ADDIS ABABA UNIVERSITY COLLEGE OF BUSINESS AND ECONOMICS SCHOOL OF COMMERCE

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

THE EFFECT OF TENDER MANAGEMENT ON PROCUREMENT PERFORMANCE OF MEDICAL DEVICES: THE CASE OF ETHIOPIAN PHARMACEUTICALS SUPPLY SERVICE.

A THESIS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF MASTER OF ART IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

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This is to certify that Abrahaley Beyene's thesis, entitled **"The Effect of Tender Management on Procurement Performance of Medical Devices at Ethiopian Pharmaceuticals Supply Service (EPSS)"** has been submitted in partial fulfillment of the requirements for award of the degree of Master of Arts in Logistics and Supply Chain Management. It complies with the regulations of the University and meets the accepted standards with respect to originality and quality of his original work.

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DECLARATION

I, the undersigned, declare that the work presented in this thesis entitled "The Effect of Tender Management on Procurement Performance of Medical Devices, A case in Ethiopian Pharmaceuticals Supply Service", is my own original effort. Further, the study has not been done and presented for a similar or any diploma or degree awards in any other universities and all the sources of materials used in this research paper have been duly acknowledged.

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CERTIFICATION

This is to certify that Abrahaley Beyene has conducted the research thesis entitled **"The Effect of Tender Management on Procurement Performance Of Medical Devices: The Case of Ethiopian Pharmaceuticals Supply Service (EPSS)"** and submitted in partial fulfillment of the requirements for award of the degree of Master of Arts in Logistics and Supply Chain Management of Addis Ababa University complies with the regulations of the University and meets the accepted standards with respect to originality and quality of his original work.

Advisor: Busha Temesgen (PhD)

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ACRONYM

- EPSS----------Ethiopian Pharmaceutical Supply Service
- FPPPA----------Federal Public Procurement and Property Agency
- AAU SOC----------Addis Ababa University School of Commerce
- PFSA----------Pharmaceuticals Fund and Supply Agency
- SOPs----------Standard Operating Procedures
- WHO----------World Health Organization
- e-GP ----------Electronic Government Procurement of Ethiopia
- UNDP/CIPS----------United Nations Development Program/Chartered Institute of Procurement and Supply
- EPSA----------Ethiopian Pharmaceutical Supply Agency
- PO----------Purchase Order
- GHTF----------Global Harmonization Task Force
- DDG ----------Deputy Director General
- PEC----------Procurement Endorsing Committee
- EU----------European Union
- MD----------Medical Devices
- US FDA, CDRH------The United States Food and Drug Administration, Center for Devices and Radiological Health
- CFR----------Code of Federal Regulations
- EFDA----------Ethiopian Food and Drug Authority
- QMS----------Quality Management System
- MA----------Manufacturer Authorization
- PSPR----------Pharmaceuticals Supply Process Reengineering
- PPDA----------Public Procurement and Disposal Act
- HR----------Human Resources
- SBD----------Standard Bidding Document

ABSTRACT

The general objective of this study was to determine the effect of tender management activities on procurement performance of medical devices in the case of Ethiopian Pharmaceuticals Supply Service. The study used a quantitative research approach as well as an explanatory research design was also applied in this research. The study's population was all staff who directly or indirectly engaged in managing EPSS's tender and a census sampling technique was conducted to gain insight into procurement performance. In this study, descriptive and inferential data analyses were produced. Out of 100 questionnaires 92 responses were valid thus makes the response rate 92%. Pearson's product moment correlation coefficient was computed and accordingly a positive and strong relationship exist between tender award, record management respectively and procurement performance and the variables were found statistically significant. A positive and very strong relationship exist between tender evaluation, tender planning, tender document initiation respectively and procurement performance of medical device as well as all variables were statistically significant. A multiple linear regression analysis was carried out, and the coefficient of determination represented by adjusted R^2 showed that the percentage of variance in procurement performance of medical device explained by the predictor variables (tender planning, tender document initiation, tender evaluation, tender award and record management factors) was 85% hence the overall model fit was significant. Based on the study findings, the investigator concludes that strong and positive association exist between procurement performance and tender award, record management factors whereas, very strong and positive association exist between procurement performance and tender planning, tender document initiation, and tender document initiation factors. Furthermore, tender document initiation, tender evaluation, tender planning, tender award, and record management were the most factors affecting procurement performance of medical device with statistically significance level of 1%. The study recommended the organization to implement medical device essence based tender planning, tender document initiation, tender evaluation, tender award and record management practice so that ensures the availability of affordable quality medical devices.

Keywords: Medical device, tender management practices (tender planning, tender document initiation, tender evaluation, tender award and record management), procurement performance.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Medical device tender management is a key part of procurement that focuses on tendering activities to acquire medical devices. Fairness, openness, competitiveness, non-discrimination, and confidentiality are the guiding principles for medical device tendering (FPPPA Directive, 2010). In order to reduce waste, corruption, fraud, or local protectionism, open tendering is typically required of all goods in governmental organizations around the world, including medical devices (Lysons and Farrington, 2006). The improvement of procurement systems' effectiveness, efficiency, and openness is a constant concern for governments. Every country has acknowledged the need for an appropriate national tendering system that complies with international standards and performs as intended in order to increase the effectiveness of the use of public funds, including those provided via Official Development Assistance (World Bank, 2006).

The Ethiopian public procurement directive (2010) was enacted in order to harmonize tender management, which is a part of public procurement processes in the public service, in order to maximize economy and efficiency, promote competition and ensure fairness, increase accountability, and transparency, and promote integrity. In Ethiopia, public tendering for medical devices is conducted in a centralized manner. The ideas of cost, service delivery, and time performance have a significant impact on the medical device procurement process. On the other hand, the concepts of cost and time have an impact on the delivery of services in a way that the effectiveness of the services depends on the time frame specified and the amount invested in or the anticipated cost to be covered by the suppliers (Gary, 2008).

In terms of their commitment and the quality of the medical devices or services they provide, the suppliers chosen to provide the required medical devices and services have an impact on the requirements of the procurement process, which in turn affects the cost and timeline of the procurement.

The ultimate goal of procurement is to source safe, quality-assured, and effective medical devices at a reasonable price at the right time for the community. Hence, major activities of procurement are carried out under the tender management stage, which contains indicators that are individually scored, such as aspects of tender planning, tender document initiation, evaluation, tender award, and contract establishment (MSH or Yellow Book 2012, PP. 21.2-21.9). Managing tenders in a well-structured and organized manner increases the efficiency and effectiveness of medical device procurement performance. Tender planning is the first phase of the tender process that helps in determining the procurement of an entity's resources and the timing of their acquisition ("when") and allocating funds such that the entity's operations are met as required in an efficient way. In advance of the other categories, the unique features to be considered during planning for medical devices, particularly medical equipment, are turnkey work, installation, training, warranty management, after-sale services, and decommissioning, which are part of the Total Cost of Ownership, which covers costs from acquisition to disposal, such as total acquisition costs, storage, and disposal. Total acquisition cost is a term used to understand the pre-purchase costs (like research, designing, raw materials, etc.) and purchase costs such as product price, payment terms, packaging, insurance, transport, custom formalities, and operating expenses (Jarvis 2018, P. 56). In order to make an effective tender, planning should be well defined, considering the above factors and supported by an action plan that will foresee the future images of all opportunities.

Effective procurement, according to USAID Deliver Project (2013, P. 1), is a vital component that enhances an organization's supply chain as well as reduces the bottlenecks that occur in the procurement process, leading to health product supply chain failures such as shortages and stock-outs of products. Among the strategies used during the medical device tendering process are to ensure clinical input, evaluate the overall cost of care, encourage supplier variety, and ensure process transparency and fairness (Graves 2011, P. 107).

Tender document initiation comprises the preparation of a tender document that consists of instructions to bidders, bid data sheets, evaluation criteria, statement of requirements (specifications, bidding forms), and advertisement through known newspapers and an organization website (FPPPA SBD, 2011). A bid data sheet is a supplement of instructions to bidders where the necessary information is to be included. Solicitation is a process where if any

clarifications are required, they include the selling of tender documents and receiving and opening of tenders. When preparing a tender document, it should be concise enough to omit any vague and/or biased specification and evaluation criteria as well as minimize clarification to be requested by vendors, because a lack of a well prepared document won't assure the public body's interests, such as best value for money.

Management of medical device tenders is a complicated undertaking that necessitates unique procurement, broad performance, and technical standards. As a result, other stakeholders, such as health facilities, concerned associations, and regulatory bodies, are involved. Bad quality, delivery delays, faults, or no deliveries at all are major difficulties that a procuring entity with a poor procurement system faces when trying to get the most value for money (Mordecai 2017, P. 42). Quality refers to product conformance to specifications that are fit for purpose to meet customer expectations, whereas delivery refers to the operation's capacity to deliver items on time to their intended usage by end-users. Medical devices that aren't safe, high-quality, or properly working have a negative influence on health-care delivery and can even lead to death.

If there is to be excellent governance in the procurement process of public bodies, record management is required. Organizations have lost money due to business claims or poor governance in circumstances where records are improperly kept. According to surveys, many businesses continue to have bad management practices, which can result in claims if they are brought to court (Kisurkat 2016, P. 3). According to the FPPPA (2010, P. 100), all public procurement agencies must keep procurement records for ten years after the resulting contract was signed or if no contract was signed after the procurement was cancelled.

Medical device Public sector tendering plays an important role in serving the community and should be followed by procedures that highly regulate all activities in the process to promote efficient and effective management of its supply chain. Not only tender planning and tender document preparation, but also tender evaluations are among the most essential activities that adhere to the procedures. Evaluations that are conducted in line with the regulated procedures avoid the likelihood of conflicts of interest and malpractices such as corruption and fraud. According to Jarvis (2019, P. 81), public sector procurement is auditable by the government of the country to ensure that all tendering activities have been conducted in line with the regulations

of the nation, which enhances fairness, effective competition, and transparency. Competitive tendering is undertaken to exercise ethical and transparent procurement that shows fair and equal treatment among bidders. The most commonly used tendering methods are open and restricted, and negotiation is not applied to these types.

Through its amended proclamation number 1263/2021, the Ethiopian Pharmaceuticals Supply Service (its former name was the Ethiopian Pharmaceuticals Supply Agency) has been given the authority to manage the supply chain and handle all procurement of health commodities for the public health sector. The variety of health commodities offered by EPSS includes pharmaceuticals, medical supplies, chemicals, and other food supplements, in addition to medical devices (such as medical equipment, reagents, software, furniture for hospitals, etc.). In order to guarantee nationwide access to medical devices, the organization serves as the executive arm of the Ethiopian Federal Ministry of Health (FMOH). The organization has been conducting centralized procurement and supply of quality-assured medical devices to all government health institutions at an affordable price since 2000G.C. The logic behind centralized procurement is to procure medical devices in bulk, which in turn reduces the price of individual products because suppliers will be prepared to increase transparency and lower the price due to the high procurement volume and because it enables them to arrange the manufacturing and distribution expenses (Erixon et al. 2021, PP. 4 & 66).

So, this study assessed the effect of tender management on the procurement performance of medical devices at the Ethiopian Pharmaceuticals Supply Service.

1.2 Statement of the Problem

Around 65% of the annual budget of the government of Ethiopia is spent through procurement (e-GP strategy & roadmap 2018, P. 23). Hence, procurement procedures are designed to guarantee that government funds are used in the most efficient and cost-effective manner possible, resulting in the best value for money by delivering high-quality goods and services on time and within budget. One of the procurement concepts is to obtain products at the right time, right quality, right quantity, right place, and right price in order to maximize economy, efficiency, and effectiveness (Jarvis 2018, P. 64; FPPPA 2010, P. 2).

Tendering is helpful to get the best value for money, but if the right tendering approach isn't used, it will also reduce supplier competition. Inadequate availability and affordability of medical devices, as a result, forces the public to use their diagnosis as well as treatments in the private sector, which has high costs and is also a problem of international concern but also includes the organization. Access to an affordable, high-quality, and evidence-based medical device is not always simple or reliable. Purchasing quality-assured medical devices is critical to expanding health-care delivery and improving quality of life (UNDP 2018, P. 10). Tender process is a risky task which requires effective planning before conducting the procurement. Unless all activities are properly executed and managed as per the tendering plan, it will lead to a procurement delay and incur costs that have an impact on procurement performance.

The issues related to procurement performance include rising fragmented small volume procurement requests, which results in repetitive tender planning, poor procurement visibility; weak supplier performance review; and weak implementation of supplier pre-qualification. The organization is obliged to undertake repetitive based tendering, which wastes resources and staff time, thus influencing procurement performance efficiency and effectiveness (PSPR 2017, P. 21). The most typical primary difficulties associated with tendering, according to Diaconu et al. (2017, P. 2), include indiscriminate tendering methods, a lack of preventative and service maintenance, and a lack of technical capacity building. As a result, in this instance, the majority of patients are neither diagnosed nor treated as they belong to the nationality of one country.

According to WHO (2015, P. 11), exercising category management is essential in reducing the level of supply risk of products and prioritizing efforts, which in turn enhances the cost-effectiveness of the procurement. Since all products do not have equal importance, as well as all suppliers may not have the same capability and performance to supply the required medical devices, the assessment of the supply risk of products and supplier positioning relationships is important to EPSS in its sourcing strategy of procurement effectiveness and efficiency.

EPSS exercises four types of tendering methods for medical devices, which are: open bidding, commonly known as international and national competitive bidding; restricted bidding; two-stage bidding; and direct procurement. These tendering methods are initially chosen during tender planning based on some factors like the type of purchase, threshold value, and nature of

products; and also their time scale, which depends on geographical location (national or international) (FPPPA Proc. No. 649/2009). Currently, local manufacturers are limited in the manufacturing of medical devices in our country, so their tendering is conducted mostly through international competitive bidding, and this has time delays.

Another special procurement carried out in EPSS is placement of medical devices, in particular medical equipment, which means procurement of laboratory reagents, consumables, and related supplies along with supply of the main equipment free of charge, including installation and maintenance service during the contract period. Managing placement is complex in nature, but it makes the medical equipment functional and ready for use as well as ensures an uninterrupted supply of reagents and consumables. However, the organization faces challenges of reagent expiries, INCOTERM issues during awarding, and high expenditure, which influences the procurement performance of medical devices. As procurement of medical devices is sophisticated, it leads to clarification on the tender documents, so time scale is not a choice and should be kept mandatory for vendors to get adequate time for better preparation and submission of their bids or offers. Clarification rose due to specification ambiguity and non-standardized specifications affecting the procurement principles like effective competition and fairness. Tender evaluation is an assessment of vendors' offers against the specifications and requirements defined in the tender document in a way that ensures best value for money. One of the important factors that affect procurement is lead time. Based on what I have read and preliminary interviews, estimating the evaluation time per each tender is not yet determined, which makes it difficult to manage its lead time and influences the efficiency of procurement. Product registration certificates are one of the most evaluated criteria during bid evaluation and unless there is clear categorization of standard certificates for each medical device, it will lead to clarification and complaints during bid floatation or tender award and also products may be retendered by the regulatory board of complaints.

Public procurement activities, according to FPPPA (2010, P. 100), are highly regulated, and it is mandatory to retain all procurement documents in a well-organized manner in order to build confidence between the procuring organization and external regulatory bodies. However, in the majority of situations, procurement transaction records were discovered to be inaccurate,

missing, lost, or misplaced, leading to suspicions of dishonest activities, which negatively impacted procurement performance (Kisurkat 2016, P. 2).

The procurement of medical devices may be less efficient and effective as a result of the lengthy procedures that the tender management process must go through. This could therefore lead to a disruption in the flow of medical devices, endangering the general public's ability to acquire necessary medical devices. Studies show that if the tendering process is not handled effectively, it is susceptible to various problems, including fraud. But in Ethiopia, tendering procedures, particularly those involving medical devices, have received little or no attention from researchers, if any at all.

Generally, customer satisfaction is the end result of all activities in the tender management supply chain, as the mission of EPSS aims to procure and supply quality-assured health commodities at an affordable price to end customers (public health institutions) at the right intended time (EPSA Quality Policy). Therefore, this study is important to assess the effect of tender management practices on the procurement performance of medical devices at the Ethiopian Pharmaceuticals Supply Service (EPSS) head office.

1.3 Basic Research Questions

The following main research questions are proposed:

- What is the effect of medical device tender planning on procurement performance of the EPSS?
- What is the effect of medical device tender document initiation on procurement performance of EPSS?
- What is the effect of medical device tender evaluation on procurement performance of the EPSS?
- What is the effect of medical devices tender award on procurement performance of the EPSS?
- What is the influence of medical devices record management of tender process on the procurement performance of EPSS?

1.4 Objectives of the Study

1.4.1 General Objective

The objective of this research is to assess the effect of tender management on procurement performance of the medical devices as a case study in the supply chain system of EPSS.

1.4.2 Specific Objectives

- ✓ To explain the effect of medical device tender planning practice on procurement performance at EPSS.
- ✓ To explain the effect of medical device tender document initiation practice on procurement performance at EPSS.
- ✓ To find out the effect of medical device tender evaluation practice on procurement performance at EPSS.
- ✓ To analyze the effect of medical device tender award practice on procurement performance at EPSS.
- ✓ To determine the effect of medical device record management of tender process on procurement performance at EPSS.

1.5 Significance of the Study

This research will look at the effect of tender management on EPSS's procurement performance of medical devices. The study's findings will assist the organization in taking the required steps to provide appropriate decisions for the supply chain in tender management, thereby enhancing procurement performance of the medical device. Because there has been little previous research in this field, this research report provides some guidance to other researchers for their future inquiries.

1.6 Scope of the Study

Quantification and market-shaping, tender management, and contract administration are the key operations of procurement, and all of these activities, with the exception of quantification and market-shaping, are carried out only at the head office. Tender planning, tender document initiation and invitation, solicitation, tender evaluation, tender award, and contract establishment are all steps in the medical device tender management process. Due to time constraints, the study has been conducted at the Ethiopian Pharmaceuticals Supply Service head office to assess the

effect of tender management on the procurement performance of medical devices from the perspectives of tender planning, tender document initiation, tender evaluation, tender award, and record management of the tender process.

1.7 Limitation of the Study

Due to various settings and circumstances, every study article has its own unique set of constraints. The shortages of reference materials, which have been done on similar titles, and the time issue, were two factors affecting this study. Because the researcher was a full-time public servant employee, there was an overwork load on the researcher to prepare this study while also carrying out the typical organizational activities. The researcher, on the other hand, had strived to locate the best way to get access to similar issues from many organizations and countries. In addition, to address the time constraint, the investigator used his time properly at night and on weekends as well as maintained positive relationships with his immediate supervisor and coworkers that shared and minimized some tasks.

1.8 Definition of Terms

1.8.1 Conceptual Definition

Medical device: "any instrument, apparatus, implement, machine, appliance, implant, reagent for in vitro use, software, material or other similar or related article, intended by the manufacturer to be used, alone or in combination, for human beings" (GHTF, 2012).

Medical equipment: an instrument which have an intended use for diagnosis and treatment of disease or rehabilitation following disease or injury (WHO).

Tender plan: a process that assesses total cost of ownership, time frame for each activity carrying out in the whole tender process up to the award of contract, who is responsible officer and which tendering method is suitable for this specific purchase (FPPPA Directive, 2010).

Procurement: the Process of acquisition of goods services and works (FPPPA, 2010).

Health Sector Goods: means "all of the pharmaceuticals including medical devices, nutritional supplement and oral and inject able forms of contraception, vaccines and condoms that the supplier is required to supply to the public body under the contract" (FPPPA, 2010).

Installation: the process of assembly of parts/equipments and configuring software into place (WHO, 2011).

Commissioning: when a series of tests and procedures are performed to check whether the new medical device is working safely and correctly prior to using the device (WHO 2011).

Bids or offers: the documents prepared/proposed against the requested buyer's bidding documents and submitted to the purchaser by vendor (FPPPA, 2010).

Bidding or tender document: the document prepared by procuring entity to serve as a reference in the preparation of vendor offers (FPPPA, 2010).

Procuring entity: means a public entity making a procurement proceeding to which the FPPPA applies (Kisurkat, 2016).

1.8.2 Operational Definition

Organization: the Ethiopian Pharmaceuticals Supply Service (EPSS)

Stakeholders: the entities that have close relations for supporting EPSS through technically and or financially.

Researcher or Investigator: a person who is responsible to carry out this research.

Tender management: a process of the successive stages in the tender process cycle that includes planning, procedure selection, steps to solicit bids from tenders, assessment, and evaluation of those bids, as well as awarding and establishing the contract.

Procurement performance: a means of determining the degree to which the procurement function can, by enhancing its quality, meet the goals and objectives at the lowest possible cost and within an acceptable amount of time.

Record management: Means to preserve accurate data on tendering process in a Safe way and easy to retrieve in future for reference.

1.9 Organization of the Study

The research proposal is organized into five chapters. Chapter one involves an introduction that comprises the background of the study with a special focus on procurement in general and medical devices tender management in particular; problem statement, research question, and objective; the significance of the study; the scope of the study; limitations; and definition of terms. The second chapter examines literature about medical device tender management, 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.

The fourth chapter contains presentations of data and its interpretations, and discussion, whereas the fifth chapter consists of a summary, conclusion, recommendation, and further investigation areas of the study.

CHAPTER TWO

RELATED LITERATURE REVIEW

2.1. Introduction

This section reviews the literature on the medical device tendering process. It contains a review of theoretical and empirical literature related to tender management on procurement performance of medical devices that highlights the processes of tendering, tender planning, tender document initiation and invitation, tender evaluation, tender award and record management of the tender process. It also presents the conceptual model.

2.2. Theoretical Literature Review

2.2.1 Carters '10 Cs' Theory

In order to be able to award a contract to the most qualified and capable bidder, Ray Carter introduced a theory in 1995 that provided guidelines on the criteria set out in the tender document and then used to evaluate bidders in both the technical and financial evaluation stages of the medical device tendering process. Cost, cash, capacity, competency, consistency, commitment, compatibility, control, communication, and compliance are the broad range of "10 Cs" criteria used by the Carters. On the basis of the principles of effective competition, fairness, accountability, and transparency, the planning stage is first and foremost to examine and define the precise requirements to be classed under each of these criteria. Following a clear definition of the requirements, the tender document's specific evaluation criteria are established in accordance with the nature of the medical devices as a means of achieving value for money.

Tendering is the procurement procedural aspect of the bidding process that the buyer needs to follow for procuring medical devices from national and/or international vendors. The Carter's criteria are powerful in all perspectives of tender management activities (i.e., planning, tender preparation, evaluation, awarding, and managing records). By selecting bidders who are capable of completing the required delivery, have overall financial stability, consistently deliver and improve quality, such as process capability or track record reliability, are committed to key values like cost or quality management, have control systems to monitor and manage resources

properly, have reduced costs in the aspect of price and whole life cycle cost, and more, they help to create an efficient and effective procurement performance (Jarvis, 2018).

Therefore, Carters' theory adds value to this study by preventing the time, cost, quality, effort, and embarrassment of granting a contract to a vendor who later turns out to be unable to perform the task due to cash flow issues, business failures, or other circumstances.

2.2.2 Transaction Cost Theory

Oliver Williamson introduced the transaction cost theory in 1979. Based on Williamson's (1979) view of transaction cost theory, the organization's primary goal is to lower overall medical device transaction costs. This theory discusses issues such as how the organization determines its borders, how it should manage operations, and why the organization exists. On the other hand, it also states that hierarchical organizations, such as firms, may allocate resources more efficiently than a system of constrained bargaining, such as a market. 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 tender 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). When we engage in managing tenders to procure medical devices and services, costs will result. So, this theory suggests that a procuring body should try to lower the cost of granting a contract to a supplier that would come back after executing each tender process by enhancing activities such as planning, tender preparations, and tender evaluations.

Hence, the option to organize tender management activities vertically or instead choose market exchange is influenced by transaction costs. Hence, this theory is relevant to the study that outlines the conditions necessary for a business to manage medical device economic transactions outwardly and the conditions under which it should manage an economic transaction internally. As a result, a sustainable supplier can be counted on to complete a significant contract or maintain a steady, safe supply stream of medical devices to government health facilities (Jarvis, 2018).

2.2.3 Deming Quality Management Theory

The Plan-Do-Check-Act cycle is the cornerstone of continuous improvement and is the emphasis of the quality management theory, which was first proposed by Edwards Deming in 1986. It emphasizes the necessity of measuring product deviations and continuously reducing them. The Plan stage involves defining objectives and actions; the Do stage actualizes actions by incorporating them into the process; the Check stage entails assessing and analyzing the results; and the Act stage entails figuring out what needs to be altered to attain continuous improvements (Deming, 1986).

This approach is centered upon the idea of ongoing improvements that aid in raising quality while lowering costs. Deming placed a strong emphasis on management, both on an individual and organizational level, because he thought that managers were usually to blame for quality problems. According to Deming, ineffective processes, procedures, and systems were at the core of many quality issues, and employees had little control over them unless they were given the authority to do so (Jarvis, 2018).

Of the fourteen management principles, Deming asserts that bidders should be chosen based on quality rather than solely on the tender's provided price. The theory from 1986 states that a measure of the quality being purchased is necessary for the price to have any meaning. Low quality and excessive cost are the unavoidable results of inadequate quality control measures and procuring entities' tendency to favor the bidder who offers the lowest price. According to Deming (1986) and Ishikawa (1985), organizations should work with bidders to guarantee that their medical devices and services are of the highest quality. Quality-related tender management activities, particularly tender planning, tender document initiations, tender evaluations, and tender awards, 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).

Therefore, from the above concepts, medical device tender management involves activities that start from tender planning up to contract award. The major dimensions to consider in the

tendering of medical devices are tender planning, tender document initiation and invitation, tender evaluation, tender award, and record management of the tender process.

2.2.4 Medical Devices Tendering Process

There are most common steps in the tendering process. The first step is determining tender methods and what to include in the tender process. Secondly, preparing a request for tender involves contractual requirements, required outlines, and how vendors should respond. Third, tender invitation will takes place by prior a known ways of advertising. Fourthly, tender floatation; this is the stage of suppliers for obtaining all relevant documents, pre-tender conferencing, making clarifications on any ambiguous circumstances; suppliers will prepare their bids as per the given bidding forms and requirements; and finally, submission at the right time at the right place will be carried out. After bid submission by suppliers, the next step is evaluation and selection of the bid. This will be conducted against the pre-set criteria in the tender document, so the bid that offers the most responsive and best value for money will be selected. The sixth stage is the result announcement and the debriefing of unsuccessful vendors on their incompliance. After disclosing the tender result, there will be complaint management for those vendors who have any grievances with the assessment of the tender. Finally, a formal contract agreement will be established (Ayoti 2012, P. 10).

On the other hand, the simplified tendering workflow is classified into five major stages, and these are initiation, solicitation, opening, evaluation, and awarding. A tender initiation involves lots of selection and tender document preparation (evaluation criteria, instructions, specifications). The second stage is solicitation and consists of invitation and floating periods. Thirdly, tender document opening will be conducted by the opening committee. The fourth stage is bid evaluation (due diligence, technical, and financial) according to the pre-defined criteria in the bidding document. The final and fifth stage of tendering is awarding, in which the finalized bid assessment will be disclosed to all participant vendors or bidders. The next step is creating a contractual agreement between the buyer and supplier, Perago Information System (2021, PP. 4-6).

2.2.5 Medical Device Tender Planning

A tender plan clarifies what is needed, determines tender format and scope, defines requirements, what strategies are used, and when it is needed by both user and buyer, and sets milestones for each activity carried out in the tender process. A procurement strategy is a long-term plan to cost-effectively acquire the necessary supplies from efficient vendors who will deliver quality products on time (MSH or Yellow Book 2010, P. 21.3). Planning in the approach of category management is the right procurement strategy that will prioritize efforts and minimize its associated risks, like allocation of finance and supply risks. It is obvious that the aim of setting milestones is to execute all activities based on the planned schedule. Pooled procurement is another recent alternative procurement option to be considered during planning, according to USAID Deliver Project (2011, P. 102), in which procuring entities join together for the benefit of more competitive pricing by boosting their negotiating power with suppliers. The FPPPA (2010, P. 13) insists that any entities that are accountable to public bodies shall prepare plan supported by action plan to implement the necessary strategy, manage and execute the work program, ensure compliance, and achieve economy and efficiency.

When planning, the timing for each activity of a tender should be clearly identified in a logical way as it has a high influence on procurement effectiveness. Unless the plan is well integrated into the organization's annual approved budget, it will affect the procurement performance, such as the delay of LC opening. According to Jarvis (2019, P. 23), there are three types of tendering methods, namely: open tendering, restricted tendering, and negotiated tendering. In addition, the FPPPA (2010, PP. 18-19) states that there are five procurement/tendering methods applicable to medical devices: open bidding, restricted bidding, requests for quotation, requests for proposal, two-stage bidding, and direct procurement. Internationally, open tendering is the most transparent among the tendering methods that ensures effective competition and fairness.

According to Davis (2014, P. 12), total cost of care or ownership is an approach that assures medical devices with initially inexpensive and/or high spending but has long-term benefits. It involves pre-purchasing, purchasing, post-purchasing, and all the way to decommissioning and disposal of medical devices. So, carefully emphasizing total cost of ownership during tender planning has a great impact on the long-term use of medical devices.

2.2.6 Medical Device Tender Document Initiation

A tender or bidding document is the document used to request potential suppliers to offer a quotation, bid, or proposal to supply the required goods, services, or work. Tender document initiation involves tender document preparation and advertisement (FPPPA 2010, PP. 2 & 123). When preparing tender documents, it shall be better to indicate all relevant information in three sections, namely: bid data sheet, evaluation criteria, and statements of requirements, because these sections belong to vendors' proposal or offer preparation accordingly.

Tender document preparation necessitates a thorough understanding of and adherence to government, lender, and donor procurement procedures. Product specifications, terminology, use of the brand and generic counterparts, price adjustment, pricing, currency, transportation, insurance, conditions of the method of payment, and bid security are all issues that must be addressed in the tender documents. Considering supplier pre-qualification as part of the preparation of a tender ensures the procurement of effective and safe health commodities by keeping substandard products from entering the outlets. Pre-qualification is generally accepted as an essential procurement practice in ensuring product quality (USAID 2006, P. 13). The criteria to be included during tender preparation are total life cycle cost, technical merit, systems and resources, and added-value solutions (Jarvis 2019, P. 44). When setting an evaluation criterion for medical devices, in particular medical equipment, the tender document under evaluation criteria should consider the total cost of ownership, such as installation, turnkey work, commissioning, warranty, maintenance service, and disposal (Jarvis 2018, P. 56). The Key Performance Indicator (KPI) is another important way to be part of the initial tender process that helps to get information for evaluating a supplier's performance (Mason 2018, P. 129). The appropriate categorizing or classifying of medical devices in accordance with EU regulations is essential to comply with the quality conformity assessment in order to affix the CE mark. The European Commission of the Council Directive 93/42/EEC (2010) has classified all medical devices into three classes, namely: class I; class I (sterile); class I (measure); class IIa; class IIb; and class III. The conformity assessment procedures used to affix the CE mark based on the 93/42/EEC Directive are summarized in the following table.

Conformity Assessment Procedures	Classes					
Annexes	I	I (sterile)	I (measure)	IIa	IIb	III
II including section IV						√
II excluding section IV		√	√	√	√	
III					√	√
IV		√	√	√	√	√
V		√	√	√	√	√
VI		√	√	√	√	
VII	√	√	√	√		

Table 1: Medical Devices Conformity Assessment Procedures

Similarly, the US FDA regulations (21 CFR: parts 800–1050 and 1-99), medical devices are also classified as class I, II, or III based on the device's description and intended use. Class I products have the lowest risk, and the general requirement with the exemption of premarket notification (510 (k)) is sufficient to evaluate and sell the devices on the market. Class II is categorized under medium risk and usually needs 510 (k) or premarket notification (PMN) before the devices reach the market. Whereas Class III is the highest-risk device and needs a Premarket Approval (PMA) certificate rather than a PMN. As the hierarchy increases from class I to class III, the degree of risk increases from lowest to highest, and its regulation will strictly increase.

Generally, it is obvious that product registration certificates in African countries are not organized enough due to low infrastructure, financial incapability, and so on. Hence, in addition to the country's registration, it is also better to consider product certificates issued by the US FDA and European Union regulations in tendering to reduce product quality issues.

Unless the tender document is prepared to the best of one's ability, it will result in poor quality of service at health facilities and also raises clarification during the solicitation period, possibly regarding biased evaluation criteria and/or unclear and ambiguous specifications, hence affecting the competitive environment among vendors and taking time to prepare a response to the bidder’s inquiry. So, adhering to the guiding principles of tendering such as fairness,

transparency, effective competition, and openness is an important way to ensure the efficiency and effectiveness of procurement (Ayoti 2012, P. 12).

2.2.7 Medical Device Tender Evaluation

Every procuring entity should evaluate bids by pre-defined criteria set in the evaluation and qualifying criteria section of the standard tender document. Because tendering is conducted for high-value procurement, the Procurement Endorsing Committee, which is established by the head of the procuring entity based on personnel capability criteria such as officials with responsibility in high positions in the organization, better knowledge, and experience, and also should have a professional mix, must approve the evaluation proposal (FPPPA 2010, P. 4).

The compliance approach, which is based on fulfilling the minimal technical requirements at the lowest price, as well as the most economically advantageous tender, which includes weighting (scoring) of both technical and financial factors, are the two techniques of selection used during evaluation. Preliminary examination (bid originality, bid security amount and validity duration, bid price validity, MA), technical, financial, and post-qualification criteria based on an on-site visit or physical checking parameters, manufacturing capacity, and production process are the four evaluation criteria (FPPPA 2010, PP. 27-28).

The product registration certificate is one of the most important elements to consider as a technical evaluation criterion. The following evaluation criteria must be met by medical devices: First, regulatory approval and market authorization are granted by GHTF member countries or WHO prequalified countries. Second, GHTF-compliant QMS certifications. Third, quality assurance documents such as certifications, declarations of conformity, certificates of origin, and paperwork issued by notified bodies are available for end-product-specific standards such as ISO and other technical standards. 4th, ensure that the technical criteria are met. Primary and secondary packagings, as well as labeling, are covered in the fifth category. The last one is vendors, who are knowledgeable about medical device safety, storage, environmental conditions, usage, maintenance, and disposal (UNOPS 2021, P. 10).

The third evaluation criterion is financial, which includes the product's country of origin, INCOTERM, the distance from the port of discharge, financial stability, etc.

Finally, post-qualification is conducted after identifying the successful bidder. A physical inspection at the bidder's site to ascertain whether the bidder has full capability to execute if a contract is awarded, but this stage of evaluation may not always be feasible.

When assessing a tender, the FPPPA proclamation No. 649/2009, which governs Ethiopian public procuring bodies, states that they must follow the procurement principles of value for money, impartiality, transparency, fairness, and accountability. According to WHO (2011, P. 10), in public procurement, effective governance necessitates values and conduct such as accountability, transparency, responsiveness, professionalism, competition, and appeal rights. However, if the pre-set criteria are imprecise or confusing, the procurement principles outlined above will be impacted. So, based on what I've read, a well-defined criterion obtains the right product or service through some procurement rights, such as the right quality, the right price, and the right time, resulting in an effective and efficient procurement process.

Time is an important factor in tender evaluation; if it is delayed too long, it will have a negative influence on an organization's cash flow, and the products will not reach health facilities on time. Managing evaluation lead time should be aided by a tool that displays the time required to evaluate each tender, as this has an impact on procurement effectiveness. Furthermore, it is preferable to develop evaluation guidelines in order to ensure consistency in tender evaluation and to provide professional clarity on how to evaluate a tender.

2.2.8 Medical Device Tender Award

This is a formal announcement of the result to all bidders who participated in the bid at the same time once the evaluation proposal has been accepted by PEC. In addition, the unsuccessful bidders will be informed of the reason for their failure to succeed in their bid as well as the identity of the successful bidder. Bidders have the right to appeal a procuring entity's rejection of their proposal after a tender result, requesting that their bid be reconsidered (FPPPA 2010, P. 110; Yellow Book 2012, P. 21.18). To keep the procurement process moving as quickly as possible, the ideal time to settle complaints is within thirty days. According to FPPPA (2010, P. 111), any procuring organization must review and reply to complainants within ten working days of receipt.

Following the notification of the tender result and the processing of any objections, the public body shall write a letter to the successful bidder. Only when the procuring entity and the successful bidder execute a contract including extensive provisions controlling the execution of the procurement in issue is it said to be completed (FPPPA 2010, P. 56).

A purchase order will be issued to the bidder whose quotation meets the necessities of the bid document through the general public frame and who quotes the bottom evaluated cost. A purchase order is an individual order for goods and associated offerings issued through a contracting authority or any procuring entity pursuant to the terms, conditions, and pricing established in a contract agreement. Following the final preparation of the purchase order (PO) for overseas ones, it ought to be accepted by independent regulatory authorities (which include EFDA, the Ministry of Agriculture, and different institutions). Because the regulatory authority is a third party, it has an impact on the time commitments for purchase order approval.

A contract is essentially a legally binding agreement between two parties that binds each of them to perform specific actions. Each party is legally sure to carry out the desired obligations regarding the supply of the goods and associated services due to the putting of a purchase order with the aid of any procuring entity. Unless an extraordinary circumstance arises, the winning bidder must sign a contract with the procuring entity within 15 days of being notified of the award (FPPPA 2010, P. 63).

2.2.9 Medical Device Records Management of Tender Process

Record management is about the recording of written or printed paper, tender documents, process documents, and other relevant documents with respect to tender records that bears the official or legal form of something done and can be used to furnish evidence, instruction, reference, or information about the carried out works (MSH or yellow book 2012, P. 21.19). Because tender management deals with a lot of paperwork, hence properly keeping tender records for ten years is important in providing evidence of what has transpired as well as providing information researching discrepancies (FPPPA 2010, P. 100).

During the day-to-day activities of tendering, the consistent use of standard forms/templates provided by the Quality Assurance and Quality Control unit should be evaluated and applied.

When acceptable changes to the preceding standard form/template occur, the document update must be approved by the Quality Assurance and Quality Control unit before being implemented. In addition, each official or legal letter that is to be included in the record should be placed in the inbox in chronological order of its dates so that any correspondence may be easily followed. Any procuring entity should follow ISO 15489 when it comes to record management practices (International Organization for Standardization on Records Management Systems). Many variables related to procurement success are controlled by the system, supporting its position as a facilitator of information assets and government action.

2.2.10 Procurement Performance

Procurement performance is a component or activity of integrated procurement management. It entails describing the important indications, methods, and processes that must be used to measure procurement success. Although management appears to be interested in running and regulating the procurement function as efficiently and effectively as possible, the true issue is how to achieve procurement goals in the government sector that are influenced by both internal and external forces.

Poor procurement performance contributes to rising inefficiencies, costs, and decreased competition in the procurement function. According to Barsemoi et al. (2014, P. 623), poor procurement performance contributes to a decrease in profitability in the private sector and is thus a major hindrance to the realization of organizational growth because it causes delivery delays, and low-quality goods and services, and an increase in defects. Failure to embrace e-procurement, the use of traditional procurement practices, and a lack of coordination of procurement activities between the requisitioning and procurement departments result in poor procurement performance in both the commercial and public sectors.

Given the importance of the procurement function and the requirement for consistent procurement techniques, it is vital to study measures that would improve procurement efficiency and effectiveness. Appropriate procurement performance monitoring indicators must be in place, and they must be supported by both management and operational professionals in order to properly monitor procurement performance (USAID Deliver Project 2013, P. 1).

The public sector procurement needs to get the best value for money, particularly as it is public money that is being spent. There are three methods of securing budget savings, namely; economy, efficiency, and effectiveness (Carter 2018, P. 43).

- **Economy:** means paying lower prices for the same medical devices
- **Efficiency:** refers to reducing inputs, but maintaining outputs, or maximizing outputs from the same inputs.
- **Effectiveness:** the relationship between the actual and intended impact of a service, balancing the importance of services against their cost.

Measuring procurement performance is the first step toward understanding a system's strengths and weaknesses and taking corrective action. Specific and measurable indicators must be defined in order to develop an efficient method for monitoring procurement performance. One of the criteria of procurement performance is efficiency in the procurement process, which is measured in terms of transaction costs and time. The quality of the medical devices and services is another indicator of procurement performance (Walker and Rowlinson 2008).

2.2.10.1 Cost

A cost is an amount paid for something before medical devices and services can be obtained or done. On the other hand, the financial consequences of not carrying out the proposal, as well as the benefits of doing so, should be considered. It includes both direct and indirect costs, as well as procurement costs. Direct costs, such as direct labor and materials needed to make more medical devices, are variable costs. On the other hand, indirect costs are fixed expenditures that do not change depending on the quantity produced, such as lighting, warehousing, or office rent (Carter 2018, P. 73). Because the consumer will evaluate the worth of a product or service and make a purchasing choice based on the price, the cost is a critical aspect of customer happiness (Kaura et al. 2015). According to Mason (2018, P. 183), cost management is about managing expenditure to reduce costs to the minimum level possible without causing a reduction in quality. The aim is not simply to stay within budget and it includes but is not limited to the following:

- Planning how much of each resource is needed to deliver a project /procurement
- Estimating what the project/procurement process will cost in financial terms
- Budgeting or allocating finance to cover the estimated costs

2.2.10.2 Quality

Quality performance refers to the quality deliverables of procurement related to medical devices and services, thus improving the organization's brand reputation. On the other hand, customer satisfaction is the end outcome of the organizational activities through the delivery of excellent performance. Some of the quality deliverables are excellent product and service quality, fit for purpose, meeting the specification, minimizing variations and defects, reliability, product reliability, and attractiveness. According to Mason (2018, P. 180), quality performance covers everything else not related to costs, and it includes conformance specifications, deliveries matching orders, compliance with policies and code of conduct, responses to queries, compliance with relevant legislation, and risk management.

2.2.10.3 Time

Lead time is the total amount of time it takes from the initial identification of the need to when the medical devices or services are delivered to the organization (Carter 2018, P. 84). According to Hong et al. (2018), lead time needs to be monitored appropriately to reduce unnecessary costs and enhance customer service. The large variance in implementation time adds to the difficulties of procurement planning. In order to ensure efficient production of medical devices by suppliers, it is vital to precisely predict lead times and deliver on time to minimize delivery delays that can cause stock shortages, resulting in higher total costs and revenue loss (Hong et al., 2018).

2.2.11 Relationship between Tender Management and Procurement Performance of Medical Device

Tender management best practices minimize quality, cost, and time, whereas bad practices result in delays and waste, which are inefficient and ineffective. Awarding criteria are undisclosed because only successful bidders are notified, while those who are not being kept in the dark about their reasons for failure. As a result, poor and inferior items are obtained, making tendering procedures inefficient (Athumani 2012, P. 6). Appropriate records management guarantees that records can be obtained quickly and readily when needed, thus influencing medical device procurement performance (Matto 2022, P. 89). The tender process's stage of tender evaluation is particularly prone to unethical behavior and thus needs a special focus to bring its contribution to enhance the procurement performance. Good specifications, which are a necessary component of

the tender document's initiation, facilitate specification compliance and enable the provision of an equivalent award at the lowest cost, boosting the competitiveness of the bid.

Tender management practices, according to Muya et al. (2019, P. 234), are marked by inefficiency, ineptitude, and corruption, all of which lead to serious procurement difficulties. The main performance principles of quality, cost, and time have a significant impact on the procurement process. The procurement function is critical in delivering services in developing countries like Ethiopia, where it contributes to a considerable portion of total expense. Due to the enormous sums at stake, procurement performance is required to achieve the best value for money. Therefore, with the aim of enhancing procurement performance, tender management implements a variety of measures including planning, tender preparations or initiations, tender evaluations, tender awards, and records management, among others.

2.3 Empirical Review

2.3.1. Medical Device Tender Planning

According to Njeru & Willy's (2014, PP. 62-63) investigation, planning is the fundamental activity that prepares the groundwork for subsequent tender actions; it fuels and then ignites the procurement process's engine. The process of determining an organization's budget, allocating resources in a timely manner, and establishing acquisition schedules ensures that operations function smoothly. Planning adheres to the procurement portfolio (category management), improves accountability and transparency, and decreases supplier dependency, all of which improve procurement performance. Creating a category management portfolio also allows for the appointment and identification of responsive and credible suppliers.

According to the findings of Githinji & Moronge (2018, P. 2139), open tendering (international and national competitive) is the most widely utilized type of tendering and provides a wider choice in selecting the most suitable bid due to the competitive environment of bidders. It also encourages supplier competition, which results in the best value for money, transparency, and the avoidance of favoritism and corruption. As a result, using an open tender has a significant impact on improving procurement performance.

The findings of Munyawera et al. (2018, P. 715) declare that the bottom line in tender planning is that it is not about future decisions, but about the influence of current ones. All users must set goals; this will affect procurement performance as well as the efficient use of available resources and budget allocation. Procuring entities should put in place strict mechanisms to guarantee that procurement is based on a well-thought-out plan that complies with procurement regulations.

2.3.2. Medical Device Tender Document Initiation

According to Muya et al. (2019, P. 239) investigate finding, appropriate specification decides the victory of procurement performance. In any case, preparing poor specifications during tender initiation is a major difficulty in cost estimation for medical devices. In addition, the study uncovers that failure to adhere to specifications increases making biased and irregular decisions. According to Athumani (2012, P. 58), specifications are a major consideration when preparing tender documents, and some invites failed to attract bidders due to ambiguous specifications, resulting in product re-tendering as well as a lack of value for money. The investigation concluded that the medical device's lack of safety and functionality has an influence on service provision across the national health system, resulting in decreased patient output, greater patient danger, and death (Diaconu et al. 2017, P. 2). Furthermore, 40 to 70 percent of medical devices in low-resource nations are defective or non-functional, according to the study.

The findings of Kinyanjui (2021, PP. 53-54) show that bidders should conform their medical devices to quality assurance certificates issued by third-party bodies and that bidders should also involve buyers in product design to improve product quality and reduce unnecessary costs associated with non-standardized design. Furthermore, the study reveals that setting bidder’s financial statements criteria as part of tender preparation play an important role to ensure continuity of supply.

2.3.3. Medical Device Tender Evaluation

Muya et al. (2019, PP. 238–239) reveal that in order to attain the objective of any procuring entity, it must guarantee that all the essential procurement rules are taken into account in obligatory requirements, technical and financial angles when it comes to the assessment of tender offers. Credit rating or ratio analysis of the supplier can be an exceptionally important viewpoint

that entities have to consider when evaluating suppliers in terms of quality commitment. Furthermore, the finding shows that enhancing tender evaluation activities will increase the procurement performance of medical devices.

Finding quality certificates and product registration, according to Jayathilaka & Rajapakshe (2020, pp. 9–10), is a factor that has impacted the medical equipment industry's tender hit rate because it evaluates the safety and effectiveness of medical devices before and after they reach the market (US FDA, CDRH), so the buyer will not accept any bids. In the sphere of medical device tendering, the country of origin is also another element to consider.

Because training is a means of gaining knowledge and sharing experience, learning about public procurement as a whole helps procurement employees learn tendering regulations and procedures so that they can evaluate tenders quickly (Ayoti 2012, P. 57). Employing skilled individuals, according to Mutoro et al. (2018, P. 30), is critical in executing tendering activities faster and facilitates successful procurement performance.

According to Kinyanjui (2021, p. 53), the bidder's personnel capacity and financial stability are assessed at this stage to demonstrate the bidder's feasibility and to improve the buyer's reputation.

2.3.4. Medical Device Tender Award

Athumani (2012, P. 58) investigates that effectively debriefing defeated bids decreases the risk of legal action by demonstrating to the supplier that the process was carried out appropriately and in accordance with procurement and probity laws.

The findings of Abdella (2014, P. 56) demonstrate that delays in contract signing and a lack of awareness about the contract are two hurdles in the tender process that impede the effectiveness or performance of procurement. Any procuring organization located in Ethiopia, according to FPPPA (2010, P. 63), should urge the supplier to sign and submit the contract within 15 days of receiving the contract notification.

2.3.5. Medical Device Record Management of Tender process

According to Kisurkat (2016, P. 34), all tendering records are preserved for six years or more, which is in accordance with the Kajiado county PPDA 2005, which ensures that all regulations are met, and so good record management adds value to procurement success.

The findings of Matto (2022, PP. 89-90), reveal that records arrangement and access have an impact on procurement performance. Records should be kept in a separate file for each project and organized chronologically within the tender process for simple retrieval. Unacceptable record management behavior, such as misplaced files, and inactive and active files, is reduced by a system with good record keeping. To get the highest procurement performance, it is critical to invest in record management attributes such as storage (space), people, and financial resources. Tender records are captured and created during the tender process, thus they must be managed efficiently to assure their legitimacy, integrity, usability, and reliability.

2.4 Conceptual framework

A conceptual framework is a set of interconnected ideas (concepts) regarding how a phenomenon works and how it is related to its individual elements. The link between the independent variables and the dependent variable is investigated using the conceptual framework. Tender planning, tender document initiation, tender evaluation, tender award, and record management are the independent variables, whereas procurement performance is the dependent variable, according to the aforementioned literature and problem statement. Further, based on the above literature here are the hypotheses drawn for this study.

Hypothesis 1: Tender planning practice has a significant and positive effect on the procurement performance of EPSS.

Hypothesis 2: Tender document initiation practice has a significant and positive effect on the procurement performance of EPSS.

Hypothesis 3: Tender evaluation practice has a significant and positive effect on the procurement performance of EPSS.

Hypothesis 4: Tender award practice has a significant and positive effect on the procurement performance of EPSS.

Hypothesis 5: Tender record management practice has a significant and positive effect on the procurement performance of EPSS.

The relationship between independent and dependent variables is depicted in diagrammatic form in the diagram below.

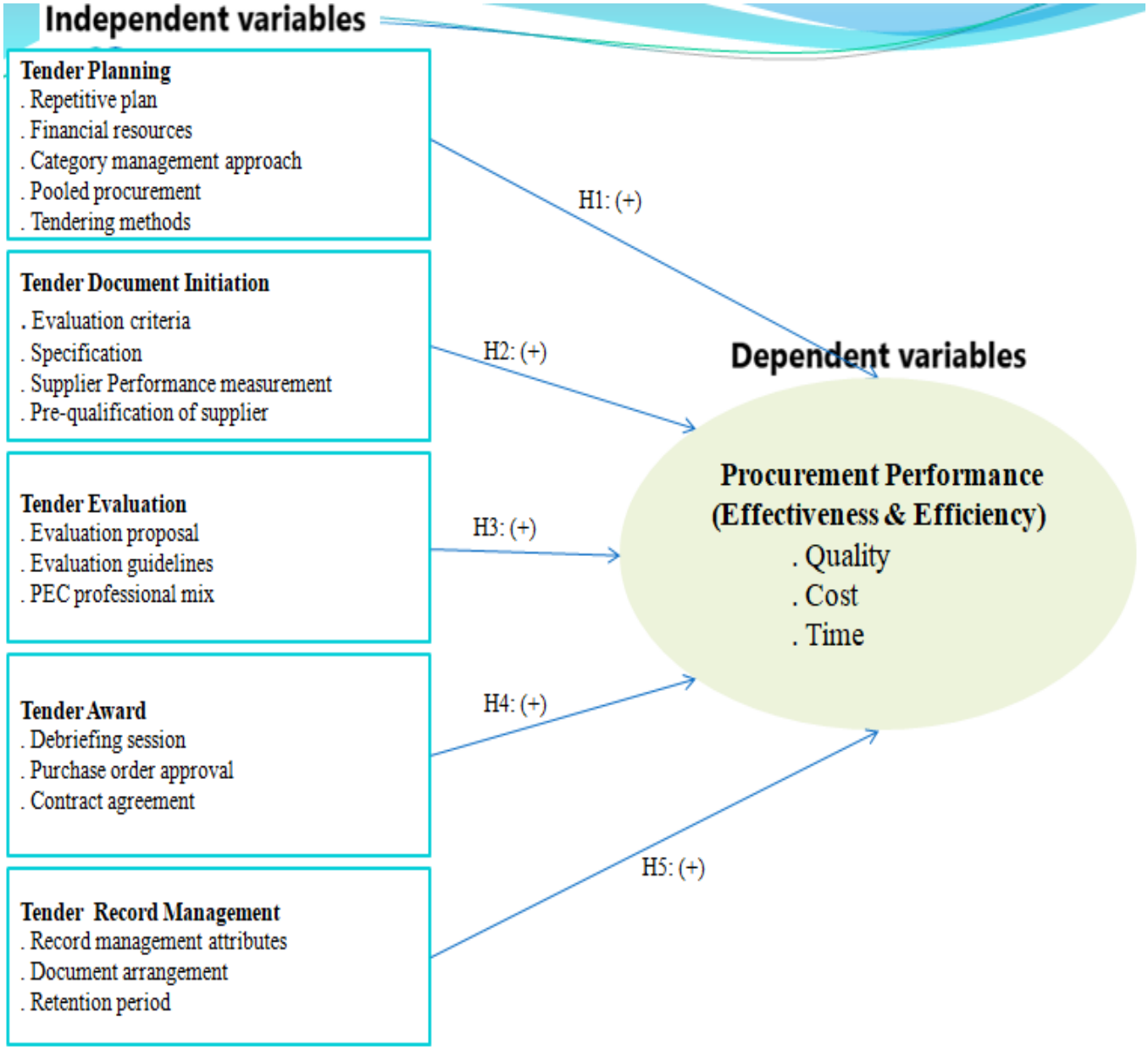

Figure 1: Conceptual model for the study (Source: own survey by referring different literatures such as Logistics Handbook, 2011; ISO 15489; Yellow Book or MSH, 2012, Athumani 2012, Matto 2022, Muya et al. 2019, etc…)

CHAPTER THREE

RESEARCH METHODOLOGY

This section focuses on the overall procedures of a research used in gathering relevant data for the achievement of the objectives of the study. The methodology consists of description of study area, research approach, research design, population and sampling, data analysis, and presentation of data.

3.1. Description of the Study Area

The Ethiopian Pharmaceuticals Supply Service is a government-run organization that procures all types of medicines, medical equipment, medical supplies, laboratory reagents, and chemicals from national and international manufacturers and suppliers and distributes them to government health facilities through its 19 branches across the country.

It is a legal body formed by the government of the Federal Democratic Republic of Ethiopia (FDRE) to provide an uninterrupted supply of health sector goods to the public at a reasonable price. The headquarter is located on Arbegnoch Street, in front of St. Paul's Hospital, in Addis Ababa's Addis Ketema Sub-City, around 2.8 kilometers west of the Piazza (the center of Addis). The outbound logistics directorate (warehousing and inventory management unit, distribution and fleet management unit), the inbound logistics directorate (quantification and market-shaping unit, tender management unit, contract management unit), and the quality management unit are the three major sub-processes of the organization. Human resources management, finance management (RDF & Program), information system management, planning, monitoring, evaluation, and general service are also supported organizational functional units. The purpose of the research is to analyze the effect of tender management on the procurement performance of medical devices at the Ethiopian Pharmaceutical Supply Service.

3.2. Research Approach

The study had employed a quantitative research approach to generate numerical data that can be turned to numbers, with a focus on counting and classifying aspects, as well as developing statistical tools and figures to characterize what is observed through structured questionnaires or techniques.

3.3. Research Design

The study begins with the purpose of understanding a problem or condition and ends with the goal of establishing a causal effect between variables in order to understand how one variable influences or causes changes in other variables. Explanatory research, according to Athumani (2012, P. 36), is a study design that is used to figure out what's going on, why it's going on, and what can be done to solve it. As a result, this study has focused on an explanatory research design that examines the causes and reasons for the subject in order to assess the impact of tender management on medical device procurement performance.

3.4 Population and Sampling

3.4.1 Target Population

As per the HR data, there were 100 employees. This included all staff (including officers, team leaders, technical advisors, and directors) who were involved either directly or indirectly in managing tenders of the organization (i.e., quantification and market-shaping unit, tender management unit, contract management unit, and other cross-sectional units). As a basis, the study's candidates were used as the units of the population, with a sample size of 100 participants.

3.4.2 Sampling Technique

The population refers to the overall group of people, events, or things of interest that the researcher wants to look into, whereas the target population refers to the entire set of elements from which the researcher wants to draw conclusions. The target population to whom the findings apply was defined and consistent with the problem and objectives stated in the problem statement. Because of the small sample size, the study has employed a census population sampling technique to offer the required and relevant information on the quantitative data.

3.5. Sources of Data

3.5.1. Primary Source

Primary data was collected from directors, technical advisors, team leaders, and officers who were involved either directly or indirectly in the tendering process of medical devices using structured questionnaires, which were only closed-ended questions.

3.5.2. Secondary Source

In this particular study, the secondary sources of data include documents that consist of journals, SOPs, reports, bidding documents, bid evaluation documents, tender award documents, purchase orders, contract agreements, and any other documents that were used only for information to enrich the research.

3.6 Data Collection Procedures

The data collection method took into account current tender management practices and their impact on procurement performance, which was investigated using a structured questionnaire based on a 5-point Likert Scale rating system for the independent and dependent variables as 1 (very low) to 5 (very high). The research instrument had designed clearly and was free from any ambiguity to address the specified objectives of the study. First of all the selected participants were communicated for their consent prior to starting data collection. Then after knowing the willingness of participants, the prepared self-administered structured questionnaire was disseminated to each respondent. After a certain time questionnaires were collected after a few days along with an appreciation for their participation as well as spending their precious time. Lastly, the investigator made a thank you message remark for the cooperation of all respondents. Primary data was gathered from the subject of the study and accordingly, the collected data was checked for its completeness and consistency prior to starting the analysis.

There were three elements to the questionnaire that was proposed and used in this investigation. Part one of the study looked at demographics, while Part two looked at medical device tender management practice or responder characteristics. Part three focuses on the performance of medical device procurement.

3.7 Data Analysis

Data analysis is a process that consists of numerous decisions and discrete tasks that can be unique to particular research. In particular, data analysis consists of a series of activities that can involve the application of several different statistical techniques in a variety of different ways. The collected data has been checked initially to detect any errors to ensure consistency and completeness.

After the data was checked, the descriptive data was analyzed and coded by the use of IBM Statistical Package for the Social Sciences (SPSS) version 23. The data analysis included frequency distribution, percentage, mean, standard deviation, product-moment Pearson's correlation, Analysis of variance, and bi-variate analysis to explain the relationships between different variables tested in this study.

Descriptive statistics teach us how to present information numerically and graphically in order to get a broad view of the data we've gathered. As per the study, Pearson's correlation and multiple regression analysis, which includes ANOVA and summary model in inferential statistics, were used to analyze both associations and effects of tender management activities on procurement performance.

3.9. Validity and Reliability

3.9.1. Validity

The most crucial requirement in research, according to Kothari (2004), is validity, which demonstrates how well an instrument measures what it proposes to measure. The data collection tool was piloted on some of the respondents to ensure the validity of the questionnaires by checking the clarity, ambiguity, and readability of the statements and questions. The researcher was able to explain some vocabulary during the pilot study, and the tools had to be adjusted and modified accordingly.

3.9.2. Reliability

Data collectors were trained on the data collection instruments and processes and the investigator supervised the data collection process and reviews the questionnaires that will be completed to clarify any data inconsistencies. To ensure the reliability of the instrument, Cronbach’s test has been conducted. Reliability is the trend toward consistency exhibited in repeated measurements of the same phenomenon. The amount to which all of the items on a scale measure distinct a facet of the same property is referred to as internal consistency. Cronbach's alpha standard ranges from 0 to 1, and with = 0.7 or higher is considered internally consistent or sufficiently reliable data (Alsaffar et al. 2013). The questionnaire was reviewed by specialists and a pilot test was conducted on 15 participants to confirm the instrument's reliability, but these respondents didn’t include in the final research. Hence, based on the feedback, the questionnaire was changed to

ensure the Cronbach's Alpha would fall greater than or equal to 0.7. The item-total statistics Alpha is presented hereunder in table 2.

Table 2: Reliability Test

No.	Variables	Number of items	Cronbach's alpha
1	Tender Planning	9	0.914
2	Tender Document Initiation	7	0.902
3	Tender Evaluation	6	0.890
4	Tender Award	7	0.899
5	Record Management	6	0.900
6	Procurement Performance	9	0.884
Total		**44**	**0.914**

Source: SPSS own survey (2022)

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

Prior to beginning data collection, AAU SOC had communicated with the organization (EPSS) through a formal letter to obtain official authorization to conduct the research. Before disseminating the research instrument, all participants' permission was sought before they were enrolled as respondents in the study. During data collection, interviewers explained the study's goal, scope, and intended outcome to respondents. All the necessary information obtained from participants was handled ethically, without distorting the individuals' initial concerns, and will be kept confidential. Respondents also assured that any information gathered throughout the course of the study was kept private. To protect the respondents' anonymity, no individual was identified in any reports or publications based on their responses.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSIONS

This chapter analyzes the data obtained and discusses the results in respect of the study's research objectives and hypothesis, which were expressed in the first chapter. All data sets were primary data acquired from employees who were, directly and indirectly, involved in the organization's tender management unit, contract management unit, quantification and the market-shaping unit, and other cross-sectional units. In order to convert the gathered data into a numeric format, data coding had prepared to represent each item and variable. Hence, after finalizing the data coding, results were analyzed, discussed, and presented using charts, tables, frequency distributions, and percentages. The first section of the questionnaires indicates the socio-demographic information of the respondents. Whereas the second part includes an assessment of tender management practices of EPSS, and the final section presents the regression and correlation analysis between independent and dependent variables. Analysis of the collected data was computed with the help of software called Statistical Package for Social Science (SPSS).

4.1 Response Rate of the Study

The response rate is the ratio of usable responses received to the total number of respondents who are eligible in the selected population. A response rates of 80% or greater enables the researcher to generalize its representations of the target population to be sufficient and acceptable as a general rule of thumb (Fincham 2008, P. 2). As shown in the graph below, the study found that 92 out of 100 questionnaires were correctly filled out and returned for processing, giving the study a 92% response rate. Whereas 3 (3%) of the questionnaires are incomplete and 5 (5%) of the questionnaires have not been returned. As a result, 92 questionnaires were deemed sufficient because they exceeded the usual response rate rule of thumb.

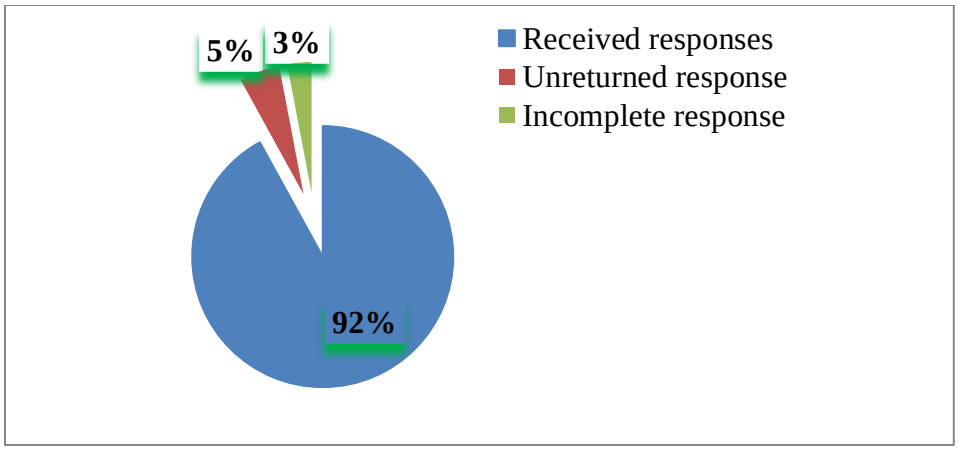

Figure 2: Response rate of the study

Source: SPSS own survey (2022)

4.2 Socio-demographic Characteristics of the Respondents

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

Table 3: Socio-demographic information

Socio-demographic character	Sub category	Frequency	Percent (%)
Gender	Male	69	75
	Female	23	25
Age	Less than 31 years	31	33.70
	31 to 40 years	53	57.60
	41 to 50 years	2	2.20
	Above 50 years	6	6.5
Educational qualification	Diploma	0	0
	Degree	41	44.60
	Masters	51	55.40
	PhD	0	0
Working Directorates	TMD	22	23.90

	QMSD	30	32.60
	CMD	33	35.90
	Others	7	7.60
Year of experience	Below 3 years	14	15.20
	3 to 6 years	28	30.40
	7 to 10 years	39	42.40
	Above 10 years	11	12.00
Job Position	Director	3	3.3
	Team leader	17	18.50
	Officer	65	70.70
	Advisor	7	7.60

Source: SPSS own survey (2022)

As observed in the table above, males accounted for 75% of the responses, while females accounted for 25%. According to the findings, both males and females participated in this study.

Among the responses grouped by age, 53 (57.60%) of the responses were grouped between 31 and 40 years of age, followed by groups less than 31 years of age 31 (33.70%), groups over 50 years accounted for 6 (6.5%), and lastly, groups between 41 and 50 years accounted for 2 (2.20%) of the responses. Hence, the results show that most of the respondents were young workers in the organization.

Although the educational qualifications for diploma and Ph.D. level were included in the questionnaire, no one respondent was presented in this study. However, 51 (55.40%) of the responses were from those with master's level education, and this group dominated the response, while 41 (44.60%) were educated at the degree level. This indicates that all of the respondents had sufficient education to understand and reply to the survey.

Among the organizational experience, respondents with experience of 7 to 10 years accounted for 39 (42.40%) and dominated the others, followed by the experience of 3 to 6 years accounted for 28 (30.40%), below 3 years accounted for 14 (15.20%), and above 10 years of experience accounted for 11 (12%) of the responses. This meant that the majority of the responses (42.40%)

had worked in the organization for 7 years and above, meaning that they could provide accurate information regarding the report.

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 Tender Management Practice

In order to determine the effect of tender management on procurement performance, first, the practice of tender management was assessed at the Ethiopian Pharmaceuticals Supply Service. Hence, respondents were requested to show the current state of tender management practice in their organization. The tender management practice is comprised of five variables, namely: tender planning, tender document initiation, tender evaluation, tender award, and record management.

Respondents have rated the state of tender management practice by using the established five point Likert scale with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Means and standard deviation were used in this study to examine the tender management practices of the organization. The mean is the simple average of all responses in a given distribution. According to Lady (2016), means are interpreted as follows: 4.5–5 = always practiced, 3.5–4.49 = very often practiced, 2.5–3.49 = occasionally practiced, 1.5–2.49 = rarely practiced, and 1–1.49 = never practiced.

Standard deviation is a measure of dispersion that shows how close or far each of the respondents' opinions is from the distribution mean. Furthermore, a small standard deviation highlights that the data is low-spread, which means that respondents have almost similar opinions. Whereas high standard deviation indicates the widespread of the data from distribution mean that shows a variety of opinions among respondents.

4.3.1. Medical Device Tender Planning Practice

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

Table 4: Descriptive statistics of medical device tender planning practice

Items	N	Mean	Std. Deviation
There is a repetitive plan to be prepared due to the fragmented and piecemeal procurement request.	92	3.62	0.900
The organization's plan is carried out based on the allocated resources such as approved budget.	92	3.23	0.743
When preparing a plan, whole life cycle cost is considered to determine the current and future lowest cost of medical devices.	92	3.09	0.821
The organization has experience in conducting pooled procurement.	92	2.86	0.967
The organization activities are performed according to the scheduled plan.	92	2.75	0.872
Planning takes into account category management approach to identify risks and prioritize efforts in sourcing.	92	2.79	0.719
The organization select its tendering/procurement methods based on the FPPPA proclamation.	92	3.59	0.787
The organization has a tracking system for easier time monitoring of the planned activities.	92	2.61	0.838
Medical devices delivery schedule is appropriately established/planned to minimize LC extension that reduce the costs will incur due to this extension or amendment.	92	3.02	0.914
Grand Total	**92**	**3.06**	**0.498**

Source: SPSS own survey (2022)

As the result shows in the above table 4, an overall mean and standard deviation of (M = 3.06, SD = 0.498) represented that tender planning was occasionally practiced in the organization.

Furthermore, the table indicates that a repetitive plan to be prepared due to the fragmented and piecemeal procurement request was very often practiced in the organization with the largest mean (M = 3.62, SD = 0.900), whereas all of the other items were practiced occasionally in the organization.

Generally, as the descriptive statistics depicted, there was a high standard deviation spread with a range of 0.719 to 0.967, which comparatively shows responses were more varied for tender planning practice.

4.3.2. Medical Device Tender Document Initiation Practice

The study aims to assess the state of medical device tender document initiation practice in the Ethiopian Pharmaceuticals Supply Service and the findings are presented in the table.

Table 5: Descriptive statistics of medical device tender document initiation practice

Items	N	Mean	Std. Deviation
The organization prepares its tender document according to the FPPPA standard bidding document.	92	3.75	0.779
When defining evaluation criteria in the tender document, the organization adhere to the guiding principles of procurement such as fairness, transparency, effective competition, and openness.	92	3.73	0.813
The KPI of supplier performance measurement has included as part of the tender document.	92	2.89	0.831
The organization use generic and standardized specifications for medical devices.	92	3.46	0.831
In addition to the quality standard of Ethiopian Food and Drug Authority, there is a predefined standard of quality (like US FDA, CE) which is part of tender document, as per the international categorization of all medical devices such as Class I, Class II, and Class III.	92	3.59	0.772
During tender floatation period, there are amendments and/or clarifications causing extension of bids.	92	2.82	0.755
The organization use supplier pre-qualification as part of the tender document.	92	3.09	0.979
Grand Total	**92**	**3.33**	**0.491**

Source: SPSS own survey (2022)

The study result in the above table 5 demonstrates that the overall mean and standard deviation (M=3.33, SD=.491) represented that tender document initiation was occasionally practiced in the organization.

The above table reveals that the organization's preparation of the tender documents according to the FPPPA standard bidding document (M = 3.75, SD = 0.779), and when defining an evaluation criteria in the tender document, the organization adheres to the guiding principles of procurement such as fairness, transparency, effective competition, and openness (M = 3.73, SD = 0.813), and in addition to the quality standard of the Ethiopian Food and Drug Authority, there was a predefined standard of quality (like US FDA, CE) which was part of the tender document, as per the international categorization of all medical devices, such as Class I, Class II, and Class III (M = 3.59, SD = 0.772) were very often practiced. The other four items were practiced occasionally in the organization.

Generally, as the descriptive statistics depicted, there was a high standard deviation spread with a range of 0.755 to 0.979, which comparatively thus shows responses were more varied for tender document initiation practice.

4.3.3. Medical Device Tender Evaluation Practice

The study aimed to examine medical devices tender evaluation practice in the Ethiopian Pharmaceuticals Supply Service and accordingly its data is presented here below.

Table 6: Descriptive statistics of medical device tender evaluation practice

Items	N	Mean	Std. Deviation
The organization's tender evaluation process is conducted against the pre-defined criteria/requirements.	92	3.55	0.761
The organization has a mechanism for evaluation time estimation per each tender.	92	2.59	0.729
The established Procurement Endorsing Committees have a professional mix.	92	2.68	0.694
The organization has evaluation guidelines for medical devices.	92	2.95	0.701

There is a timely evaluation of bids by the Tender Evaluation Committee.	92	3.12	0.888
There is a timely endorsement of the evaluation proposal report by the Procurement Endorsing Committee.	92	2.85	0.825
Grand Total	**92**	**2.96**	**0.482**

Source: SPSS own survey (2022)

The study result in the above table 6 demonstrates that the overall mean and standard deviation (M=2.96, SD=0.482) represented that tender evaluation practice was occasionally practiced in the organization.

The above table reveals that the organization's tender evaluation process was conducted against the pre-defined criteria and requirements with the highest mean (M = 3.55, SD = 0.761) being only very often practiced in the organization, whereas the other five items were practiced occasionally in the organization.

Generally, as the descriptive statistics depicted, there was a high standard deviation spread with a range of 0.694 to 0.888, which comparatively shows responses were varied for tender evaluation practice.

4.3.4. Medical Device Tender Award Practice

The study attempted to assess the practice of medical device tender awards in the Ethiopian Pharmaceuticals Supply Service and its data is presented in the table below.

Table 7: Descriptive statistics of medical device tender award practice

Items	N	Mean	Std. Deviation
After endorsing the evaluation proposal, tenders are awarded to winners timely.	92	3.16	0.952
After disclosing award notification, there is a debriefing session for unsuccessful vendors/bidders.	92	2.48	0.703
The organization gives a response to bidders' complaints on tender results within the standard time frame of FPPPA.	92	3.48	1

The organization issues a letter of contract award to the successful supplier.	92	2.43	0.868
The organization's purchase order is being approved by the Ethiopian Food and Drug Authority on time.	92	2.82	0.797
There is a pre-agreed contract terms and conditions (pre-agreed contract) thus improves the well completion of contract between the buyer and supplier.	92	3.13	0.841
Contract agreement is signed within the time frame of FPPPA.	92	3.1	0.813
Grand Total	**92**	**2.94**	**0.492**

Source: SPSS own survey (2022)

The study result in above table 7 reveals that the overall mean and standard deviation (M=2.94, SD=0.492) represented that tender award was occasionally practiced in the organization.

The above table shows that after disclosing award notification, a debriefing session for unsuccessful vendors/bidders with a small mean (M = 2.48, SD = 0.703), and the organization's issuance of a letter of contract award to the successful supplier with a small mean (M = 2.43, SD = 0.868) were rarely practiced in the organization, whereas the other five items were practiced occasionally in the organization.

Generally, as the descriptive statistics depicted, there was a high standard deviation spread with a range of 0.703 to 1. This shows responses were more varied for tender award practice.

4.3.5. Medical Device Record Management Practice

The study attempted to examine medical device record management practice in the Ethiopian Pharmaceuticals Supply Service and its data is presented here below.

Table 8: Descriptive statistics of medical device record management practice

Items	N	Mean	Std. Deviation
The organization keeps tendering records for a 10-year retention period.	92	3.51	0.791
The organization invests in record management attributes such as storage (space), people, and financial resources.	92	2.29	0.764
The organization implements consistent use of standard forms or templates as developed by the Quality Assurance and Quality Control Directorate.	92	3.33	0.813
Whenever acceptable changes happen over the previous standard form or template, the document change is carried out by prior notice to the Quality Assurance and Quality Control Directorate for approval.	92	2.63	0.624
All documents related to tender are managed in a controlled way of increasing confidentiality.	92	3.42	0.774
The official letters and relevant documents are arranged properly in a box file in sequential order of their dates for easy traceability.	92	3.4	0.902
Grand Total	**92**	**3.1**	**0.445**

Source: SPSS own survey (2022)

The study result in table 8 indicates that the overall mean and standard deviation (M = 3.1, SD = 0.445) represented that record management practice was occasionally practiced in the organization.

The above table reveals that the organization kept tendering records for a 10-year retention period with the large mean (M = 3.51, SD = 0.791) very often practiced. However, the organization invests in record management attributes such as storage (space), people, and financial resources (M = 2.29, SD = 0.764), which is rarely practiced. The other four items were practiced occasionally in the organization.

Generally, as the descriptive statistics depicted, there was a high standard deviation spread with a range of 0.624 to 0.902, which comparatively shows responses were more varied for record management practice.

4.4 Medical Device Procurement Performance

The study attempted to look at the performance of medical devices procurement in the Ethiopian Pharmaceuticals Supply Service and its data is presented in the table below.

Table 9: Procurement performance of medical device

Items	N	Mean	Std. Deviation
Resources are properly utilized to achieve the procurement cost-effectiveness of a medical device.	92	2.63	0.794
In comparison to the cost of medical devices, the organization's operational/management costs are lower.	92	3.36	0.884
The product's price paid for medical devices are in alignment with international prices.	92	3.24	0.803
The organization purchase performance is measured at the end of fiscal budget year and gets feedback.	92	2.72	0.843
The organization supplies defect free medical devices to health facility.	92	3.46	0.790
Suppliers deliver the correct medical devices.	92	3.30	0.737
There are delays in executing procurements of medical devices.	92	2.93	0.912
There are delays in processing payments to suppliers.	92	3.33	0.691
Suppliers deliver medical devices on time.	92	3.22	0.810
Grand Total	**92**	**3.13**	**0.603**

Source: SPSS own survey (2022)

As the above table demonstrates that the overall mean and standard deviation (M=3.13, SD=0.603) represented that the performance of procurement was occasionally practiced in the organization.

The result reveals that all of the respondents remained neutral to all statements indicated in the above table; hence the procurement performance of the organization was under medium level which requires further enhancement and optimization.

Generally, as the descriptive statistics revealed, there was high standard deviation spread with range of 0.737 to 0.912, which comparatively shows responses were more varied for the procurement performance.

4.5 Correlation Analysis

Correlation analysis is a statistical tool for determining how closely two metric variables are related. The Pearson's product-moment correlation coefficient was used to determine the direction and strength of the relationship between independent variables of tender management practices, specifically tender planning, tender document initiation, tender evaluation, tender award, and record management, and the dependent variable, namely the organization's procurement performance (Field, 2006). The coefficient of correlation (r) is meant to be in the range of -1 to +1 (Muya et al. 2019, P. 236). According to Alwadael (2010), a zero (0) correlation indicates that the independent and dependent variables have no relationship. When the correlation coefficient reaches 0.8-1.0, its relationship is very strong. If it is in the range of 0.60-0.79, the correlation is strong. There is a moderate correlation when its value lies between 0.30-0.59. If the correlation is in the range of 0.1-0.29, the correlation is weak. Lastly, if the range is from 0.01-0.09, there is a very weak correlation between variables. The computed values of Pearson's correlation coefficient are presented here in the table below.

Table 10: Independent and dependent variable coefficients of correlation

Correlations							
		Procurement Performance	Tender Planning	Tender Document Initiation	Tender Evaluation	Tender Award	Record Management
Procurement Performance	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	92					

		Procurement Performance	Tender Planning	Tender Document Initiation	Tender Evaluation	Tender Award	Record Management
Tender Planning	Pearson Correlation	0.822**	1				
	Sig. (2-tailed)	0.000					
	N	92	92				
Tender Document Initiation	Pearson Correlation	0.808**	0.706**	1			
	Sig. (2-tailed)	0.000	0.000				
	N	92	92	92			
Tender Evaluation	Pearson Correlation	0.825**	0.722**	0.697**	1		
	Sig. (2-tailed)	0.000	0.000	0.000			
	N	92	92	92	92		
Tender Award	Pearson Correlation	0.760**	0.698**	0.615**	0.688**	1	
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		
	N	92	92	92	92	92	
Record Management	Pearson Correlation	0.719**	06.48**	0.591**	0.636**	0.552**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	
	N	92	92	92	92	92	92
**. Correlation is significant at the 0.01 level (2-tailed).							

Source: SPSS own survey (2022)

As observed in the above table 10, tender planning practice has a positive and significant correlation with the procurement performance of the organization ($r = 0.822$, $P<0.01$). Hence, this shows a very strong relationship between the two variables. There is also a positive and significant correlation between the tender document initiation practice and procurement performance ($r = 0.808$, $P<0.01$), and this indicates a very strong relationship. In addition, tender evaluation practice is positively and significantly correlated with the organization's procurement performance ($r = 0.825$, $P<0.01$), so the result shows a very strong relationship between the

variables. Whereas tender award has a positive and significant correlation with the procurement performance of the organization ($r = 0.760$, $P<0.01$), which shows a strong relationship between the two variables. Finally, there is a positive and significant correlation between record management and procurement performance ($r = 0.719$, $P<0.01$), which indicates a strong relationship.

In general, the correlation analysis revealed a positive and statistically significant association between the tender management practices (independent variable) and the procurement performance of the organization (dependent variable).

Therefore, according to the yellow handbook of health commodities management science for health, Muya et al. (2019), and other literature, these findings are consistent as being a tool for the achievement of the procurement performance of the Ethiopian Pharmaceuticals Supply Service.

4.6 Regression Analysis and Hypothesis Testing

A statistical procedure for analyzing the associative relationships between a dependent variable (outcome variable) and one or more independent variables (predictor variables) is known as regression analysis. As the study has included five independent variables, it needs to use a multiple regression analysis, which is a method for creating a mathematical relationship between two or more independent variables and a dependent variable at the same time. On the other hand, it measures the effect of tender management practices (tender planning, tender document initiation, tender evaluation, tender award, and record management) on the procurement performance of the Ethiopian Pharmaceuticals Supply Service.

4.6.1. Assumptions of Regression Analysis

A. Normal Distribution Test

Multiple regression assumes that variables have normal distributions, according to Osborne (2002, P. 1). Otherwise, variables that are not normally distributed, such as those that are highly kurtotic or skewed, may distort relationships and significance tests. Kurtosis is a measure of the distribution's peakedness, whereas skewness is a measure of symmetry. At an absolute value of Z

≤ 3.29, the distribution of variables might be judged to be normal in the case of moderate sample size (N) (50 < N < 300) (Kim 2019, pp. 1-3).

Therefore, as per the table indicated below, the skewness and kurtosis test values lie between-1.5 and +1.5, thus showing that there is a normal distribution of the variables.

Table 11: Normal distribution test

Descriptive statistics					
	N	Skewness		Kurtosis	
		Statistic	Std. Error	Statistic	Std. Error
Tender Planning	92	-0.062	0.251	-0.159	0.498
Tender Document Initiation	92	0.175	0.251	0.259	0.498
Tender Evaluation	92	0.375	0.251	-0.1	0.498
Tender Award	92	-0.171	0.251	-0.541	0.498
Record Management	92	0.243	0.251	-0.53	0.498
Procurement Performance	92	0.146	0.251	-0.69	0.498

Source: SPSS own survey (2022)

B. Linearity Test

According to Osborne (2002, P. 1), the relationship between independent and dependent variables can only be effectively estimated using multiple regressions if the relationships are linear. In addition, the dependent variable (procurement performance) is defined as a linear function of the predictor variable (tender management practice) by linearity.

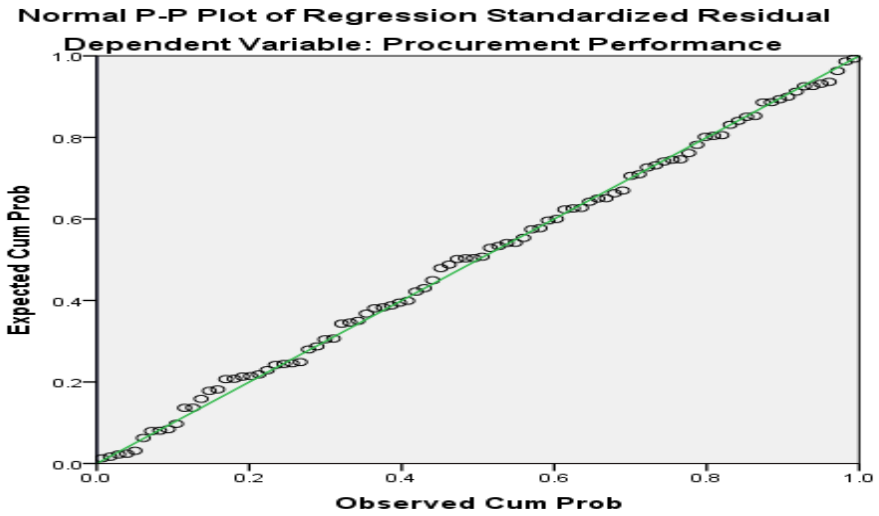

Figure 3: Linearity test,

Source: SPSS own survey (2022)

As shown in the above figure the probability plot follows through the inclined line hence we can conclude that there is a linear relationships between the dependent and independent variable.

C. Multi-Collinearity Test

Multi-collinearity is defined as a situation in which the inter-correlations between independent variables in a multiple regression model are extremely high, resulting in misrepresentations of regression analysis results. If the value of r = 1, it means that the predictor variables are exactly multicollinear, resulting in inaccurate inferences regarding the relationship between the independent and dependent variables (Kim 2019, P. 559).

According to several practitioners, the Variation Inflation Factor (VIF) and tolerance are the most reliable indicators of the degree of multicollinearity between the independent variables (O Brien 2007, P. 673). According to Kim (2019, P. 559), if the tolerance and variance inflation factors are larger than 0.1 and less than 10, respectively, some scholars also suggest that the tolerance value should be greater than 0.2, hence the data is free of multicollinearity issues.

Table 12: Multicollinearity test

Model	Independent Variables	Collinearity Statistics	
		Tolerance	**Variation Inflation Factor (VIF)**
1	Tender Planning	0.333	3.007
	Tender Document Initiation	0.415	2.410
	Tender Evaluation	0.351	2.851
	Tender Award	0.435	2.301
	Record Management	0.508	1.9301

Source: SPSS own survey (2022)

As seen in the above table, the tolerance values are from 0.333 – 0.508, whereas the value of the variation inflation factor is in the range of 1.9031 – 3.007. Therefore, the indicated values of variation inflation factors and tolerance explain that the predictor variables are neither overlapped with each other nor extremely high, which means there are no multi-collinearity issues.

D. Homoscedasticity Test

Homoscedasticity is defined as the homogeneity of variance assumptions or a constant finite variance that occurs across all levels of the predictor variables (independent variables), according to Williams (2013, P. 9). A visual examination of a scatter plot of standardized residuals or errors by regression of standardized predicted value can be used to verify the assumption.

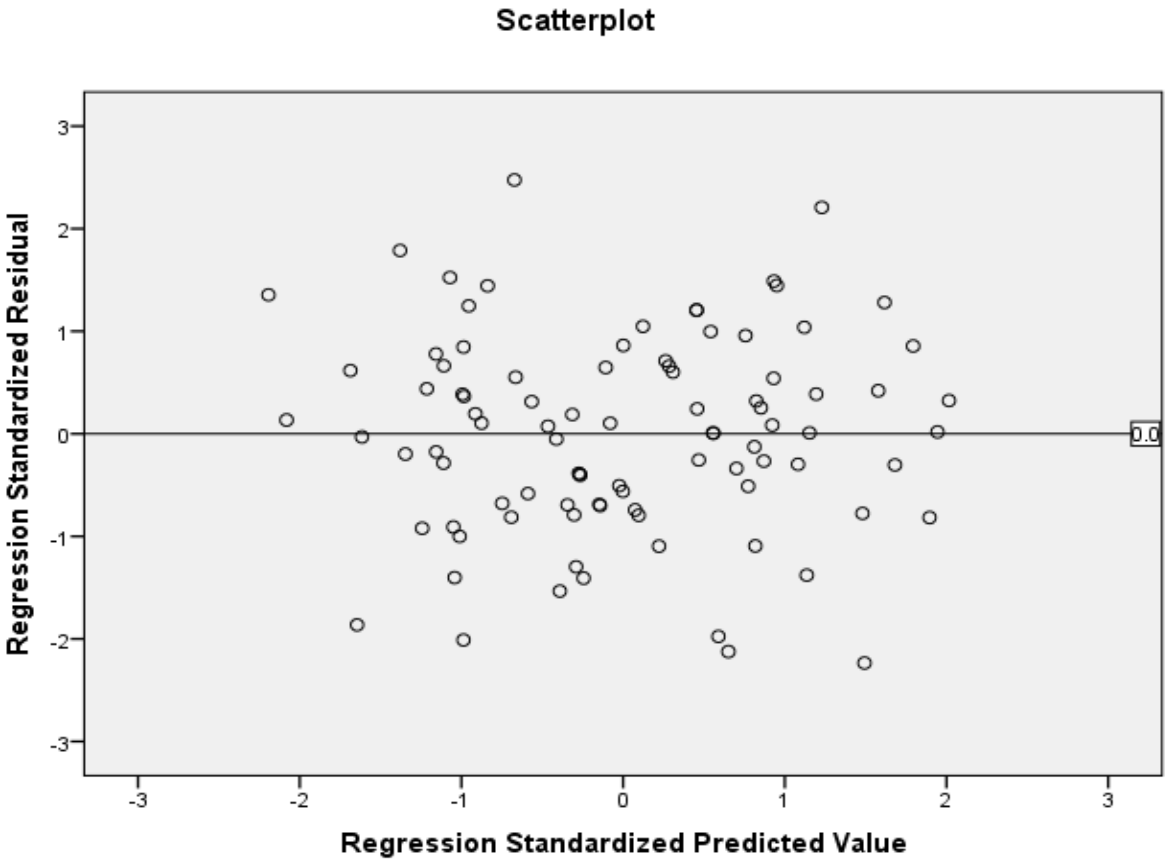

Figure 4: Homoscedasticity test

Source: SPSS own survey (2022)

As seen in the above plots, residuals are randomly scattered around the horizontal line (zero point) or do not significantly differ from the usual plot as long as the residuals are distributed fairly evenly (Osborne 2002, P. 4).

4.6.2 Regression Model

Regression analysis is used to determine the relationship between the independent variables (tender planning, tender document initiation, tender evaluation, tender award, and record management) and the dependent variable (procurement performance).

Table 13: 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), Record Management, Tender Award, Tender Document Initiation, Tender Evaluation, Tender Planning				
b. Dependent Variable: Procurement Performance				

Source: SPSS own survey (2022)

As seen in the above model summary, "R" denotes the multiple correlation coefficient values of 0.927, which shows a very strong correlation between the independent variables and dependent variables and thus justifies a good level of prediction. The coefficient of determination (R Square value) analysis is used to determine the effects of tender management practices on the procurement performance of the Ethiopian Pharmaceutical Supply Service. Adjusted R Squared, in contrast to R Squared, which can only increase, has the ability to decrease with the addition of fewer significant variables, resulting in a more trustworthy and accurate assessment than R^2. The value of adjusted R-square (0.85) revealed that the model accounts for 85% of the variance in the procurement performance of medical devices, which is explained by the ability of a linear combination of all predictor (tender management) variables, whereas the remaining factors not considered in this study contribute roughly 15% of the change or influence on the procurement performance of the organization, which requires further investigations.

Generally, the five variables of tender management practices, namely: tender planning, tender document initiation, tender evaluation, tender award, and record management, are good explanatory variables in predicting the organization's procurement performance.

Analysis Of Variance (ANOVA)

The F ratio enables us to check whether the overall model has a good fit for the research paper. As seen in the table, the level of significance is less than 0.05 (0.01), thus explaining the existence of a statistically significant relationship between independent variables and dependent variables. Tender management practices have significantly predicted the procurement performance of the organization by F = 104.417 times, at a sig. value of less than 0.01. Hence, the overall model is significant and a good fit for the study.

Table 14: ANOVA results

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), Record Management, Tender Award, Tender Document Initiation, Tender Evaluation, Tender Planning						

Source: SPSS own survey (2022)

4.6.3 Regression Coefficients

The regression coefficients indicated in table 14 describe how tender planning, tender document initiation, tender evaluation, tender award, and record management of tender management practices affect the procurement performance of the Ethiopian Pharmaceuticals Supply Service. The unit of measurement for regression coefficients is known as the standard deviation.

Table 15: Regression coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		ß	Std. Error	Beta		
1	(Constant)	-1.038	.193		-5.390	.000
	Tender Planning	.268	.085	.221	3.146	.002
	Tender Document Initiation	.338	.077	.275	4.374	.000
	Tender Evaluation	.317	.086	.253	3.699	.000
	Tender Award	.217	.075	.177	2.872	.005
	Record Management	.209	.077	.154	2.715	.008
a. Dependent Variable: Procurement Performance						

Source: SPSS own survey (2022)

Standardized Coefficient (Beta)

The standardized coefficients are useful for determining which predictor variables are the most relevant. As a result, it assesses the effects of several independent variables (tender management practices) on the dependent variable (procurement performance). Tender document initiation (Beta = 0.275) has the highest standardized coefficient, followed by tender evaluation (Beta = 0.253), tender planning (Beta = 0.221), tender award (Beta = 0.177), and record management (Beta = 0.154), as indicated in the table above. Tender document initiation practice had the highest relative effect on medical device procurement performance among the five predictor variables. All independent variables have a P value less than 0.01; thus, the predictive variables of tender planning, tender document initiation, tender evaluation, tender award, and record management practices of the organization are statistically significant in predicting the procurement performance of the organization.

Unstandardized Coefficient (ß)

The unstandardized coefficients helps to determine or interpret the influence of each predictor variable on the procurement performance of the medical device. The unstandardized coefficients

(ß1, ß2, ß3, ß4, ß5) are coefficients of the examined regression model, so the general regression model for procurement performance was equated as follows:

$Y = ß_0 + ß_1X_1 + ß_2X_2 + ß_3X_3 + ß_4X_4 + ß_5X_5 + e$

Where;

Y = Procurement Performance (PP)

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

X_1 = Tender Planning (TP), $ß_1$ = Tender Planning Coefficient = 0.268

X_2 = Tender Document Initiation (TDI), ß2 = Tender Document Initiation Coefficient = 0.338

X_3 = Tender Evaluation (TE), $ß_3$ = Tender Evaluation Coefficient = 0.317

X_4 = Tender Award (TA) $ß_4$ = Tender Award Coefficient = 0.217

X_5 = Record Management (RM), $ß_5$ = Record Management Coefficient = 0.209

Therefore, the equation is written as;

$Y = -1.038 + 0.268X_1 + 0.338X_2 + 0.317X_3 + 0.217\ X_4 + 0.209X_5 + e$

The constant factor (ß0 =-1.038) shows that the Ethiopian Pharmaceuticals Supply Service's procurement performance would be -1.038 when the other variables in the model remained zero.

According to the analysis, the unit increase in tender planning will result in a 26.80% rise in the organization's procurement performance. Furthermore, a unit increases in tender document initiation activities results in a 33.80 percent increase in procurement performance; a unit increase in tender evaluation results in a 31.70 percent increase in procurement performance; and a unit increase in tender award activities results in a 21.70 percent increase in procurement performance. Finally, a unit increase in record management can result in a 20.90% improvement in procurement performance.

All tender management activities (tender planning, tender document initiation, tender evaluation, tender award, and record management) showed a P-value of less than 1% level of significance.

The results of the regression coefficient indicate that the five independent variables are statistically significant in predicting procurement performance. In other words, a unit increase or change in the predictor variables increases the procurement performance of a medical device.

As a result, these findings give strong support for the effectiveness and efficiency of the Ethiopian Pharmaceuticals Supply Service's procurement performance, as well as literature implying that tender management practices affect procurement performance.

4.6.4 Hypothesis Testing

A hypothesis is a testable statement expressing a logically conjectured relationship between two or more variables. Hence, according to the results of the regression analysis, the hypothesis of the research paper is tested as follows:

A. The effect of tender planning practices

Hypothesis 1: Tender planning practice has a significant and positive effect on the procurement performance of the organization.

As shown in the above table 14, the unstandardized ß coefficient of the regression result for tender planning practice is 0.268 with a P-value of 0.002, which is less than the level of significance of 0.05. Hence, by remaining constant with the other variables, tender planning practice has a positive and statistically significant impact on the Ethiopian Pharmaceuticals Supply Service’s procurement performance.

Therefore, the study has accepted the proposed hypothesis (alternative hypothesis H1) and stated that tender planning has a significant and positive effect on the procurement performance of the organization by rejecting the null hypothesis (H0).

B. The effect of tender document initiation practices

Hypothesis 2: Tender document initiation practice has a significant and positive effect on the procurement performance of the organization.

Tender document initiation practice, as shown in table 14, has an unstandardized regression ß coefficient of 0.338 with a P-value of 0.000, which is less than the significance level of 0.05, implying a positive and statistically significant impact on procurement performance.

By rejecting the null hypothesis (H0), the study accepted the suggested hypothesis (alternative hypothesis H2) and stated that the initiation of tender documents has a significant and positive effect on the procurement performance of the organization.

C. The effect of tender evaluation practices

Hypothesis 3: Tender evaluation practice has a significant and positive effect on the procurement performance of the organization.

As shown in Table 14, the unstandardized regression ß coefficient for tender evaluation practice is 0.317 with a P-value of 0.000, which is less than the level of significance of 0.05 (5%), thus indicating that there is a statistically significant and positive impact on procurement performance.

Therefore, the study has rejected the null hypothesis (H0) by accepting the proposed hypothesis (alternative hypothesis H3), which states that tender evaluation practice has a significant and positive effect on the organization's procurement performance.

D. The effect of tender award practices

Hypothesis 4: Tender award practice has a significant and positive effect on the procurement performance of the organization.

As the result in above table 14 shows, the unstandardized regression ß coefficient for tender award practice is 0.217 with a P-value of 0.005, which is less than the significance level of 0.05 and implies a positive and statistically significant impact on procurement performance while remaining constant on the other variables.

Therefore, the study has accepted the proposed hypothesis (alternative hypothesis H4) and stated that tender award practice has a significant and positive effect on the procurement performance of the organization by rejecting the null hypothesis (H0).

E. The effect of record management practices

Hypothesis 5: Tender record management practice has a significant and positive effect on the procurement performance of the organization.

As shown in table 14, tender record management practice has an unstandardized regression B coefficient of 0.209 with a P-value of 0.008, which is less than the level of significance value of 0.05, thus indicating that record management has a statistically significant and positive impact on procurement performance while the other variables remain constant.

Therefore, the study has rejected the null hypothesis (H0) by accepting the proposed hypothesis (alternative hypothesis H5), which states that record management practice has a significant and positive effect on the procurement performance of the organization.

4.7 Discussions of the result

As stated in chapter one, the objective of this study is to determine the relationship between tender management practices and procurement performance of the Ethiopian Pharmaceuticals Supply Service. The descriptive statistics results for tender management practices revealed that tender document initiation was occasionally practiced with a near-high-end moderate extent mean value (M = 3.33, SD = 0.491), followed by tender record management (M = 3.10, SD = 0.445), and tender planning (M = 3.06, SD = 0.498), but tender award was occasionally practiced with a near-low-end moderate extent mean value (M = 2.94, SD = 0.492), followed by tender evaluation (M = 2.96, SD = 0.482).

According to the results of the correlation analysis, tender evaluation practice has a very strong positive and statistically significant relationship with procurement performance (r = 0.825, P<0.01), followed by tender planning practice (r = 0.822, P<0.01), and tender document initiation practice (r = 0.808, P<0.01). Tender award practice, on the other hand, has a statistically significant and strong positive relationship with the organization's procurement performance, with a correlation value of r = 0.760 at the P<0.01 significance level, followed by record management practice (r = 0.719, P<0.01).

As a result, tender management practices have the greatest positive and statistically significant relationship with the Ethiopian Pharmaceuticals Supply Service's medical device procurement performance.

Based on the results of regression coefficients, tender document initiation, with an unstandardized ß coefficient of 0.338 at a significance level of $P<0.01$, implies the highest positive and statistically significant impact on procurement performance, followed by tender evaluation, tender planning, tender award, and record management, with corresponding unstandardized ß coefficient values of 0.317, 0.268, 0.217, and 0.209, respectively, so that it could be concluded that tender management practice has a direct effect on the Ethiopian Pharmaceuticals Supply Service's procurement performance of medical devices.

The study accepted all of the alternative hypotheses presented in Chapter One in such a way that the predictor variables, such as tender planning, tender document initiation, tender evaluation, tender award, and record management practices, have a statistically significant positive impact on procurement performance. As a result, these findings are consistent with earlier research that found a positive and significant impact on an organization's procurement performance of the medical device. Furthermore, tender planning and tender document initiation practice, followed by tender evaluation practice, are consistently claimed to be more effective than the other tender management activities.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

The study's objective from the start has been to look into the relationship between tender management practices and the organization's procurement performance of the medical device. In addition, it was also described to assess the practices of tender management activities in the organization. Therefore, the overview of significant findings, conclusions made from the study's findings, and recommendations for improving the Ethiopian Pharmaceuticals Supply Service's medical device tender management, 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 relationship between tender management activities and the procurement performance of the organization. The study also aimed to assess the current state of tender management practices, such as tender planning, tender document initiation, tender evaluation, tender award, and record management. This research involved a literature review that included theories of tender management and 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-two (92) were returned with a response rate of 92%. With an overall Cronbach's alpha of 0.914, the internal consistency of the research questionnaires was judged to be in a good and reliable range.

The overall mean of the organization’s tender management practices was computed by using a descriptive statistical analysis. As a result, the finding revealed tender document initiation was occasionally practiced with a near-high-end moderate extent mean value (M = 3.33, SD = 0.491), followed by tender record management (M = 3.10, SD = 0.445), and tender planning (M = 3.06, SD = 0.498). However, tender award was occasionally practiced with a near-low-end moderate

extent mean value (M = 2.94, SD = 0.492), followed by tender evaluation (M = 2.96, SD = 0.482).

To examine the relationships between tender management practices and the procurement performance of the organization, Pearson's correlation coefficients were computed. Accordingly, the correlation result for tender evaluation practice shows a very strong positive and statistically significant relationship with procurement performance ($r = 0.825$, $P<0.01$), followed by tender planning practice ($r = 0.822$, $P<0.01$), and tender document initiation practice ($r = 0.808$, $P<0.01$). In addition, tender award practice has a statistically significant and strong positive relationship with the organization's procurement performance, with a correlation value ($r = 0.760$, $P<0.01$), followed by record management practice ($r = 0.719$, $P<0.01$). Therefore, in accordance with Alwadael (2010), the study discovered that three of the independent variables, namely tender document initiation, tender evaluation, and tender planning, have very strong and positive significant relationships with the dependent variable, whereas two independent variables (tender award and record management practice) have strong and positive significant relationships with procurement performance (dependent variable).

The coefficient of determination (R^2) is used to investigate the effects of tender management practices on the Ethiopian Pharmaceutical Supply Service's procurement performance. In the model summary, the value of adjusted R^2 indicates 85% of the variance predicted the changes in dependent variables (procurement performance). whereas the remaining factors not included in this model contribute 15% of the changes in procurement performance, which requires further investigations.

The study has discovered that a unit increase in tender planning, tender document initiation, tender evaluation, tender award, and record management will result in a 26.80%, 33.80%, 31.70%, 21.70%, and 20.90% improvement in the procurement performance of the organization, respectively, at a sig. value less than 0.05. Hence, these unstandardized regression coefficients imply that the five independent variables are statistically significantly affecting procurement performance. Furthermore, tender management practices have significantly predicted the organization's procurement performance by $F = 104.417$ times, at a sig. value of less than 0.01 so that the overall model is significant and a good fit for the study.

Therefore, these findings give strong support as the literature does outline the importance of ensuring that tender management practices are proper in addressing the procurement performance of the Ethiopian Pharmaceuticals Supply Service.

5.2 Conclusions of the study

According to the results of the study, the conclusions regarding tender management practice has drawn in the following points.

- Tender document initiation was occasionally practiced with a near-high-end moderate extent mean value, followed by tender record management and tender planning, but tender award was occasionally practiced with a near-low-end moderate extent mean value, followed by tender evaluation.

- Three of the variables of tender management, namely tender document initiation, tender evaluation, and tender planning, have very strong and significant relationships with the procurement performance, whereas two independent variables (tender award and record management practice) have a strong and positive significant relationships with the procurement performance (dependent variable) of the organization.

- The study revealed that tender management practices (tender planning, tender document initiation, tender evaluation, tender award, and record management) have high predictive power on the changes of the Ethiopian Pharmaceuticals Supply Service's procurement performance of medical devices. Therefore, tender management activities have a positive and statistically significant effect on the procurement performance of the organization.

- All of the alternative hypotheses were strongly supported in this study, and its conceptual framework was able to demonstrate a significant and positive relationship between tender management and procurement performance.

- In general, we can say that the study has provided evidence for the direct effect of tender management practice on procurement performance of medical devices as supported by the literature.

5.3 Recommendations of the study

The study recommended that the Ethiopian Pharmaceuticals Supply Service should have to give more attention in the light of prioritizing activities to enhance the practices of tender management as well. 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 the five tender management activities have a significant impact on the procurement performance of the organization. So, it is recommended that the Ethiopian Pharmaceuticals Supply Service should:

- Enhance tender planning practice to achieve the best value for money by preparing a consolidated plan, taking into account the necessary procurement strategies; applying an IT-supported system with full data visibility helps for easy capturing of the future decision-making process.

- Enhance tender document initiation practice on the basis of procurement principles by defining concise and clear requirements; setting clear evaluation criteria; categorizing medical devices applicable product certificates; applying the supplier's KPI; and supplier pre-qualification to achieve value for money.

- Enhance tender evaluation practice by establishing clear evaluation guidelines, appointing a professional mix of endorsing committees for an efficient approval process of medical devices and shortening the time of evaluation to ensure the best value for money. Furthermore, use the developed automated system of Google Sheet Application used for estimating evaluation time per tender as annexed hereto in this study to assist the organization's procurement professional with easy time allocation and management of each tender.

- Improve tender award practice by awarding contracts on time; implementing a Memorandum of Understanding (MOU) with the Ethiopian Food and Drug Authority for the responsive approval of purchase orders; and closely following up on the supplier's contract signing; thus ensuring the availability of medical devices.

- Enhance proper and well-organized management of tendering records by investing required resources, applying electronic records for timely and easy retrieval of documents whenever required, as well as increasing visibility.

5.1 Suggestions for further study

This research looked at five independent variables: tender planning, tender document initiation, tender evaluation, tender award, and record management, 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 aren't covered in this study but can affect procurement performance. In addition, the idea for further research is to address the challenges related to tender management practices 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.

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ANNEX I: Research Instrument

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

Dear Sir/Madam

My name is Abrahaley Beyene. I am conducting research in the area of medical device supply chain tender management systems at EPSS 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 effect of tender management supply chain on 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 spend on the response to the questions. This survey will take about 15–20 minutes to complete. We thank you in advance for your kind cooperation in answering the questions as truthfully as possible.

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

Part I: General Information and Demographic background of respondents

Please mark ✓ for your appropriate choice.

1. Gender: Male ☐ Female ☐

2. Age

- ☐ Less than 31 years
- ☐ 31-40 years
- ☐ 41-50 years
- ☐ Above 50 years

3. Educational qualification

- ☐ Diploma
- ☐ Degree
- ☐ Masters
- ☐ PhD

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

4. How long have you worked in the organization?

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

5. In which directorate are you working currently?

- ☐ Tender management
- ☐ Contract management
- ☐ Quantification and market shaping

Others (specify)_____

6. What is your job position?

- ☐ Director
- ☐ eam leader
- ☐ Advisor
- ☐ fficer

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

Part II: Medical Device Tender Management Practice Assessment

This section of the questionnaire is designed to obtain information about your level of agreement with the assessment of medical device tender management practice.

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

A. Medical Device Tender Planning Activities						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
TP1	There is a repetitive plan to be prepared due to the fragmented and piecemeal procurement request.	◯	◯	◯	◯	◯
TP2	The organization's plan is carried out based on the allocated resources such as approved budget.	◯	◯	◯	◯	◯
TP3	When preparing a plan, whole life cycle cost is considered to determine the current and future lowest cost of medical devices.	◯	◯	◯	◯	◯
TP4	The organization has experience in conducting pooled procurement.	◯	◯	◯	◯	◯
TP5	The organization activities are performed according to the scheduled plan.	◯	◯	◯	◯	◯
TP6	Planning takes into account category management approach to identify risks and prioritize efforts in sourcing.	◯	◯	◯	◯	◯
TP7	The organization select its tendering/procurement methods based on the FPPPA proclamation.	◯	◯	◯	◯	◯
TP8	The organization has a tracking system for easier time monitoring of the planned activities.	◯	◯	◯	◯	◯
TP9	Medical devices delivery schedule is appropriately established/planned to minimize LC extension that reduce the costs will incur due to this extension or amendment.	◯	◯	◯	◯	◯
B. Medical Device Tender Document Initiation Activities						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
TDI1	The organization prepares its tender document according to the FPPPA	◯	◯	◯	◯	◯

	standard bidding document.					
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
TDI2	When defining evaluation criteria in the tender document, the organization adhere to the guiding principles of procurement such as fairness, transparency, effective competition, and openness.	◯	◯	◯	◯	◯
TDI3	The KPI of supplier performance measurement has included as part of the tender document.	◯	◯	◯	◯	◯
TDI4	The organization use generic and standardized specifications for medical devices.	◯	◯	◯	◯	◯
TDI5	In addition to the quality standard of Ethiopian Food and Drug Authority, there is a predefined standard of quality (like US FDA, CE) which is part of tender document, as per the international categorization of all medical devices such as Class I, Class II, and Class III.	◯	◯	◯	◯	◯
TDI6	During tender floatation period, there are amendments and/or clarifications causing extension of bids.	◯	◯	◯	◯	◯
TDI7	The organization use supplier pre-qualification as part of the tender document.	◯	◯	◯	◯	◯
C. Medical Device Tender Evaluation Activities						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
TE1	The organization's tender evaluation process is conducted against the pre-defined criteria/requirements.	◯	◯	◯	◯	◯
TE2	The organization has a mechanism for evaluation time estimation per each tender.	◯	◯	◯	◯	◯
TE3	The established Procurement Endorsing Committees have a professional mix.	◯	◯	◯	◯	◯
TE4	The organization has evaluation guidelines for medical devices.	◯	◯	◯	◯	◯
TE5	There is a timely evaluation of bids by the Tender Evaluation Committee.	◯	◯	◯	◯	◯

No.	1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree	1	2	3	4	5
TE6	There is a timely endorsement of the evaluation proposal report by the Procurement Endorsing Committee.	◯	◯	◯	◯	◯
D. Medical Device Tender Award Activities						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
TA1	After endorsing the evaluation proposal, tenders are awarded to winners timely.	◯	◯	◯	◯	◯
TA2	After disclosing award notification, there is a debriefing session for unsuccessful vendors/bidders.	◯	◯	◯	◯	◯
TA3	The organization gives a response to bidders' complaints on tender results within the standard time frame of FPPPA.	◯	◯	◯	◯	◯
TA4	The organization issues a letter of contract award to the successful supplier.	◯	◯	◯	◯	◯
TA5	The organization's purchase order is being approved by the Ethiopian Food and Drug Authority on time.	◯	◯	◯	◯	◯
TA6	There is a pre-agreed contract terms and conditions (pre-agreed contract) thus improves the well completion of contract between the buyer and supplier.	◯	◯	◯	◯	◯
TA7	Contract agreement is signed within the time frame of FPPPA.	◯	◯	◯	◯	◯
E. Medical Device Record Management of Tendering process						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
RM1	The organization keeps tendering records for a 10-year retention period.	◯	◯	◯	◯	◯
RM2	The organization invests in record management attributes such as storage (space), people, and financial resources.	◯	◯	◯	◯	◯
RM3	The organization implements consistent use of standard forms or templates as developed by the Quality Assurance and Quality Control Directorate.	◯	◯	◯	◯	◯

No.	1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree	1	2	3	4	5
RM4	Whenever acceptable changes happen over the previous standard form or template, the document change is carried out by prior notice to the Quality Assurance and Quality Control Directorate for approval.	◯	◯	◯	◯	◯
RM5	All documents related to tender are managed in a controlled way of increasing confidentiality.	◯	◯	◯	◯	◯
RM6	The official letters and relevant documents are arranged properly in a box file in sequential order of their dates for easy traceability.	◯	◯	◯	◯	◯

Part III: Procurement performance of Medical Device

This section of the questionnaire is designed to gather information on your level of agreement with the statement on the Procurement Performance of Medical Device: 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.

F. Medical Device Procurement Cost Performance Indicators						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
PC1	Resources are properly utilized to achieve the procurement cost-effectiveness of a medical device.	◯	◯	◯	◯	◯
PC2	In comparison to the cost of medical devices, the organization's operational/management costs are lower.	◯	◯	◯	◯	◯
PC3	The product's price paid for medical devices are in alignment with international prices.	◯	◯	◯	◯	◯
G. Medical Device Procurement Quality Performance Indicators						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
PQ1	The organization purchase performance is measured at the end of fiscal budget year and gets feedback.	◯	◯	◯	◯	◯
PQ2	The organization supplies defect free medical devices to health facility.	◯	◯	◯	◯	◯
PQ3	Suppliers deliver the correct medical devices.	◯	◯	◯	◯	◯
H. Medical Device Procurement Time Performance Indicators						
No.	**1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**	**1**	**2**	**3**	**4**	**5**
PT1	There are delays in executing procurements of medical devices.	◯	◯	◯	◯	◯
PT2	There are delays in processing payments to suppliers.	◯	◯	◯	◯	◯
PT3	Suppliers deliver medical devices on time.	◯	◯	◯	◯	◯

ANNEX II: Google Sheet Application for estimating evaluation time per each tender

Estimation of Tender Evaluation Time

- The Evaluation of products is categorized in to **five families** and these are listed as follows;
    1. **Family 0**
       Lab reagents, Supplies, Instrument sets & related, etc…
    2. **Family 1**
       Patient monitor, Refrigerator, Non capital items other than instrument set, etc…
    3. **Family 2**
       Anesthesia, ventilator, Chemistry & Hematology analyzer, Ultrasound Ob/Gyn & related, etc…
    4. **Family 3**
       X ray, Lithotripter, Laundry, Dental unit, Ultrasound Doppler, Dialysis, Endoscope with complete video system and monitor & related, etc…
    5. **Family 4**
       Radiotherapy unit, MRI, CATHLAB, SPECT, CT & related, etc…

- ***The Total time taken for tender evaluation should calculated using the following formula***

$$\mathbf{Tt} = ((\,(\sum_{\mathbf{i=1}}^{\mathbf{M}} (\mathbf{p} * \mathbf{G})) * \mathbf{T})/\mathbf{480})$$

Where;

M → Number of items (Not always actual)

P → Number of participants/bidders per item (Not always actual)

G → Proportional weighting factor

T → Time taken per item and which is given **18 minutes**

T_t→ Total time taken to evaluate the whole tender and its unit is in **days**

Let's consider the maximum and minimum number of participants in every tender for **Family 0** is **8** and **2** respectively. Whereas for **Family 1-4** is **6** and **2**

Therefore, the Proportional weighting factor (G) is the product of maximum and minimum number of participants and also family number (F).

G = 6*2*F, $0 \leq F \leq 4$, where F = 0, there is no need of Proportional weighting factor i.e. **G = 1**

❖ ***Overall tender conditions:***

- For any 1<=M<=3, T_t=4 days except Family **3** and **4**
- Any decimal point either less than or greater than **0.5** should be rounded off to the **highest whole number**
- **Family 0:** Complex evaluation for any tender should not be more than **24** days (**24 + 2 = 26 days**)
- **Family 1-4:** Complex evaluation for any tender should not be more than **31** days (**28.8 + 2 =31 days**)

1. Family number (F) **0**
   a). For M<=10, T_t=5.5 days
   b). For 10<M<=20, T_t = 7 days
   c). If P > 8 & M > 80
   $T_t = (T_{t\ @\ P>8} = T_{t@\ P=8}) \cup (T_{t\ @\ M>80} = T_{t@\ M=80})$
2. Family number (F) **1** and **3**

   a). If P > 3 & M > 18

   $T_t = (T_{t@\ P>3} = T_{t@\ P=3}) \cup (T_{t\ @\ M>18} = T_{t@\ M=18})$ → **Applicable only for family (F) 1**

   b). If P > 3 & M > 3

   $T_t = (T_{t@\ P>3} = T_{t@\ P=3}) \cup (T_{t\ @\ M>3} = T_{t@\ M=3})$ → **Applicable only for family (F) 3**
3. Family number (F) **2** and **4**
   If P > 4 & M > 4

   $T_t = (T_{t\ @\ P>4} = T_{t@\ P=4}) \cup (T_{t\ @\ M>4} = T_{t@\ M=4})$

Using the above conditions Maximum Total time ($T_{t\ max.}$) taken for maximum number of participants (P) per item

1. Family number (F) = **0**;
   M = 1, P = 8, G = 1, and T = 18 minutes
   $\mathbf{Tt} = (((\sum_{i=1}^{1}(8*1))*18)/480)$
   $\mathbf{T_{t\ max.}}$ = 2 hrs and 24 minutes (0.3 days)

2. Family number (F) = **1**;
   M = 1, P = 3, G = 12, and T = 18 minute
   $\mathbf{Tt} = (((\sum_{i=1}^{1}(3*12))*18)/480)$
   $\mathbf{T_{t\ max.}}$ = 1 days 2 hrs 48 minutes (1.35 days)
3. Family number (F) = **2**;
   M = 1, P = 4, G = 24, and T = 18 minute
   $\boldsymbol{Tt} = (((\sum_{i=1}^{1}(4*24))*18)/480)$
   $\mathbf{T_{t\ max.}}$ = 3 days 4 hrs 48 minutes (3.6 days)

4. Family number (F) **=3**;
   M = 1, P = 3, G = 36, and T = 18 minute
   $\boldsymbol{Tt = (((\sum_{i=1}^{1}(3 * 36)) * 18)/480)}$
   $\mathbf{T_{t\ max.}}$ = 4 days 1 hrs 14 minutes (4.05 days)
5. Family number (F) **=4**;
   M = 1, P = 4, G = 48, and T = 18 minute
   $\boldsymbol{Tt = (((\sum_{i=1}^{1}(4 * 48)) * 18)/480)}$
   $\mathbf{T_{t\ max.}}$ = 7 days 1 hrs 36 minutes (7.2 days)

Medical Device Tender Evaluation Time Estimating Tool								
Item No.	**Item Description**	**Actual No. of participants per item**	**No of Bidders (P)**	**Family number (F)**	**Proportional weighting factor (G=6*2*F)**	**P*G**	**Tt = ((∑(p*G))*T)/480 (days)**	**Remark**
1		8	8	0	1	8	**0.6**	
2		10	8	0	1	8		
3		9	3	1	12	36	**2.7**	
4		9	3	1	12	36		
5		8	4	2	24	96	**14.4**	
6		6	4	2	24	96		
7		14	4	2	24	96		
8		10	4	2	24	96		
9		10	3	3	36	108	**12.15**	
10		5	3	3	36	108		
11		3	3	3	36	108		
12		10	4	4	48	192	**28.8**	
13		10	4	4	48	192		
14		10	4	4	48	192		
15		10	4	4	48	192		
Total							**58.65**	

In order to get the total time, **number of participants** should be only filled by the procurement personnel.