systems. Taylor & Francis, London.

[55]. WHO (2011). Medical device technical series on procurement process resource guide.

[56]. WHO (2015). World Health Organization procurement strategy

[57]. William, 2013, ‘Assumptions of multiple regressions: correcting two misconceptions’,

[58]. *Practical Assessment, Research and Evaluation, vol. 18, no. 11, PP. 1-14.*

Annex I: Research Questionnaire

ADDIS ABABA UNIVERSITY COLLEGE OF BUSINESS AND ECONOMICS, SCHOOL OF COMMERCE DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Dear Sir/Madam

My name is Jia Uga I am carrying out an academic research on the factors affecting medical device procurement performance: the case of Ethiopian pharmaceutical supply service for the partial fulfillment of a master's degree in logistics and supply chain management at Addis Ababa University, College of Business and Economics, School of commerce. I would like to extend my deep appreciation to your organization and you for your willingness and enthusiasm in participating in this valuable research. The purpose of this survey is to assess the factors affecting procurement performance of medical devices. I assure you that your response will be highly confidential and there is no harm to you in giving this information except the time you will spendon the response to the questions. This survey will take about 15–20 minutes to complete. I thank you in advance for your kind cooperation in answering the questions as truthfully as possible.

If you has any question, Please don't hesitate to contact me via email: ***jiaugafeye12@gmail.com.***

Part I: General Information and Demographic background of respondents

Please mark ✓ for your appropriate choice.

1. Gender: Male ☐ Female ☐

2.Educational qualification

☐ Diploma ☐ Degree ☐ Masters ☐ PhD

Others (specify)……-

3. How long has you worked in the organization?

☐ Below 3 years ☐ 3-6 years ☐ 7-10 years ☐ Above 10 years

4. In which directorate are you working currently?

☐ Tender management ☐ Contract management ☐ Quantification and market shaping

Others (specify) ____ _____ __

5. What is your job position?

☐ Director ☐ Team leader ☐ Advisor ☐ Officer

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

Part II: Performance Factors

This section of the questionnaire is designed to obtain information about your level of agreementwith the performance factors.

Please use tick mark (✓) to what extent you agree on the following statements under each category using **Five-point Likert scale** as given below:-

A. Organizational Factors						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
1	There is shortage of allocating budget for medical device in EPSS					
2	Procurement staffs responsible for medical device procurement show inability to apply procurement principles and guidelines.					
	There is lack of transparency in the procurement of medical devices in EPSS.					
4	Securing the right price is hampered by the organization's lack of coordination with suppliers.					
5	Unnecessary urgencies in medical device procurement is common in EPSS					
B. Environmental Factors						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
1	Medical device procurement lead time increased due to political instability in the country.					
2	Medical device price has increased due to inflation in foreign currency exchange rates.					
3	Ethiopia\s legal and regulatory system limited the number of suppliers participating in tender					
C. Technical Factors						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
1	There is loss of quality for medical devices due to failure to use standardized medical device specifications					

2	There is limited number of both local and international medical device suppliers.					
3	There is failure to monitor procurement performance for medical device.					
4	The country's lack of medical device manufacturers leads to longer times.					
D. Behavioral Factors						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
1	The medical device procurement team lacks the desired skills.					
2	The procurement team lacks awareness of medical devices to secure the right price.					
3	There is lack of trust between EPSS and the suppliers of medical device procurement.					
4	Corruption causes a decrease in quality in the procurement of medical devices.					

Part III: Medical Device Procurement performance Indicators

This section of the questionnaire is designed to gather information on your level of agreement with the statement on the Procurement Performance indicators of Medical Device: The Case of Ethiopian Pharmaceuticals Supply Service.

Please indicate ✓to what extent you agree on the following statements under each category y using Five-point Likert scale as given below.

E. Medical Device Procurement Cost Performance Indicators						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
1	There is improper utilization of resources for medical device procurement in EPSS					
2	In EPSS, operational costs for medical device managements are higher in comparison to the cost of medical devices.					
3	paid by EPSS for medical devices are not acceptable when compared ational prices.					
F. Medical Device Procurement Quality Performance Indicators						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
1	Procurement performance measurement at the end of the fiscal budget year is not common in EPSS.					

2	EPSS'S trust decreased due to supply of defective medical devices to health facilities.					

Part IV: Procurement performance rating with regard to five R's

This section of the questionnaire is designed to gather information on your level of agreement based on five rights of purchasing: The Case of Ethiopian Pharmaceuticals Supply Service.

Please indicate ✓to what extent you agree on the following statements under each category using **Five-point Likert scale** as given below:-

	Procurement performance rating with regard to five R's					
No	**Very Poor=VP Poor= P Neutral= N Good= G Very Good= VG**	**VP**	**P**	**N**	**G**	**VG**
1	With Right Quality: - the performance of procurement in terms of providing quality medical device at required level.					
2	At Right Time: - the performance of procurement in terms of managing procurement lead-time.					
3	At Right Price: - the performance of procurement in terms of securing the right price					
4	From the Right Source: - the performance of procurement in terms of awarding the right source.					
5	Right Quantity: - the performance of procurement in terms of acquiring the right quantity.					

Thanks for your time and participation!