



**UNIVERSITY OF ADDIS ABABA
COLLEGE OF HEALTH SCIENCE
SCHOOL OF PHARMACY
DEPARTMENT OF PHARMACEUTICS AND SOCIAL
PHARMACY**

**PROCUREMENT LEAD TIME REDUCING PRACTICES AND
CHALLENGES IN THE ETHIOPIAN PHARMACEUTICALS SUPPLY
SERVICE CENTRAL**

Biyensa Negera (B.Pharm)

(GSR/3837/11)

**A Thesis submitted to the Addis Ababa University, College of Health Science,
Department of Pharmaceutics and Social Pharmacy for the partial fulfillment
of the requirements for the Degree of Master of Science in Health Supply Chain
Management**

Advisor: Busha Temesgen (PhD)

February, 2023

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DECLARATION

I, Biyensa Negera declare that a thesis entitled with “**Assessment of Procurement Lead Time Reducing Practices and Challenges: The Case of Ethiopian pharmaceutical Supply Service Central, Addis Ababa**” is my original research work and has never been submitted to any other university for any diploma or degree. This thesis has been submitted to the Department of Pharmaceutics and Social Pharmacy in partial fulfillment of the requirements for the degree of Master of Health Supply Chain Management at the University of Addis Ababa. I also declare that all the resources used under this research has been acknowledged clearly.

Brief quotations from this thesis are allowed provided that accurate citation of it is being made. However, extended quotations and reproduction of this manuscript are strictly forbidden.

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ACRONYMS

BPM-Business Process Management

CAD- Cash against Document

CMD-Contract Management Directorate

CRM-Customer Relationships Management

EPSS-Ethiopian Pharmaceutical Supply Service

HCMIS-Health Commodity Management Information System

IPLS-Integrated Pharmaceutical Logistics System

JIT-Just-In-Time

LC-Letter of Credit

MOH-Ministry of Health

NGO-Non-governmental Organization

NVA-Non-value adding activities

PFSA-Pharmaceutical Fund and Supply Agency

PLT-Procurement Lead time

PO-Purchase Order

QMSD-Quantification and Market Shaping Directorate

SOP-Standard Operation Procedure

SPSS- Statistical Packages for Social Science

SRM-Supplier Relationships Management

TMD-Tender Management Directorate

USAID- Unit State Agency of International Development

ABSTRACT

Background: *The government of Ethiopia is focusing on availing of pharmaceuticals at an affordable price, accessible to all citizens through the Ethiopian pharmaceutical supply service. Procurement lead reduction has strategic importance for service to increase the availability of pharmaceuticals. But, there are no clear strategies and practices devised to reduce the procurement lead time in Ethiopia pharmaceutical supply service central.*

Objective: *To assess procurement lead time reducing practices and challenges in the Ethiopian Pharmaceutical supply service central*

Methods: *Descriptive and explanatory studies were designed. Primary and secondary data were collected using self-administered questionnaires and data collecting tools respectively. For collecting the primary data, all technical staff of inbound logistics were involved in filling out the questionnaire whereas for the secondary data, 229 pharmaceuticals were selected using stratified and systematic random sampling techniques from 2769 pharmaceuticals received in the first semiannual of 2012 E.C. The data were analyzed using Statistical Package for Social Science and Microsoft excel. The results were presented in tables, figures, and narratives.*

Results: *The majority of the respondents said that the Ethiopian pharmaceutical supply service uses six practices to tighten its supply chain and strengthen partnerships, automates six procurement processes and uses seven practices to streamline its procurement operations. However, the majority respondents rated the supply chain integration and strengthening partnerships, procurement processes automation and procurement operations streamlining are poorly effective. Regarding the effect of the key procurement lead reducing practices; frequent procurement, and the fast mode of shipment have a significant positive effect on procurement lead time. But sourcing from local suppliers, and automating purchase order have an insignificant positive effect on the procurement lead time. The majority of respondents strongly agreed on two and agreed on ten challenges that they negatively affect procurement lead time reduction in Ethiopian pharmaceutical supply service.*

Conclusion and Recommendation: *In Ethiopian pharmaceutical supply service central, all procurement lead time reducing practices are not used. But, all challenges of procurement lead time reduction were identified. By using all practices and minimizing the challenges, Ethiopian pharmaceutical supply service can increase the effectiveness of the strategies. It is also important to analyze the cost-benefit of the key practices that have a significant positive effect on procurement lead time.*

Key terms: *challenge, lead time, practice, pharmaceutical, procurement lead time, strategy*

CHAPTER ONE

Introduction

This chapter consists of background of the study, statement of the problem, research questions, objective of the study, significance of the study, scope of the study, and organization of the paper are explained here under.

1.1 Background of the study

Speed is the competitive arena of the present and future. International competition is now a “game of rate of- progress”, rather than a “game of resources”: international competition “is a race to improve”. The needs to speed up operations “pervades entire companies ... in everything they do – from receiving orders to making and delivering products ...” Firms also need suppliers to speed up their operations. Focusing on cycle time reduction in all operations helps reduce costs and increase quality throughout the firm (Ng, et al., 1997).

Lead time management is a vital aspect in the achievement of supply chain performance and eliminating delays. It invariably improves throughput and customer service. Responsiveness to customer demand is an important property to develop in order to be competitive. Responsiveness with regards to price, product differentiation and delivery time is partly affected by the lead time of replenished material. Hence, reducing lead time provides increased competitiveness (Magnusson & Simonsson, 2012).

In many contexts and descriptions throughout the literature, the meanings of lead time can be found. However, many sources define lead-times simply the time between order placement and receipt of the shipment. But, (Waters, 2002) gives more detailed explanation that lead-time involves preparing an order, sending it to the supplier, allow the suppliers prepare them for shipment, ship the goods back to the customer, allows the customer to receive and check the materials and put them in stock. Supply chain lead time, cycle time and procurement lead time are the most common terms of lead time.

Decomposing the lead time into several crashing periods is a controllable way to achieve the balance between the two factors of time and costs (Senapati, et al., 2012). There are many components of lead time but the most important components of lead time are administrative and procurement lead time. Administrative lead time is the time that elapses between recognition of need to placement of order (Sai,

et al., 2015). Procurement lead time is defined as the time required to acquire the supplies and services and then place them in the hands of the user (Anand & Siddharth, 2016).

Lead time reducing strategies reduce lead time after long-term implementation of the practices. According to (Dan , 2021) the strategies are the supply chain integration and partnerships strengthening, procurement processes automation and procurement operations streamlining. The companies need to carefully investigate their lead time and design effective practices. Sourcing from domestic suppliers, frequent orders, fast mode of shipment and purchase order automation have the potential to reduce both the length and variability of lead time simultaneously (Godinho Filho & Ribeiro Utiyama, 2016).

It is up to the company's leadership to decide what lead time reduction practices are and how they will help get them to their goals. For reducing lead time, it is important that it is established as an organizational strategy and implemented with suitable management practices (Dan , 2021). The performance is to be improved by attending to problems affecting quality dimensions, such as lead time and should be solved by identifying and eliminating the root causes of problems (Magnusson & Simonsson, 2012).

EPSS has also set procurement lead time reduction as a strategic important to achieve operations to meet its customers' expectations by availing affordable pharmaceuticals in sustainable manner. EPSS defines procurement lead time as the time it takes to complete the procurement cycle, beginning with the date a requisition is submitted until the date pharmaceutical delivered to EPSS warehouse. This represents the time from the point where EPSS initiates or raises purchase requests to the time EPSS received the requested pharmaceutical from suppliers. The time required for a supplier to complete a single order, ending with the fulfillment of the order (EPSA, 2017).

The overall average of procurement lead time is 372 days and the target is 280 days (ETHIOPIA PHARMACEUTICAL SUPPLY AGENCY, 2018). In 2019, for managing the time between different processes separately, EPSS central has decomposed procurement lead time into five components. These are tender evaluation lead time (30 days), Purchase order (PO) approval (15 days), L/C or CAD opening lead time (15 days), supplier delivery lead time (90 days) and port clearance lead time (10 days) totally 160 days which is the current target of lead time reduction EPSS has set (EPSA, August, 2019). In this study based on the two evidences, procurement lead time is considered reduced when it is less than 280 days.

This study was conducted in Ethiopian pharmaceutical supply service (EPSS) central; a service responsible for procuring and distributing pharmaceuticals to public health facilities. The service's inbound logistics; QMSD (Quantification and Market Shaping Directorate, TMD (Tender Management Directorate and CMD (Contract Management Directorate) are directly concerned with reducing procurement lead time. These directorates have designed their own performance indicators that measure procurement lead time, identified causes and consequences of long procurement lead time, and aims at reducing it. This study identified practices and challenges of procurement lead time reduction, examined the effectiveness of procurement lead time strategies and the effect of key PLT reducing practices on PLT. This helps the service clearly knows the practices that it is using and not using, effectiveness of the strategies and the effect of the key practices on PLT. It also enables the service know the challenges that hinder the reduction of PLT. Based on the findings of the study, the service can make efforts use the practices that currently not using, maximize the effectiveness of the strategies and the effect of the key practices. It can take action to minimize or eliminate the challenges of procurement lead time reduction.

1.2 Statement of the problem

Pharmaceutical procurement is a complex process that involves many steps, agencies, and manufacturers (Anand & Siddharth, 2016). Timely procurement and un-interrupted supply chain management are crucial in timely supply of the required quantity of essential medicines to all the health facilities located in the remotest part of the country. Invariably it is presumed that the targeted population is being benefited when such programs are initiated and implemented. However, it has been observed that systems are often not effectively functioning causing problems like stock-outs or oversupply thus leading to a shortage of medicines or accumulation of medicines well past their expiry date. This results in not only loss of much-needed finances but failure to provide much needed essential medicines to all who urgently need them (Kirui & Makau, 10, October 2016).

Reducing lead time increases competitive advantage and secures inventory which can provide a response to uncertain demands but, the lead-time reduction is one of the most important problems encountered in the efficient management of the supply chain (Leng & Parlar, 2009). Lead time reductions is strategic benefit to firms but, most existing methods for generating these outcomes (reduced lead time) are seen as being too complex and difficult to implement. Firms consider, amongst other strategies, developing strong collaborative relationships with their trading partners (Singh, 2009).

A long lead time reduces flexibility and encourages high stocks to cover uncertainty before another order can arrive (Waters, 2002). Lengthy and inflexible lead-times in the procurement process will inevitably lead to wastage of high-value products (Raja & Mohammad, March 2005). It can also generate costs, for instance as a consequence of greater forecast errors which causes the necessity for higher safety stocks and an increase of rush orders. The issue boils down to not being able to swiftly follow customer demand, which at times will render too low stock levels, and lost sales as well as too high stock levels and obsolete material, tied-up capital and warehouse space. The value of decreasing lead times hence is greater for products with high fluctuation in demand (Magnusson & Simonsson, 2012).

The lead time variability is a key issue that forms part of the uncertainty from the supplier side. But according to (Hopp, et al., 1990) lead time reduction offers the ability to quote faster delivery to customers. The effects of shorter lead time can only be considered beneficial if they can be achieved without undue sacrifices in other areas such as quality and throughput.

There are assessments conducted to indicate the length of procurement lead time. But, the practices and strategies help to minimize procurement lead time are not clearly found. For instance, (ETHIOPIA PHARMACEUTICAL SUPPLY AGENCY, 2018) shows that procurement lead times are very long. The total procurement lead time is determined by the source of funding for the pharmaceuticals: the lead time of program commodities, millennium development goals funded items and RDF funded items are 302 days 385 days, and 519 days respectively. The overall average is 372 days. The time it takes to obtain purchase order (PO) approval from the regulatory authority, is currently, around 30 days, as well as the time for manufacturing and shipping the products cannot be shortened significantly, and the internal processes prior to the issuing of POs are complex and undertaken in a linear and sequential manner.

Procurement lead time management is a critical component of the procurement cycle management. This component, if not well-planned and managed, can affect product availability across the supply chain and lead to EPSS's inability to meet public expectations. The lead time management should also conform to EPSS's process and corporate-level indicators as provided in the corporate strategy and monitoring and evaluations frameworks. Tender management will deploy an operational excellence approach to ensure procurement lead time is reduced to achieve constant flow of products from inbound supply chain operations through outbound warehouse to last-mile delivery. The current tender lead time is too long and

this has affected EPSS promise to ensure improved product availability at the SDPs (Isa, et al., June 2020).

According to (EPSA, 2017) there is long lead time from requested date to PO date, from PO date to contract sign, extended LC opening process, poor supplier performance and delayed custom clearance. In EPSS central, many orders are often cancelled due to reasons from suppliers and the service itself. The causes for these problems are weak tender follow up system, inadequate PO follow up system and lengthy time, long time specification development time, delayed tender document preparation and long tender evaluation time, delay in getting hard currency, lack of communication with suppliers and need of lots of clearing documents. The consequences of the problem is interrupted supply and additional incur cost. But, these gaps were not fully investigated and the dimensions of the performances were not measured as well as determined in scientific ways and also practices or strategies to decrease the lead time have not been mentioned.

This study is motivated by the recognition that lead time reduction is now of strategic importance in the successful operation of EPSS. But, there is no clear procurement-reducing practices placed by the service. It used its own methodology to show the gaps on understanding procurement lead time reducing strategies, practices and challenges. It also indicated the effect of the key procurement lead time reducing strategies and practices on procurement lead time.

1.3 Research Objective

1.4.1 General objective

- To assess procurement lead time reducing practices and challenges: In case of the Ethiopian pharmaceutical supply service central

1.4.2 Specific objectives

- To identify procurement lead time reducing practices in the Ethiopian pharmaceutical supply service central
- To examine the effectiveness of procurement lead time reducing strategies in the Ethiopian pharmaceutical supply service central
- To examine the effect of the key procurement lead time reducing practices on procurement lead time in the Ethiopian pharmaceutical supply service central
- To identify procurement the challenges of lead time reduction in the Ethiopian pharmaceutical supply service central

1.4 Research question and hypothesis

In line with the above objectives, this study tried to address the following research questions and hypothesis

1.3.1 Questions

1. What are the procurement lead time reducing practices that the Ethiopian pharmaceutical supply service central is using?
2. Are the procurement lead time reducing strategies effective in the Ethiopian pharmaceutical supply service central?
3. What are the challenges of procurement lead time reduction in Ethiopian pharmaceutical supply service?

1.3.2 Hypothesis

1. **Ho:** Sourcing from local supplier has no a significant positive effect on PLT
Ha: Sourcing from local supplier has a significant positive effect on PLT
2. **Ho:** Frequently procuring has no a significant positive effect on PLT
Ha: Frequently procuring has a significant positive effect on PLT
3. **Ho:** Automating purchase order has no a significant positive effect on PLT
Ha: Automating purchase order has a significant positive effect on PLT
4. **Ho:** Fast mode of shipment has no a significant positive effect on PLT
Ha: Fast mode of shipment has a significant positive effect on PLT

1.5 Significance of the study

The main significance of this study is to address gaps and help managers, directors, and technical staff of EPSS central in a better understanding of the practices that the service is using to reduce PLT and challenges that prolong PLT. Additionally, the results and recommendations of this study help the service know the effectiveness of the strategies and the effect of the key practices on PLT. This enables the management of the service to use all practices and maximize the effectiveness of the strategies. It also benefits the suppliers of EPSS and all public health facilities which it supplies. Supply chain management practitioners can also get new information that may be more beneficial in the management of their operations. Supply chain management is proving to be a significant concept in both corporate and academic aspects. Future researchers who will conduct on pharmaceuticals LT (lead time) management and PLT reducing practices can find reference materials for their studies. The study is expected to enhance knowledge of the existing research. It explored the various gaps and prompt further research by scholars and other stakeholders. This study can also be a benchmarking tool for the EPSS and other stakeholders like the Ministry of Health (MOH) and Non-governmental organizations (NGOs) that supply pharmaceuticals and financially support EPSS that are challenged by poor lead time management practices.

1.6 Scope of the study

This study is bounded to identify the practices and challenges of PLT reduction, the effectiveness of PLT reducing strategies, and the key PLT reducing practices on PLT in Ethiopian pharmaceutical supply service (EPSS) central found in Addis Ababa. The researcher believes that the majority of procurement

lead time reducing practices is carried out by inbound logistics technical staff (the quantification and market-shaping directorate (QMSD), tender management director (TMD), and contract management director (CMD)) of EPSS central. The effects of cost, quantity, and distance on procurement lead time are not considered. The findings of the study can be taken as an initiation for consequences of long lead time and other researches to be undertaken.

1.7 Organization of the study

The whole thesis is presented in five different chapters. The first chapter gives an outline of the general background of the study. This chapter also explains the statement of the problem, research question, the objective of the study, the significance of the study followed by the scope and operational definition. The second chapter is the literature review chapter; which gives theoretical, empirical concepts, and conceptual framework on which this research work intends to be carried out. The third chapter is the research methodology chapter; where an elaboration of the design of the research work is given including the study design and methodology, sample and sampling methods; tools, procedures, and sources of data collection; and data analysis. The fourth chapter is the summary of the findings and discussion in which the results of the analysis are presented, interpreted and discussed in comparison to previous findings. The fifth chapter is the conclusion and recommendation where the findings of the research come to conclusion and specific recommendation is forwarded to the respective bodies.

1.8 Operational definitions

- **Challenge-** is a situation that threatens to hinder or derail a business' pursuit of success (Indeed Editorial Team, 2021).
- **EPSS central** is the physical location where pharmaceutical and medical products are delivered to and stored at a central site in the country (EPSA, August, 2019)
- **Lead time (LT)** - Lead-time is usually defined as simply the time between order placement and receipt of the shipment (Waters, 2002)
- **Pharmaceuticals:** Are those that can be used for health care needs of the population (WHO, 2007).
- **Practices** - the ways business attempts to do so in the most cost effective way to reach its objectives (Indeed Editorial Team, 2021).
- **Procurement lead time (PLT)** –) is the time it takes to complete the procurement cycle, beginning with the date a requisition is submitted until the date pharmaceutical delivered to EPSS warehouse (EPSA, August, 2019)
- **Strategy-** determines the direction and scope of an organization over the long term, and it should determine how resources should be configured to meet the needs of markets and stakeholders (Johnson, et al., 2005)

CHAPTER TWO

RELATED LITERATURE REVIEW

This chapter focuses on related literature on the study. The chapter is presented under the following sections: Theoretical literature review dealing with theories given by different scholars on contribution of lead time in supply chain, definition of lead time and its components, factors or challenges causing long lead time, practices of lead time reduction and benefits of lead time reduction, followed by empirical review, which focuses on the relevant literature relating to lead time. The conceptual framework of the study is also addressed in this chapter

2.1 Theoretical Literature review

2.1.1 Concepts of lead time in supply chain management

Companies use three main strategies to swiftly attract customers: to serve customers as fast as possible; to encourage potential customers to urge a delivery time “quote” before ordering, and to ensure a regular delivery interval for all potential customers (So & Song, 1998). Lead times can make or break business. The quantity of time it takes to satisfy an order incorporates a direct impact on whether customers will look elsewhere or wait patiently their order. In today’s “I want it now” world, it’s critical for B2C and B2B manufacturers to develop strategies for reducing time interval to remain competitive, reduce costs and increase income (Dan , 2021).

According to (USAID | DELIVER PROJECT, 2011)lead time is one in every of the foremost important determinations for a system designer to calculate. It is the time between when new stock is ordered and when it's received and available to be used. Logistics managers measure the time interval and try to reduce it to evaluate how well a logistics system is meeting the six rights. Goods should be available to customers at the proper time—before the customer asks. Time interval is calculated in some hours or several months within the complete in-country system, from arrival in port to the top user, between specific levels of the system, or the procurement interval from when a product is ordered with the manufacturer until it arrives in port. It also varies with the speed of deliveries, availability of transport, communications environment, and weather.

The definition of time interval within the supply chain management is the time from the customer places an order to the instant it's received by the customer. Interval is imposed on the provision chain by the

competition in business which is driven by customer expectations, supply chain innovations and, competitive pressure. Competitors that can't deliver products and services within the established interval will likely to perish (Kader, 2014)

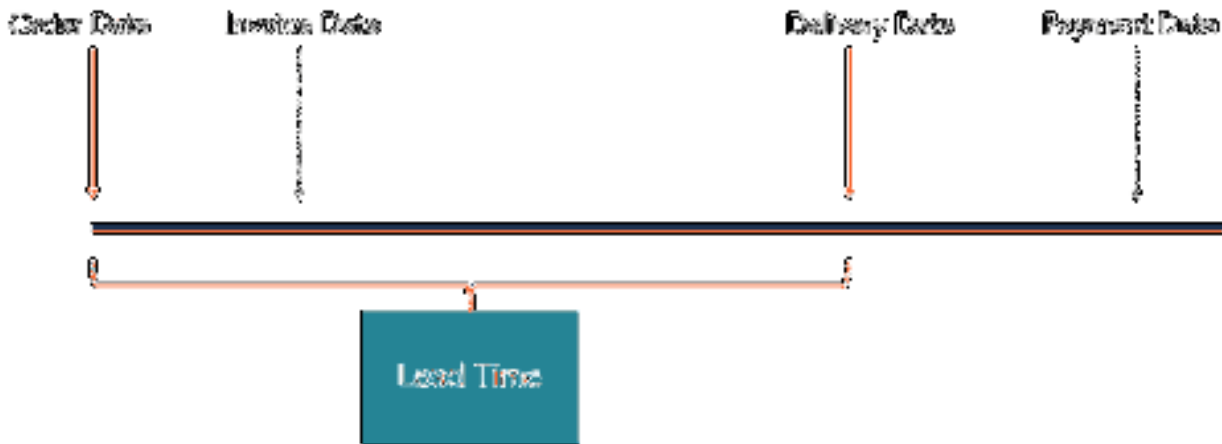


Figure 1: Lead time

2.1.2 Lead time and its components

According to (TutorialsPoint-Simplyeasylearning , 2016) Cycle time is often called the lead time. It is the end-to-end delay in a business process of interest, supply chain process and the order-to-delivery process. In the cycle time, there are two types of lead times:

1. Supply chain lead time
2. Order-to-delivery lead time

The order-to-delivery lead time is the time of delay in the middle of the placement of order by a customer and the delivery of products to the customer. In case the item is in stock, it is similar to the distribution lead time and order management time. If the ordered item needs to be produced, it is the summation of supplier lead time, manufacturing lead time, distribution lead time and order management time.

The supply chain process lead time is the time taken by the supply chain to transform the raw materials into final products and the time required to reach the products to the customer's destination places. So, it comprises supplier lead time, manufacturing lead time, distribution lead time and the logistics lead time. Lead time compression (reduction) is a crucial topic to discuss due to the time based competition and the collaboration of lead time with inventory levels, costs, and customer service levels.

Lead time consists of setup time, production time and shipping time. The first two lead-time components are determined by the manufacturer; whereas the shipping lead time may be chosen by the manufacturer or the retailer. The manufacturer is responsible for the setup time and production time at their normal durations. The two supply chain members are better off, and thus, they would have no incentive to deviate from the global solution that maximizes the system- wide profit (Leng & Parlar, 2009).

According to (Corporate finance institute, 2020) the components of lead time are preprocessing time, processing time, waiting time, storage time, transportation time and inspection time. Preprocessing time is the planning time, and includes the time taken to receive a request for replenishment while the processing time is the time taken after receiving a purchase order to procure or produce the item. Waiting time is the time taken between procuring necessary items to the time when the production process commences. Storage time is the amount of time that the items stay in the warehouse or factory awaiting delivery. Transportation time is the time taken to move from the warehouse/factory to the customer. Inspection time is the time spent by the customer checking the product to see if it meets the specifications and also refers to the time required to deal with any non-conformity with the order request.

Lead Time = Preprocessing Time + Processing time + Waiting time + Transportation time + Storage time + Inspection time

2.1.3 Procurement lead time

In procurement, lead time includes initiation to procure goods or services, up to the time of arrival. Procurement lead time includes selecting a good or service, identifying a need, sourcing vendors, negotiation time, ordering and paying. The procurement process is more variable than purchasing lead time and its lead time, depending on sizes and scopes of what is being procured. Lead time in procurement is usually measured in months. Purchasing lead time starts when the goods or services are ordered and ends when they are received and includes availability confirmation, ordering, order acknowledgement, shipping notice, receipt of goods or service, invoice recording and payment (TechTarget Contributor, 2016).

In EPSS central procurement lead time (PLT) is the time it takes to complete the procurement cycle, beginning with the date a requisition is submitted until the date pharmaceutical delivered to EPSS warehouse. This represents the time from the point where EPSS initiates or raises purchase requests to the

time EPSS received the requested pharmaceutical from suppliers. The time required for a supplier to complete a single order, ending with the fulfillment of the order. The procurement lead time are the time from order request to PO date/contract submission date, time from Letter of credit (L/C) or cash against document (CAD) opened to products reach to port and time from port to EPSS warehouses.

EPSS PLT Components		Low	Medium	High
1	Tender evaluation LT	<20 days	20-30 days	>30 days
2	PO approval LT	< 7days	7-15 days	>15 days
3	L/C or CAD opening LT	< 7days	7-15 days	>15 days
4	Supplier delivery LT	<69 days	69-90 days	>90 days
5	Port clearance LT	<7days	7-10days	>10 days
	Total	<110 days	110-160 days	>160days

Table 1: EPSS's procurement lead time components with its crashing periods

2.1.4 Procurement Lead time reducing challenges

The factors that affect the organizations' lead time include

1. **The lack of adequate financial support to the procurement process,**
2. **Legal and top leadership influence**
3. **Staff incapacity and**
4. **Socio-political factors.**
5. **Inadequate financing to the procurement process** is a common problem across the firms and the resultant under budgeting affects the lead time management of the firm (Igosangwa, 2014).

Failure to replenish stock is mostly caused by lead time delays, which varies among suppliers. Some lead time delays cannot be anticipated. Some common causes of shipping obstructions and lead time delays include:

6. **Natural disasters,**
7. **Human error,**
8. **Raw material shortages,**

9. Inefficient inventory management systems, and other factors (Corporate finance institute, 2020) and (KENTON, 2020)

An extended lead time is one of the major problems and can be endowed their investment in improving the factors affecting the lengthened lead time issue. The prevailing factors behind this are mostly related to:

- 10. **The inefficacy of the supply chain and port facility:** The major back-lock in the supply chain is the incomplete support of the primary textile industries that is supposed to supply the raw materials to the readymade apparel industries, especially fabrics (Kader, 2014).
- 11. **Incomplete specifications:** are the main reasons for long lead times to develop alternative suppliers. Incomplete specifications are also responsible for delays at process different stages, besides wasting time with reworks due to lack of consistent information (Alexandre, et al., 2016).

In addition to incomplete specification, five possible causes with regard to long lead-times and high variability, of which four are:

- 12. **A lack of order release mechanisms,**
- 13. **Imprecise forecasting,**
- 14. **Absence of supplier monitoring techniques and**
- 15. **Low significance for strategic suppliers (Nijkamp, May 29, 2012).**

2.1.5 Procurement lead time reducing practices

Lead time reducing practices are broadly classified under three strategies: supply chain integration and partnerships strengthening, procurement process automation, and streamlining procurement operations.

A. Practices of supply chain integration and partnerships strengthening

These procurement lead time reducing practices tighten supply chain to create an integrated supply chain and strengthen partnerships to build strong collaborations with customers, suppliers and stakeholders.

1. **Sourcing (procuring) from local suppliers:** Buying products locally, as opposed to sourcing from international suppliers, reduces the lead time because the goods are transported over shorter distances (Corporate finance institute, 2020).
2. **Consolidating suppliers:** Consolidating suppliers within specific supply markets is a proven strategy to concentrate buying power and reduce purchase prices. By simplifying and automating interactions with preferred suppliers, procurement can more effectively work these relationships beyond just cost savings, to include regarding sustainability, innovation, risk reduction, diversity, localization and other key objectives (Mitchell & Sawchuk, 2012).
3. **Providing pre-order summaries of forecasts to suppliers:** In anticipation of need, so suppliers can plan accordingly and not be surprised by a large order. Share sales history and projections and create a true partnership with suppliers to decrease lead times, build business and create trust. Letting your suppliers know when to expect reorders based on actual sales data helps them anticipate needs and speed up the fulfillment process (Dan , 2021).
4. **Frequent procurement (purchasing in lot or partially receiving):** consider ordering smaller quantities more frequently to help reduce lead times and carrying costs. Ordering more frequently in small quantities can help reduce your lead time and carrying costs (Dan , 2021).
5. **Creating an incentive for suppliers:** Incentives generally fall into two main categories: Cooperative incentives, where both buyer and supplier share benefits based on their joint performance. Competitive incentives can be an effective approach to improve delivery for purchases where the buyer-supplier relationship is characterized by balanced and moderate amounts of mutual dependence (TERPEND & KRAUSE, 2015).
6. **Just-In-Time (JIT) technique:** looks for ways of avoiding this by moving to small, frequent deliveries with short lead times (Waters, 2002).
7. **Communication with suppliers:** Staying in touch with supplier throughout the production process helps ensure that expectations are being met and that any issues along the way can be addressed promptly. Information sharing with summary suppliers to refine the currently used forecasting method; the introduction of supplier or supply chain monitoring and measurement to assure long-term success (Nijkamp, May 29, 2012).
8. **Horizontal collaboration in transport with importers and /or other governmental distributors:** (Ghaderi, et al., 2016) shows horizontal collaboration in transport can lead to reduced lead times and lower variability of lead time by means of direct routing and avoiding multi-transshipment routes which

reduces the uncertainty and variability by diminishing the number of stages in the transport chain. Thus, effective lead-time management is a source of competitive advantage as it can reduce supply chain costs by lowering inventory levels. Transportation lead time can be reduced by consolidating the orders which avoid transshipments and multi-drop routes.

9. Strategic suppliers and customers relationship management (SRM and CRM): In today market, transferring product to customers at the shortest possible time is an advantage. In contrast, long lead time provides undesirable results for a company. There might be many reasons in the supply chain for this delay, but focus can be placed on suppliers and supplier relationship management (SRM). After implementing SRM approach, products are delivered five days earlier which is approximately shows 33% time reduction. Therefore, the LT indicator has been cut by one third, which indicates the effectiveness of SRM in supply chain (Momiwand & Shahin, 2012).

B. Practices of procurement process automation

These practices reduce procurement lead time by facilitating workflow, reducing human errors and order process when they are automated. According to (Procurement cloud, 2021)the following five essential procurement processes should be automated to minimize the lead time:

- 1. Automating purchase order process:** Purchase order process automation helps lessen manual processing issues. Purchase order automation can streamline and make purchasing processes faster and more efficient. It automation allows organizations automate the entire purchase order cycle to deliver improvements in productivity and process efficiency, while saving costs and reducing time delays caused by human errors.
- 2. Automating purchase order approval:** The purchase order approval process requires different stakeholders to validate the purchase. Once it passes the internal processes of the buyer and vendor, it becomes a legally binding contract between the parties. Manual purchase order processing requires significant time and human resources at an expense to organizations. Conversely, automated procurement approval system means instant approvals in real-time from any location, streamlining the purchase order approval process. Now, purchase orders are approved in minutes.
- 3. Automating purchase requisition:** Most of the time, purchase requisitions get stuck and consume a lot of time to move through the complex hierarchical structure. Procurement process automation will not only reduce the time of approval cycle but also remove redundant steps in the process and enable purchasing staff to do more in less time.

4. **Automating invoice management:** There's a problem with manual invoice management. procurement teams have to often deal with poorly managed purchase orders, missing goods receipts, submission delays, uncontrolled (maverick) spending, tricky spreadsheets, and insufficient transparency as far as the spend culture is concerned. Practically, manual invoice management usually means delayed payments and compliance issues. By going digital invoice management becomes buttery smooth through integrations with finance and accounting tools.
5. **Automating supplier management:** Without a clear line of disclosure and process transparency, organizations will end up making a strain in their suppliers' relationships. With automation, procurement teams can streamline suppliers' management and select the best vendor available. By automating suppliers' management process, organizations can quickly identify and resolve grievances, forming a better relationship with the vendor.
6. **Automating contract management:** In manual contract management, all contracts are disorganized and unstructured, finding contracts can be a real challenge. Procurement automation organizes all contracts in a central repository that can easily be accessed and it also ensures that all contracts stay consistent and accurate.
7. **Automating inventory management:** Relying on manual data consolidation often means that companies do not realize that they are under stocked until it is too late. With automated inventory management, businesses have access to real-time inventory data and are immediately alerted with levels that are dangerously low. Advanced ordering solutions can even be programmed to automatically submit a purchase. Depending on manual data entry to manage supply is essential to speed up inventory management processes and reduce errors.

C. Practices of streamlining procurement operations

The following procurement lead time reducing practices streamline procurement operations from order entry to delivery.

1. **Using fast mode of shipment:** Company can also organize for alternative shipping methods that are quicker than the current shipping methods, or that offer more frequent shipments. The suppliers may prefer slow mode of shipments, but result in more cost savings, which can affect lead times. Transitioning to a more flexible shipping method can gradually reduce the lead time, even though it may come at an additional cost (Corporate finance institute, 2020).

2. **Gaining preferential (necessary) resources:** Gaining preferential resources by increasing the significance towards strategic suppliers decrease long delivery times and their high variability with regard to purchased parts.
3. **Strategic suppliers' selection:** Supplier selection is the process by which firms identify, evaluate, and contract with suppliers. The main objective of supplier selection process is to reduce purchase risk. It also maximizes overall value to the purchaser, and develops closeness and long-term relationships between buyers and suppliers. The need for cutting the delivery time of the current on-time delivery process help companies gain competitive advantage against the competitors. Creating a new streamlined order to delivery process, strategic supplier selection and strategic supplier relationship management can reduce the time of delivery (Heinonen, 2015).
4. **Decomposing lead time:** In many practical situations, lead time can be reduced at an added crashing cost by decomposing lead time; in other words, it is controllable. By shortening the lead time, safety stock can be lowered, reduce the loss caused by stock out, improve the service level to the customer, and increase the competitive ability in business. Time and cost are the most potential competitive factors in business. Under cost considerations, a firm can apply a variety of means to reduce the lead time to satisfy customer's demands. Decomposing the lead time into several crashing periods is a controllable way to achieve balance between the two factors of time and costs (Senapati, et al., 2012).
5. **Reducing non-value added activities:** Value stream mapping purpose is to provide optimum value to the customer through a complete value creation process with minimum lead time (Samad, et al., January 2013).
6. **Using SOP for improving consistency:** Standardizing the operational procedures and documenting will help reduce confusion among staff and help easy learning and improve consistency in production (Henderson, 2021).
7. **Vertical integration backward and forward:** vertical integration affects operational efficiency as it improves throughput of materials and information along the supply chain resulting in lower lead times and higher delivery performance (Buzzell, 1983).
8. **Using business process management (BPM):** Business process management concept in supplier development can reduce lead times of process and contribute to the primary objective of the area, which is operate efficiently and effectively, considering needs and strategic planning scope, promoting guaranteed delivery and increased margins for organization. The use of BPM tools reduce

lead time around 40% and 56%, besides seeking alternative suppliers and materials, thereby meeting organizations needs regarding delivery warrantee and profitability (Alexandre, et al., 2016).

2.1.6 Effectiveness of procurement lead time reducing strategies

1. Supply chain integration and partnerships strengthening

An integrated supply chain and strengthened partnerships reduce procurement lead time. For instance, integration is prerequisite for effective sharing and utilization of information between different companies in the chain. The transfer of information brings important advantages in process costs and lead-times, while the resulting possibility of smaller and more frequent orders means reduced inventory costs (Trkman & Groznik, 2006). Similarly, companies can improve operational performances (and lead time ones specifically) through supply chain integration, i.e. information sharing and system coupling. Nevertheless, integration can be difficult to be performed in a global sourcing context because of suppliers' distance. This can make more difficult for companies to control sourcing globalization counter effects - mainly longer lead times – and neutralize lower cost seeking strategies (Golini & Kalchschmidt, 2009).

Supply chain practices have to be considered (Droge, et al., 2004) suggests reducing procurement lead time by means of investments in supply chain integration with local suppliers. (Markham & Roy , 2001) though there is a wide acceptance of the strategic importance of integrating operations with suppliers and customers in supply chains, many questions remain unanswered about how best to characterize supply chain strategies. The widest degrees of arc of integration with both suppliers and customers have the strongest association with performance improvement. A higher level of integration provides better operational performances (also in terms of lead time).

2. Procurement processes automation

Procurement automation is about automating procurement processes to maximize efficiency and reduce the time taken. It speeds up the procurement process by freeing up employees from repetitive and time-intensive activities. The benefits of procurement automation; increases productivity, eliminates manual errors, provides visibility into spends, acts as a central repository, improves collaboration between internal and

external teams and removes approval bottlenecks (Procurement cloud, 2021). By switching to an electronic procurement system, the process can be made more transparent and flexible; thereby increasing the effectiveness and efficiency of procurement (Lahiru & Pradeepa , 2017).

Automation is one of the greatest ways of reducing lead time in the supply chain. Automation reduce lead times by taking care of tasks usually done manually, such as placing orders, processing changes, data entry, and freeing up much confusion and valuable time that is tied up into error-prone processes. Over time, lead times are decreased, and the sales have improved. Another benefit of automation is the reduction in the number of hours (approximately 70 hours per week) by factory workers. Automation has played a significant role in this reduction of lead time. Finally, the time required to process a typical production order through the factory is generally reduced with automation (Cflow, n.d.).

3. Procurement operations streamlining

The procurement process can be streamlined by removing manual procedures which take more time and required repetition in several stages. By switching to an electronic procurement system, the process can be made more transparent and flexible; thereby increasing the effectiveness and efficiency of procurement. The success of a procurement system relies on the management of suppliers. Adopting a supplier management system can streamline the procurement process through reduced lead times, quality product and reduced percentage of rejects and reworks (Lahiru & Pradeepa , 2017).

Public procurement often bears witness to long delays and inefficiencies due to the fact that organizations have complex and redundant processes that do not fully exploit the potential for greater efficiency. The streamlining of procurement procedures is accurately mapping the current processes by identifying the steps needed and the people involved. Once the processes are mapped out, the source of inefficiency (time loss, redundant processes, etc.) can be identified. The processes can be restructured and simplified, eliminating unnecessary time loss, use of resources, or other types of administrative burden (the Minister for the Cabinet Office, 2008).

2.1.7 The effect of the key procurement lead time reducing practices on procurement lead time

According to (Godinho Filho & Ribeiro Utiyama, 2016)When variability is low, the mean strategy is best. When the variability is moderate, it is effective to use the worst case strategy which usually has a

lower cost and exhibits a similar effect on lead time. For high variability, the variability strategy and for complex tasks, the mean strategy is always the best option. However, for situations in which it is not possible to improve the mean, the worst case strategy is an excellent alternative in procurement with low variability. In the presence of moderate and high variability, the variability improvement strategy is as the best alternative to mean strategy.

1. Sourcing from local suppliers

If local sourcing is properly managed, it can have significant impact on internal efficiency. Companies should take in proper consideration the impact of global not only for their sourcing activities, but also for their manufacturing processes. Quite interestingly, no significant differences (besides that on through put time efficiency previously mentioned) arise between local and global sourcing. This may be due to the companies may decide to stay local for different reasons either related to performances that they want to improve directly (e.g., transportation cost, delivery lead time, flexibility etc.) or to access specific local competences (Golini & Kalchschmidt, 2009).

Using a domestic suppliers based stateside can automatically reduce lead time by two weeks or more. Delivery is a function of a supplier's efficiency and effectiveness, including on-time delivery, short lead times, reliable delivery methods, good packaging for delivery, and delivery of products in good conditions and without errors in product type and quantity. The advantages of local sourcing is the lower burden of logistics which positively affects lead times of suppliers, enables stronger supplier management, and better control of product conditions and quantities. However, for companies requiring advanced delivery services, the benefits of supplier proximity is nullified by low supplier efficiency and effectiveness due to low investment levels. Hence, despite longer distances, delivery conditions of suppliers abroad might be better than delivery conditions of local suppliers (Dan , 2021).

2. Frequently procuring

Many businesses purchase their inventory in bulk to receive wholesale or discounted prices, believing it to be cost efficient. However, buying in bulk sometimes elongates lead times, costing the company potential sales and new customers. Depending on the lead time duration, this could actually cost the organization more than they are saving. Instead, businesses should perform a total cost analysis to

determine if ordering smaller batches at higher frequencies minimizes labor and carrying costs, as well as lead times (Henderson, 2021).

Considering ordering smaller quantities more frequently reduces lead times and carrying costs. This is particularly true for ordering from domestic suppliers that comes with the assurance of shorter and more predictable lead times. By ordering smaller quantities more frequently, there is no the pressure of minimum order quantities and risk ordering more the need. Also, by ordering less, there's a chance that the products will reach more quickly, as the manufacturers won't have to embark on a new production run just for the companies (Dan , 2021)

3. Automating purchase order

Purchase order process automation minimizes the manual processing issues and make faster and more efficient by streamlining the purchasing processes. It automation allows organizations automate the entire purchase order cycle to deliver improvements in productivity and process efficiency, while saving costs. Sometimes, lead time delays are caused by human errors, when the person responsible for ordering new stock delays contacting suppliers (Corporate finance institute, 2020).

4. Using fast mode of shipment:

Transitioning to a more flexible shipping method can gradually reduce the lead time, even though it may come at an additional cost (Dan , 2021). Company can also organize for alternative mode of shipment that are quicker than the current mode of shipment, or that offer more frequent shipments. The suppliers may prefer shipping methods that are slow but result in more cost savings, which can affect lead times. Transitioning to a more flexible shipping method can gradually reduce the lead time, even though it may come at an additional cost (Corporate finance institute, 2020)

2.1.8 Benefits of procurement lead time reduction

Lead time carries huge importance when delivering products. It is a core parameter that varies and affects all supply chain partners hence varying lead times could therefore have an effect on the supply chains. Because logistics supports time and place commitments in the supply chain, it can be argued that the lead-time frontier accounts for at least half of logistics success (Ndubi, 2016).

Short lead-times are a major source of potential competitive advantage (Jaff & Ivanov, 2015). The reduction of lead time may subsidize the cost of inefficiency caused by the lack of the demand distribution information. It is especially significant for a system with high uncertainty in demand, large buyer's carrying cost, or high buyer's service level requirement. The common shipment cycle will increase, but the buyer's protection period is reduced after the lead time is shortened. Maintaining the same service levels, the buyers can reduce the stocks at the expense of a slight increase in the vendor's stock after shortening the replenishment lead time. Considerably, the common shipment cycle time and the buyer's target level of replenishment are sensitive to demand uncertainty, the buyer's carrying cost, and the vendor's production rate. Finally, the number of shipments per production cycle and the vendor's target level of replenishment are significantly influenced by the production rate (Hsu & Huang, 16 June 2009).

The manufacturer also promises to expedite or postpone the delivery of the order by a certain amount of time if the retailer makes such a request and then the retailer places an order with the manufacturer. This has an opportunity for the retailer to modify the lead time by using most up-to-date demand information before the order is delivered. Consequently, the lead time flexibility helps the retailer most when the demand uncertainty is high. The retailer should always delay the choice of lead time as late as possible which means it should exercise its lead time option later rather than earlier (Cakanyildirim & Luo, October 12, 2003).

2.2 Empirical literature review

According to the company has weak supply chain integration and extended lead time for the services provided to its customers. Supplier Integration, Customer Integration and Internal Integration have a significant relationship with lead time. But even if supplier integration has significant relationship with lead time it doesn't have a significant effect on the company's service lead time (Mulgeta, 2017).

Cooperation reduces up to 45% average lead time because of two effects. First, cooperation aggregates orders and these larger orders are not easily rejected by the suppliers who could be inclined to offer shorter lead times to acquire these orders. Second, procurement involvement generates a mutual commitment for both purchasing group and supplier to further reduce the time spent in the administrative process. In addition, the impact of group sourcing on product quality and supplier management is a primary motive for joining a purchasing cooperative, as it is the economics of scale in purchasing price. The time reductions in supply time are considerable; on an average, 22.6%, but individual time savings amount to

30%. By consolidating demand, the purchasing group is able to receive deliveries directly from a single truck, rather than having to wait to join scheduled multi-drop routes from the suppliers point (Ghaderi, et al., 2016).

The procurement process can be streamlined by removing manual procedures which take more time and required repetition in several stages. By switching to an electronic procurement system, the process can be made more transparent and flexible; thereby increasing the effectiveness and the efficiency of procurement. Many countries practice E-procurement in their educational systems: The success of a procurement system depends on the management of suppliers. Adopting a supplier management system can streamline the procurement process through reduced lead times, quality product and reduced percentage of rejects and reworks (Jayaratne, 2017).

Regarding the extent of manufacturers' market share, 24% of the medicines are supplied by the domestic manufacturers. This implies high import of medicines than manufacturing of medicines domestically (Gebeyaw, February 2020). There is high lead time which is attributed to by the delays in the procurement processes since the requisition stage to the day of delivery and receipt to the end users. Quotation lead time is found to be statistically significant in explaining overall lead time. It takes a maximum of 20 days and a minimum of 11 days for the entire local purchase order process. The longer the length of period the quotation process takes the longer the overall lead time in the procurement process which leads to higher inventory costs The average mean is 14.55 days to prepare and deliver to supplier the confirmed request documents for the supply of goods. Local Purchase Order lead time is not statistically significant in explaining overall lead time. The number of days taken to raise an LPO can influence the overall lead time positively if not managed effectively (Kiilu, 2016).

The adoption of information computer technology tools substantially reduce (about 30%) the amount of time required to reach the final customer. In the simulated scenario, the final customer could be reached 68 days in advance if compared with the previous situation (Bertolini & Bottani, October 2007).

Lead time may be reduced by crashing setup and transportation time, by increasing the production rate, or by reducing the lot size and show that lead time reduction is especially beneficial in case of high demand uncertainty (Christoph, 2012).

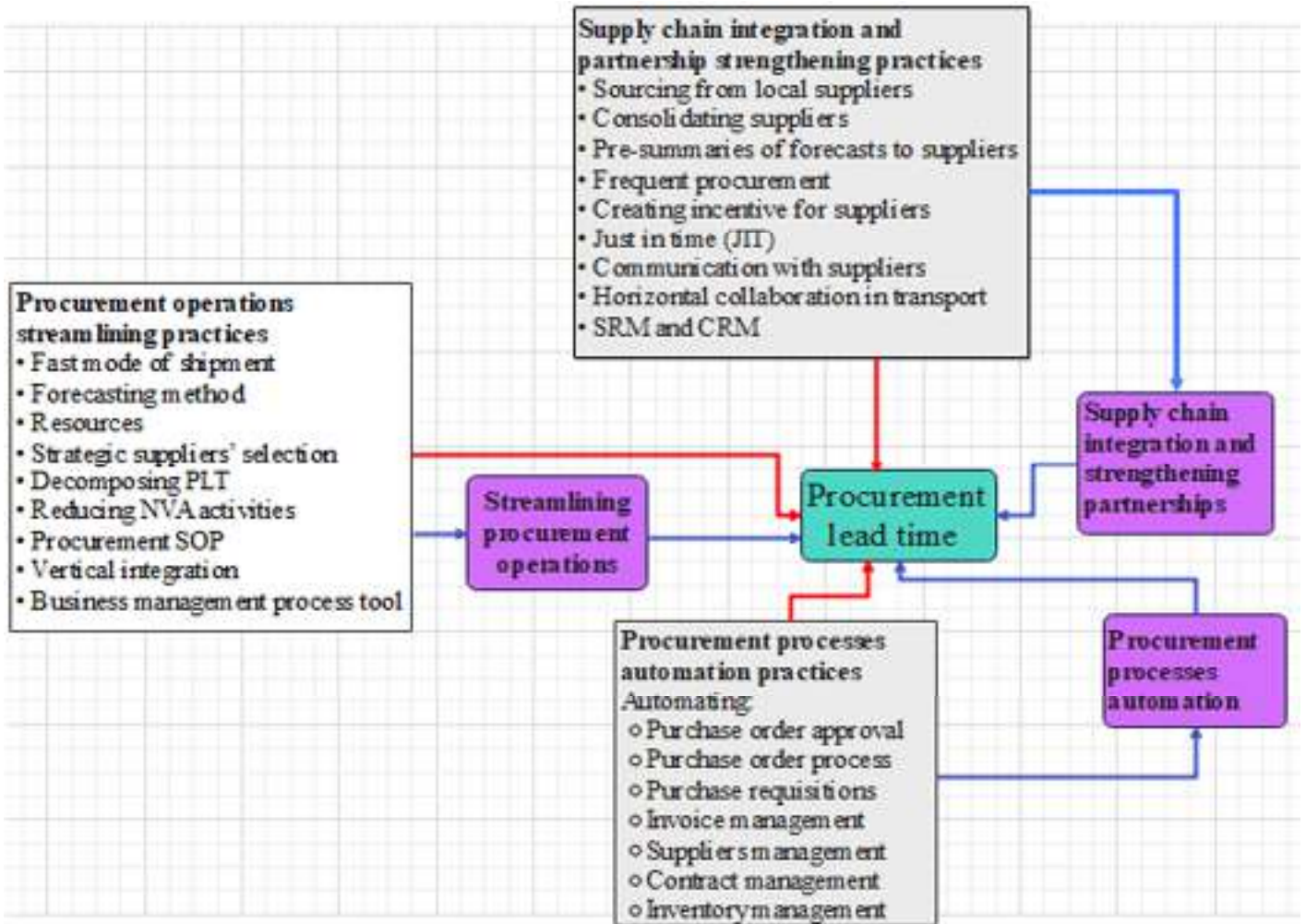
Air (63%) is the major means of transportation to ship medicines in crossing Ethiopian border followed by road truck (24%) and sea (13%) transportations used by the service (Gebeyaw, February 2020). Air

freight is a better transportation mode than sea freight for long distance delivery. Although the sea freight cost is cheaper than the air freight cost, it takes longer traveling time for more than a week. Setting up the purchasing process, timeline, and shipment consolidation could help the company reduce the averaged purchasing lead time from 27 days to 9 days and save the transportation cost around 78.41 % (THANGSAMPAN, 2017).

The use of business process management tools optimize procurement main role and contributes to development process lead time reduction around 40% and 56%, besides seeking alternative suppliers and materials, thereby meeting organizations needs regarding delivery warrantee and profitability (Alexandre, et al., 2016).

2.3 Conceptual framework

This diagraph of conceptual framework show the effect of procurement lead time reducing practices on procurement lead time. In this study, dependent variable is procurement lead time and independent variables are procurement lead time reducing practices and strategies. The PLT reducing practices are categorized under three procurement lead time reducing strategies which are supply chain integration and partnerships strengthening, procurement operations streamlining and procurement processes automation. The key PLT reducing practices are sourcing from local suppliers, procuring frequently, using fast mode of shipment and automating purchase order process. In this diagraph, they are bolded.





-  = Direct effect of PLT reducing practices on PLT
-  = Indirect effect of PLT reducing practices on PLT

Figure 2: Conceptual framework from literature review, 2022

2.4 Identified literature gap

The main point of contention in this review of the literature is that some sources claim that lead time management is a more relevant notion than lead time reduction because some clients place a premium on the long lead time. On other hand, short lead time doesn't always satisfy customers' needs. However, the findings of most of the studies indicate that reducing lead time is always important to gain a competitive advantage. Secondly, there are no clear-cut definitions and components of lead time in all literature. From the literature review, it is found that lead time reducing practices are designed based on companies' leadership. This shows that lead time reducing strategies and practices that are effective in one company may not be effective in other companies. This is why this study is designed to look into assessing procurement lead time reducing practices that EPSS is exercising and the effect of the key ones on procurement lead time.

CHAPTER 3

METHODOLOGY OF THE STUDY

Introduction

In this chapter, the research approach to be used in the study is presented. It explains the research methodology utilization and its justification for the purposes of this study. The chapter discusses procedures and activities under taken, focusing on the study's research design, sampling design, sample size determination, data collection data processing and analysis and instrument development. It further addresses issues of reliability and validity and concludes with the ethical considerations of the study.

3.1 Description of study area

This study was conducted at the Ethiopian pharmaceutical supply service head office. EPSS is a pharmaceutical procuring and distributing service to Ethiopian public health facilities. In order to bring efficiency in the Pharmaceuticals Supply chain, PHARMID was transformed to pharmaceuticals fund and supply agency (PFSA) in 2007 G.C then to Ethiopian pharmaceuticals supply agency (EPSA) in 2017 G.C. Currently, the service is under the ministry of health and stands for forecasting, procurement, warehousing and distribution of pharmaceuticals throughout the country. The service has 19 branches which are found in all regions of Ethiopia. It has more than 2000 employees. The service has inbound and outbound logistics. Under inbound logistics, there are three operational directorates: the quantification and market-shaping directorate (QMSD), tender management directorate (TMD), and contract management directorate (CMD). The Service manages both Programs (donated and free) and revolving drug fund (purchased) Pharmaceuticals. Procurement lead time reduction activities are widely carried out by inbound logistics technical staff.

3.2 Study Design

Descriptive and explanatory studies were designed. A descriptive study was conducted to better understand practices and challenges of procurement lead time reduction and examine the effectiveness of procurement lead time reducing strategies in EPSS Central. An explanatory study was conducted to examine the effect of the key PLT reducing practices on PLT.

3.3 Study Approach

Quantitative approaches were employed to collect both the primary and secondary data for the study.

3.4 Population and Sampling design

3.4.1 Target population

The study populations to identify practices and challenges of procurement lead time reduction and examine the effectiveness of the strategies were all technical staff of inbound logistics. The inbound logistics have 60 technical staff. All members were involved in the study for they are small in number and all deal with procurement lead time reduction. The target populations to determine the effect of PLT reducing practices on PLT were all pharmaceuticals procured in the first six months of 2012 E.C which were 2769 in number. These target populations were recent and also not affected by the Covid-19 pandemic.

3.4.2. Sampling techniques

The stratified and systematic random sampling were applied to select samples of the pharmaceuticals received in the first semiannual of 2012 E.C.

Pharmaceuticals at regular interval ($n^{\text{th}} = \text{population in each strata} / \text{sample in each strata}$)

No sampling techniques applied to select the staff who filled the questionnaires since their number was small (60) (EPSS human resource development directorate).

3.4.3 Sample size determination

To select samples of the pharmaceuticals received in the first semiannual of 2012 E.C, the sample size was calculated using the following formula developed by (Yamane, 1967) with a 94% confidence level to know the strength and relationship between the dependent variable and independent variable.

$$n = \frac{N}{1 + N(e)^2}$$

Where; n = the desired sample size (correction of sample size)

N = Population size of technical staff

e = margin of error

The total number of pharmaceuticals received in the first six months of 2012 was 2769 (HCMIS 2012).

Based on the above formula, the sample size is calculated as follows

N=2769

e= 0.06, level of confidence is 94%

So, $n=2769/1+2769(0.06)^2$, $n=2769/1.1$, $n=252$

Since, collecting and analyzing data of 262 samples is time-consuming; the researcher has decided to adjust the sample to the minimum using the following formula.

$n=no/ 1+ (n/N)$, $no=252$, $N=2769$

So, $n=252/1+ (252/2769)$, $no=252/1.1$, $no=229$

The adjusted sample size was 229.

The calculation to get the sample from each stratum

Types of strata		Total number of items received or procured	Percentage of strata in total pharmaceuticals received	Percentage in Adjusted sample size	
1	RDF	Medicines	365	$=(365/2769)*100=13\%$	$=229*13\%=30$
		Medical supplies	484	$=(484/2769)*100=17\%$	$=229*17\%=39$
		Chemicals and Reagents	990	$=(990/2769)*100=36\%$	$=229*36\%=82$
		Total RDF	1839	66%	151
2	Health Program	Medicines	515	$=(515/2769)*100=19\%$	$=229*19\%=44$
		Medical supplies	189	$=(189/2769)*100=7\%$	$=229*7\%=16$
		Chemicals and Reagents	226	$=(226/2769)*100=8\%$	$=229*8\%=18$
		Total health program	930	34%	78
Total		2769	100%	229	

Table 2: Summary of sample size techniques

Conclusion: the sample size of RDF pharmaceuticals was 151 and which in turn stratified and sample size from RDF medicines, medical and chemicals and laboratory reagents was 30, 39 and 82 respectively whereas the sample size of Health programs pharmaceuticals was 78 and health program medicines, medical supplies and chemicals and laboratories were 44,16 and 18 respectively.

3.4.4 Sampling procedure

Since the number of inbound logistics staff was small, all population was allowed to involve and complete the structured questionnaires. The questionnaires were disseminated to all technical staff of inbound logistics and collected by the principal investigator. The data of pharmaceuticals procured in the first semiannual of 2012 E.C was used to determine the effect of the procurement lead time reducing practices on procurement lead time. For this study, pharmaceuticals were stratified into RDF and health programs. Each RDF and Health programs was stratified into medicines, medical supplies and chemicals, and laboratory reagents. Then, the pharmaceuticals in each stratum were sorted according to their received time. Then, at the **12th** regular interval, pharmaceuticals were selected from each strata. Data for this study were collected from manual and electronic (HCMIS) data sources using data collection tools. Two trained enumerators were deployed and coordinated by the researcher.

3.4.5 Inclusion and exclusion criteria

For this study, all technical staff of inbound logistics was included. Other staff of EPSS did not participate in completing the questionnaires. All pharmaceuticals procured from local and foreign suppliers received in the first six months of 2012 E.C were included; pharmaceuticals received at different periods were excluded because either their supply chain was impacted by COVID-19 or the data was outdated. Medical equipment categories were also omitted due of their unique nature of their supply chains.

3.5 Data Collection Methods and Instruments

Primary and secondary data that directly answered and fulfilled the objective of the study were collected. The primary data were collected using structured questionnaires ([annex3](#)). The secondary data were collected from documents and electronic recordings using data collection tool ([annex4](#)). Both manual and electronic data sources were used to make the researcher confident in the quality of data.

3.6 Data Quality Assurance

1. Validity

The questionnaire was disseminated to 10 respondents randomly as a pretest for primary data, and it was then adjusted as necessary. Respondents who were willing to complete the questionnaire were given access to it. The principal investigator verified the completeness of the data. For secondary data, a pretest of the prepared data collection tools was performed on 10 pharmaceuticals procured in first semiannual

of 2012 E.C. to ensure the validity of the tools, and modifying the tools were done accordingly. The data collectors were trained on the data collection tool (checklist). The principal investigator supervised the data collection process through spot-checking and reviewed data collection tool to clarify any data inconsistencies.

2. Reliability

The reliability of a standardized test is usually expressed as a correlation coefficient, which measures the strength of association between variables. Such coefficients vary between -1.00 and +1.00 with the former showing that there is perfect negative reliability and the latter shows that there is perfect positive reliability. For this study, Cronbach's alpha coefficient for the instrument will be calculated. (Sekaran, 2000) Points out that the closer the coefficient is to 1.00, the greater the reliability of the instrument. It is generally accepted that a 0.7 or higher value of the Cronbach's alpha coefficient represents high reliability

S/N	Reliability Statistics		
	Procurement lead time reducing strategies	Cronbach's Alpha	N of Items
1	Supply chain integration and strengthening partnerships	0.77	9
2	Procurement processes automation	0.67	7
3	Procurement operations streamlining	0.75	9
Total		0.79	25

Table 3: Reliability of procurement lead reducing strategies items

The Cronbach's alpha coefficients of supply chain integration and strengthening partnerships, Procurement processes automation and procurement operations streamlining are +0.77, +0.67 and +0.75 respectively. The Cronbach's alpha coefficient of procurement lead time reducing strategies is +0.79 which is acceptable according to (Sekaran, 2000)

3.7 Method of data analysis

The primary data and secondary were analyzed using Microsoft excel and the Statistical Package for the Social Sciences version 25 (SPSS). The results were presented in tables, charts, graphs, and written in narrative form. The secondary data were entered and analyzed using the SPSS.

Primary data interpretation

Descriptive statistics were used to calculate (mean, standard deviation, frequencies, and percentage) and results were presented using tables, charts, and graphs.

Based on EPSS’s procurement lead time crashing periods and four points Likert scale in terms of effectiveness, procurement lead time reducing practices and strategies are:

- Very effective, if PLT<110 days
- Effective if PLT is between 110 and 160 days
- Poorly effective if PLT is between 160 and 280 days
- Ineffective if PLT >280 days)

Secondary data interpretation

Procurement lead time was calculated based on the formula set by **EPSS and USAID PROJECT**

Procurement lead time=Received time-Request time

- If PLT < 280 days, it is reduced
- If PLT> 280 days, it is not reduced

Inferential statistics of the secondary data were computed using a **binary logistic regression model** since dependent (procurement lead time) is dichotomous. The regression model is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_3 X_3 + \dots + \beta_k X_k + \epsilon$$

$\beta_1, \beta_2, \beta_3, \dots, \beta_k$ are coefficients of explanatory variables

Y is a dependent variable (procurement lead time)

X1, X2, X3... X are independent variables (sourcing from local suppliers, frequent procurement, PO automation and fast mode of shipment)

ϵ is the error term

3.8 Dissemination of results

As this work is part of the master’s thesis, it was publicly defended in the school. In addition, the findings of this study will be submitted to all concerned bodies that can make use of the study findings including all organizations the study will cover, and also publication to journals will be facilitated. All efforts will be done to present the study results to available forums, workshops, and conferences.

3.9 Ethical considerations

Ethical approval was obtained from the ethics review committee of the School of Pharmacy, Addis Ababa University. In addition, permission to conduct the research was obtained from EPSS central. The study participants were informed about the purpose of the study and the importance of their participation in the study. The study subjects were informed that they can skip question/s that they do not want to answer fully or partly and also to quiet the process at any time if they want to do so and their participation was voluntary. After assuring the confidentiality nature of responses and obtaining informed consent from the study subject, the questionnaires were distributed and collected by checking the completeness of the questionnaires.

CHAPTER 4

SUMMARY OF FINDING AND DISCUSSION

4.1 INTRODUCTION

Generally, this chapter is organized under socio-demographic characteristics of technical staff of inbound logistics in EPSS central, summary of the findings and discussion.

4.2 Response rate

The data was collected from all directorates of inbound logistics in EPSS central. 59 (98.3%) technical staff of inbound logistics out of 60 samples involved and completed the questionnaires. One questionnaire was discarded because of its incompleteness. This implied that the response rate is accepted since it is far greater than 60% (Fincham, May, 2008).

4.3 Respondents profile

S/N			Count	Table Total N %
1	Gender	Male	47	80%
		Female	12	20%
		Total	59	100%
2	Age	1-25	5	8%
		26-35	47	80%
		36-45	5	8%
		>45	2	3%
		Total	59	100%
3	Highest level of education	Diploma	3	5%
		BSc/BA	35	59%
		MSc/MA	21	36%
		PhD	0	0%
		Total	59	100%
4	Directorate currently working in	QMSD	24	41%
		TMD	13	22%
		CMD	22	37%
		Total	59	100%
5	Work experience at EPSS Central	1-5	31	53%
		6-10	26	44%

		11-20	2	3%
		>20	0	0%
		Total	59	100%
6	Important Trainings received	Trained	53	90%
		Not trained	6	10%
		Total	59	100%

Table 4: Respondents' profile

From the overall study participants, male and female account for 47(80%) and 12(20%) respectively, the age of 47 (80%) respondents is between 26 and 35, have acquired BSc/BA 35(59%) followed by MSc/MA 21(36%), working in QMSD 24 (41%) followed by CMD 22 (37%) and TMD 13 (22%), have between 6 and 10 years work experience at EPSS central 26(44%), and received the important trainings for filling the questionnaires 53(90%).

4.3 Procurement lead time reducing practices

Procurement lead time reducing practices are categorized under three procurement lead reducing strategies based on their functions: supply chain integration and strengthening partnerships, procurement processes automation, procurement operations streamlining.

Using Yes or no (binary response), the perception of inbound logistics technical staff was taken to identify practices that EPSS central is using to reduce PLT.

Binary response: 1= Yes, 2=No

4.3.1 Practices of supply chain integration and partnerships strengthening

S/N	Procurement lead time reducing practices	Yes		No		Total		
		N	N %	N	N %	N	μ	δ
1	Sourcing pharmaceuticals from local suppliers	57	96.6%	2	3.4%	59	1.03	0.18
2	Consolidating suppliers according to their location or pharmaceuticals that they supply	39	66.1%	20	33.9%	59	1.34	0.48
3	Providing pre-order summaries of pharmaceuticals forecasts to suppliers	40	67.8%	19	32.2%	59	1.32	0.47
4	Frequently procure (orders in lot or receives partially)	54	91.5%	5	8.5%	59	1.08	0.28

5	Creating an incentive for suppliers with good performance	10	16.9%	49	83.1%	59	1.83	0.38
6	Practicing just in time (JIT) technique	14	23.7%	45	76.3%	59	1.76	0.43
7	Making communication with its suppliers	55	93.2%	4	6.8%	59	1.07	0.25
8	Collaborating horizontally in transport with importers and /or other governmental pharmaceutical distributors	29	49.2%	30	50.8%	59	1.51	0.50
9	Practicing strategic SRM and CRM	36	61.0%	23	39.0%	59	1.39	0.49

μ =mean, δ =standard deviation

Table 5: Supply chain integration and partnerships strengthening practices

Regarding procurement lead time reducing practices that tighten supply chain and strengthen partnerships, the majority of respondents (technical staff of inbound logistics of EPSS central) said that EPSS central sources pharmaceuticals from local suppliers 57(96.6%) at a mean of 1.03, consolidate suppliers according to their location or pharmaceuticals that they supply 39(66.1%) at a mean of 1.34, provide pre-order summaries of pharmaceuticals forecasts to suppliers 40(67.8%) at a mean of 1.32, frequently procure (orders in a lot or receives partially) 54(91.5%) at a mean of 1.08, make communication with its suppliers 55(93.2%) at a mean of 1.07 and practice strategic suppliers' Relationship Management (SRM) and customers' relationship management (CRM) 36(61.0%) at a mean of 1.39. The majority of the technical staff also said that EPSS central doesn't create incentives for suppliers with good performance 49(83.1%) at a mean of 1.83, doesn't practice just in time (JIT) 45(76.3%) at a mean of 1.76, and doesn't collaborate horizontally in transport with importers and/or other governmental pharmaceuticals distributors 30 (50.8%) at a mean of 1.51.

The procurement lead time-reducing practices under this strategy tighten the supply chain and strengthen partnerships to create an integrated supply chain and strong partnerships (Dan , 2021). Based on the results of the analysis of the questionnaires, EPSS central sources from local suppliers, consolidate suppliers according to their location or pharmaceuticals that they supply, provide pre-order summaries of pharmaceuticals forecasts to suppliers, frequently procure (orders in a lot or receives partially), make communication with its suppliers and practice strategic suppliers' relationship management (SRM) and customers' relationship management (CRM) to reduce procurement lead time.

However, EPSS central is not creating incentives for suppliers with good performance, not practice just in time (JIT), and not collaborating horizontally in transport with importers and/or other governmental pharmaceutical distributors. This may be because of a lack of awareness that these practices reduce procurement lead time or financial problems for implementing these practices. But, study conducted by (TERPEND & KRAUSE, 2015) competitive incentives can be an effective approach to improving delivery for purchases where the buyer-supplier relationship is characterized by balanced and moderate amounts of mutual dependence. According to (Waters, 2002) practicing just in time reduces procurement lead time in every company. Collaborating horizontally in transportation with importers and /or other governmental pharmaceuticals distributors also reduces procurement by achieved by means of direct routing and avoiding multi-transshipment routes which reduce the uncertainty and variability by diminishing the number of stages in the transport chain (Ghaderi, et al., 2016).

4.3.2 Procurement processes automation practices

S/N	Procurement lead time reducing practices	Yes		No		Total		
		N	N %	N	N %	N	μ	δ
1	Automating purchase order approval	46	78.0%	13	22.0%	59	1.22	0.42
2	Automating purchase order (PO) process	51	86.4%	8	13.6%	59	1.14	0.35
3	Automating purchase requisition	48	81.4%	11	18.6%	59	1.19	0.39
4	Automating invoice management	31	52.5%	28	47.5%	59	1.47	0.50
5	Automating supplier management	11	18.6%	48	81.4%	59	1.81	0.39
6	Automating contract management	33	55.9%	26	44.1%	59	1.44	0.50
7	Automating inventory management	47	79.7%	12	20.3%	59	1.20	0.41

μ =mean, δ =standard deviation

Table 6: Procurement processes automation practices

As the above table shows procurement processes automated to enhance workflow and order processes were identified by the technical staff of inbound logistics in EPSS central. Accordingly, the majority of the respondents said that EPSS central has an automated purchase order approval system 46 (78.0%) at a mean of 1.22, automated purchase order (PO) process system 51 (86.4%) at a mean of 1.44, automated purchase requisition system 48 (81.4%) at a mean of 1.19, the automated invoice management system 31 (52.5%) at a mean of 1.47, automated contract management system 33 (55.9%) at a mean of 1.44, and

automated inventory management system 47 (79.7%) at mean of 1.20. The majority of respondents said that EPSS Central doesn't have an automated supplier management system 48 (81.4%) at a mean of 1.81.

Automating potential procurement processes streamline the supply chain. According to (Procurement cloud, 2021) purchase order, purchase order approval, purchase requisition, invoice management, suppliers management, contract management, inventory management are procurement processes that need to be automated to reduce procurement lead time. In agreement with the theoretical view, EPSS central has an automated purchase order approval system, purchase order (PO) process system, automated purchase requisition system, automated invoice management system, automated contract management system, and automated inventory management system. But, it doesn't have an automated supplier management system. By automating vendor management process, procurement teams can streamline vendor selection and pick the best vendor available and organizations can quickly identify and resolve grievances to form a better relationship with the vendor (Procurement cloud, 2021).

4.3.3 Procurement operations streamlining practices

S/N	Procurement lead time reducing practices	Yes		No		Total		
		N	N %	N	N %	N	μ	δ
1	Using fast mode of shipment	46	78.0%	13	22.0%	59	1.22	0.42
2	Refining forecasting method	46	78.0%	13	22.0%	59	1.22	0.42
3	Gaining preferential (necessary) resources	43	72.9%	16	27.1%	59	1.27	0.45
4	Practicing strategic suppliers' selection	37	62.7%	22	37.3%	59	1.37	0.49
5	Decomposing procurement lead time and manage each components separately	35	59.3%	24	40.7%	59	1.41	0.50
6	Reducing non-value adding activities	26	44.1%	33	55.9%	59	1.56	0.50
7	Procurement SOP for improving consistency	57	96.6%	2	3.4%	59	1.03	0.18
8	Vertical integration backward and forward	22	37.3%	37	62.7%	59	1.63	0.49
9	Using business management process tool	30	50.8%	29	49.2%	59	1.49	0.50

μ =mean, δ =standard deviation

Table 7: Procurement operations streamlining practices

The following table of the procurement lead time reducing practices that streamline operations from order entry to receiving shows the majority of the technical staff of inbound logistics in believes EPSS central uses fast mode of shipment 46 (78.0%) at a mean of 1.22, refine forecasting method 46 (78.0%) at a mean of 1.22, gain preferential resources 43 (72.9%) at a mean of 1.27, practice strategic suppliers selection 37 (62.7%) at a mean of 1.37, decompose procurement lead time and manage each component separately 35 (59.3%) at a mean f 1.41, have procurement SOP for improving consistency 57 (96.6%) at a mean of 1.03 and use business management process tool 30 (50.8%) at a mean of 1.49. The majority of staff also believes EPSS Central doesn't reduce non-value adding activities 33 (55.9%) at a mean of 1.56, and doesn't have integration backward and forward 37 (62.7%) at a mean of 1.63.

The procurement process can be streamlined by removing manual procedures which take more time and required repetition in several stages (Lahiru & Pradeepa , 2017). EPSS central uses a fast mode of shipment, refines forecasting method, gains preferential resources, practices strategic suppliers selection, decomposes procurement lead time and manages each component separately, has procurement SOP for improving consistency, and uses a business management process tool. However, EPSS Central doesn't reduce non-value adding activities and have no integration backward and forward. But, according to (Samad, et al., January 2013) value stream mapping purpose is to provide optimum value to the customer through a complete value creation process with minimum lead time. The second practices that streamline procurement operations but EPSS is not using vertical integration. But, vertical integration affects operational efficiency as it improves throughput of materials and information along the supply chain resulting in lower lead times and higher delivery performance (Buzzell, 1983).

4.4 Effectiveness of procurement lead time reducing strategies

Using Likert scale of 1-4, the respondents rated the effectiveness of procurement lead time reducing strategies

Degree of effectiveness: **1=ineffective, 2=poorly effective, 3=moderately effective and 4=very effective**

Analysis of Likert scale (mean score) (Rusnani , 2017)

Mean score	Level of effectiveness
0.00–1.50	Very low

1.51–2.50	Low
2.51–3.50	Moderate
3.51–4.50	High



Figure 3: Pie chart of supply chain integration and strengthening partnerships effectiveness by percentage of respondents

The above pie chart shows 50.80% respondents viewed that supply chain integration and strengthening partnerships is poorly effective followed by ineffective 27.10%, moderately effective 20.30% and very effective 1.70% respondents.

Tightening supply chain and strengthening partnerships reduce procurement lead time by creating an integrated supply chain and strong collaborations (Dan , 2021). In EPSS central, the effectiveness of the supply chain integration and strengthening partnerships is poor in reducing procurement lead time. This may be because of lack of implementing supply chain tightening practices (creating incentives for suppliers with good performance, practicing just in time, collaborating also horizontally in transportation with importers and /or other governmental pharmaceuticals distributors) or lack of investments in supply chain integration. This finding confirms the previous study conducted by (Mulgeta, 2017) there are a weak supply chain integration and extended lead time for the services provided to its customers. Even if supplier integration has significant relationship with lead time it doesn't have a significant effect on the company's service lead time. In their study (Trkman & Groznik, 2006) integration is a prerequisite for effective sharing and utilization of information between different companies in the chain. The transfer of

information brings important advantages in process costs and lead-times, while the resulting possibility of smaller and more frequent orders mean reduced inventory costs. (Droge, et al., 2004) Says reducing procurement lead time is possible by means of investments in supply chain integration with local suppliers. In contrast this result, the finding by (Markham & Roy , 2001) the widest degree of arc of integration with both suppliers and customers have the strongest association with performance improvement. A higher level of integration provides better operational performances (also in terms of lead time).

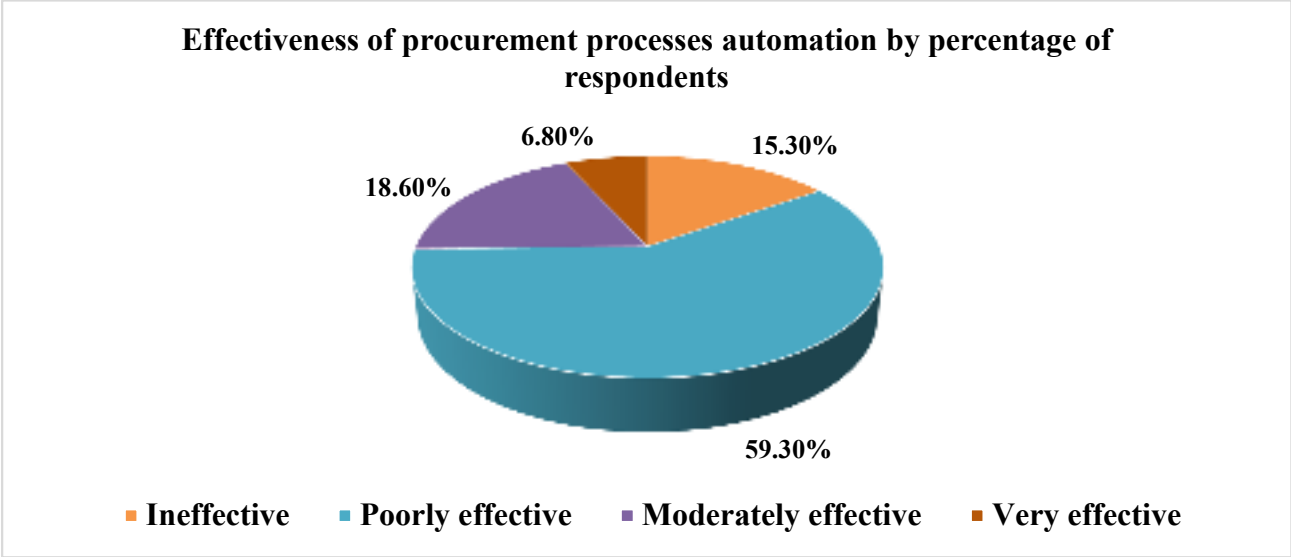


Figure 4: Pie chart of procurement processes automation effectiveness by percentage of respondents

The above pie chart shows 59.30% respondents said that procurement processes automation is poorly effective followed by moderately 18.60%, ineffective 15.30% and very effective 6.80% respondents.

Procurement automation is about automating procurement processes to maximize efficiency and reduce the time taken. It speeds up the procurement process by freeing employees from repetitive and time-intensive tasks (Procurement cloud, 2021). The finding of this study shows automating procurement processes is poorly effective in EPSS central. This may be due to supplier management system is not automated and the challenges of procurement lead time reduction. But, the adoption of information computer technology tools substantially reduce (about 30%) the amount of time required to reach the final customer (Bertolini & Bottani, October 2007)

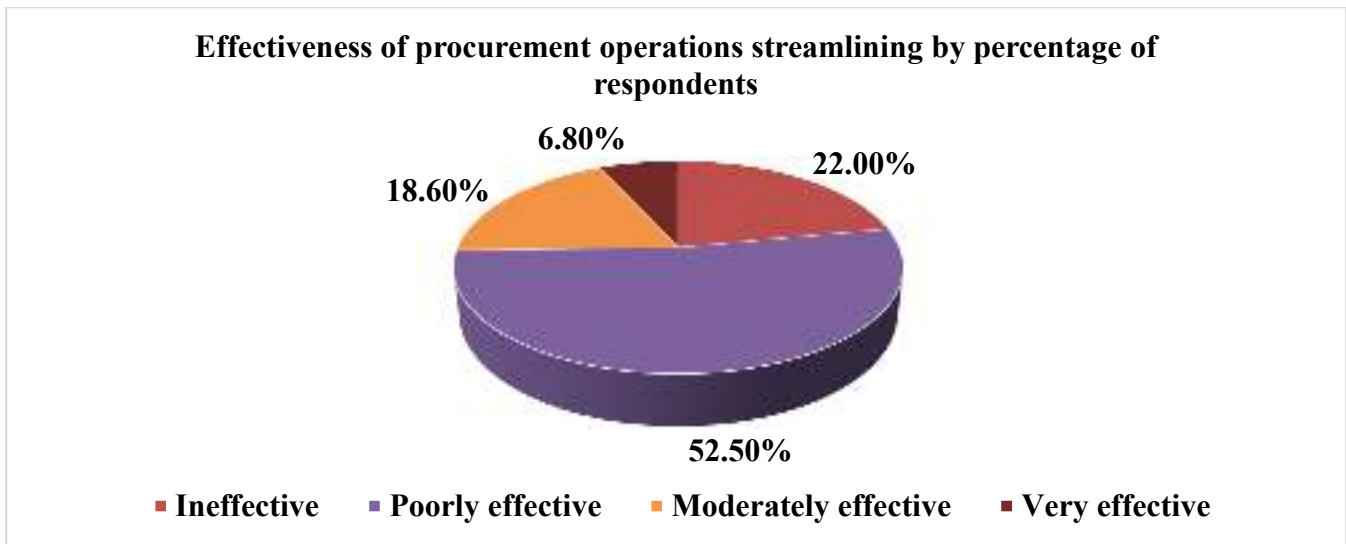


Figure 5: Pie chart of streamlining procurement operations effectiveness by percentage of respondents

The above pie chart shows 52.50% respondents viewed that streamlining procurement operations (from order entry to receiving) is poorly effective followed by 22.00% respondents who said very effective, 18.60% respondents who said moderately effective and 6.80% respondents who viewed it as very effective.

The streamlining of procurement procedures lies in accurately mapping the current processes by identifying the steps needed and the people involved (status quo analysis) (the Minister for the Cabinet Office, 2008). The majority of the respondent said that procurement process streamlining is poorly effective in EPSS central. This may be because of the service doesn't reduce non-value adding activities and have no vertical integration with suppliers and customers. According to the finding of this study, there are high challenges of procurement lead time reduction in EPSS. This may be also the reason of the ineffectiveness of streamlined procurement processes in EPSS. The study conducted by (Jayaratne, 2017) finds that adopting a supplier management system can streamline the procurement process through reduced lead times, quality product and reduced percentage of rejects and reworks. Even though EPSS central manages suppliers' relationship but the supplier management system is not automated. According to (Lahiru & Pradeepa , 2017) the procurement process can be streamlined by removing manual procedures which take more time and required repetition in several stages.

S/ N	Procurement lead time reducing strategies	Total		
		Number of Items	μ	δ
1	Supply chain integration and partnerships strengthening	9	1.97	0.74
2	Procurement process automation	7	2.17	0.77
3	Procurement operations streamlining	9	2.10	0.82

μ =mean, δ =standard deviation

Table 8: Significance of procurement lead time reducing strategies effectiveness

Based on the result of the above table, the supply chain integration and strengthening partnership ($\mu=1.97$, $\delta=0.74$), procurement process automation ($\mu=2.17$, $\delta=0.77$) and also streamlining procurement operations ($\mu=2.10$, $\delta=0.82$) are poorly effective in EPSS central. Based on the mean of the strategies, supply chain integration and strengthening partnerships is significantly poorly effective followed by procurement processes automation and streamlined procurement operations. So, the effectiveness of procurement lead time reducing strategies is poor in EPSS ($\mu=2.08$, $\delta=0.77$)

4.5 The effect of the key procurement lead time reducing practices on procurement lead time

4.5.1 Descriptive analysis

The following tables shows the result of descriptive analysis of number of pharmaceuticals and the variables

S/N	Variables	Outcomes	Count N	Table N %	μ	δ
1	Sourced from local suppliers	No	201	87.8%	0.12	0.33
		Yes	28	12.2%		
		Total	229	100.0%		
2	Frequently procured	No	88	38.4%		
		Yes	141	61.6%		

		Total	229	100.0%	0.62	0.49
3	Purchase order automated	No	36	15.7%		
		Yes	193	84.3%		
		Total	229	100.0%	0.84	0.36
4	Fast mode of shipment used	No	114	49.8%		
		Yes	115	50.2%		
		Total	229	100.0%	0.50	0.50
5	Procurement lead time reduced	No(PL>280 days)	125	54.6%		
		Yes(PLT<280 days)	104	45.4%		
		Total	229	100.0%	0.45	0.50

μ =mean, δ =standard deviation

Table 9: Descriptive analysis of the variables across pharmaceuticals

As the result of descriptive analysis, from 229 sampled pharmaceuticals received in the first semi-annual of 2012, 28(12.2%) at mean of 0.12 were sourced from local suppliers, 141(61.4%) pharmaceuticals at mean of 0.62 were frequently procured, purchase order of 193 (84.3%) pharmaceuticals at a mean of 0.84 were automated and 115 (50.2%) pharmaceuticals were delivered by using fast mode of shipment at a mean of 0.50. The procurement lead time of 104(45.4%) pharmaceuticals were reduced (<280 days) at a mean of 0.45.

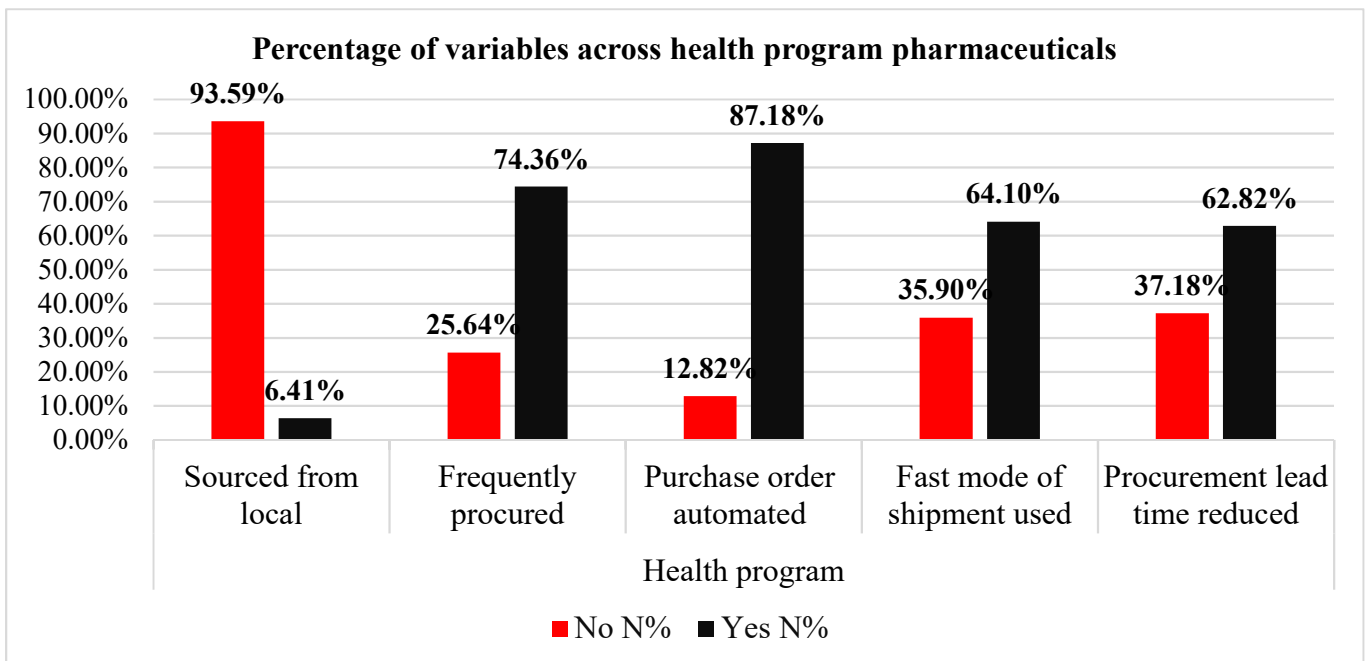


Figure 6: Histogram of percentage of the variables across health programs

As the above bar chart shows 6.41% of health program pharmaceuticals were sourced from local suppliers, 74.36% were frequently procured, purchase orders of 87.18% were automated, for 64.10% fast mode of shipment was used and procurement lead time of 62.82% was reduced (<280 days). But, the following bar chart of RDF indicates 15.23% of them were sourced from local suppliers, 59.60% were frequently procured, purchase order of 82.78% was automated, 42.28% were delivered by fast mode of shipment and only 36.42% had reduced procurement lead time.

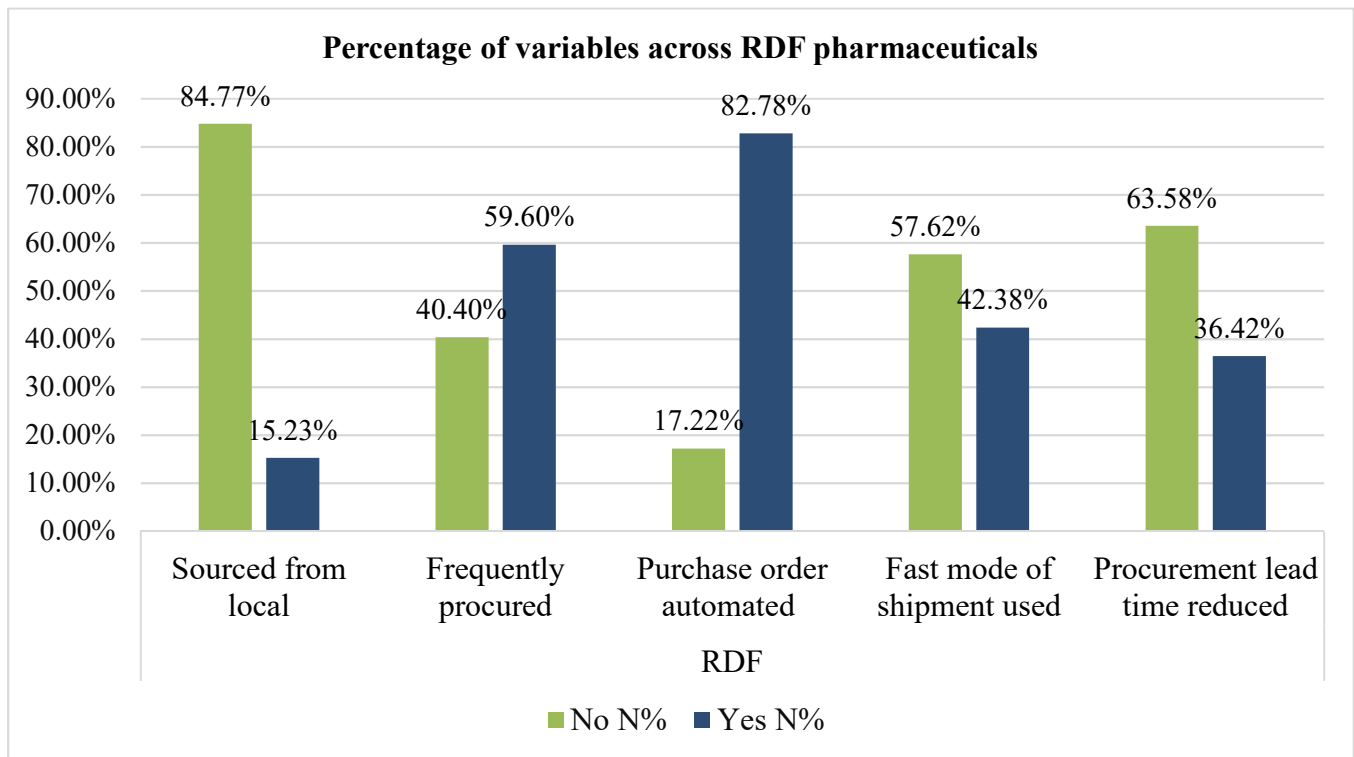


Figure 7: Histogram of percentage of the variables across RDF pharmaceuticals

4.5.2 Logistic Regression

Case Processing Summary

Cases		N	Percent
Selected Cases	Included in Analysis	229	100
	Missing Cases	0	0

	Total	229	100
Unselected Cases		0	0
Total		229	100
If weight is in effect, see the classification table for the total number of cases.			

The case processing summary output table shows there are 229 total sample of with zero missed data.

Dependent Variable Encoding

Original Value	Internal Value
No(PLT>280 days)	0
Yes(PLT<280 days)	1

The dependent variable encoding the coding for the criterion variable, in this case the pharmaceuticals with the reduced procurement lead time (<280 days) is represented by 1 and the pharmaceuticals with procurement not reduced (>280 days) is represented by 0. The preferred choice is the reduced procurement lead time (PLT<280 days) or represented by 1.

Classification Table^{a,b}

Observed			Predicted		
			Procurement lead time reduced		Percentage
			No(PLT>280 days)	Yes(PLT<280 days)	Correct
Step 0	Procurement lead time reduced	No(PL>280 days)	125	0	100.0
		Yes(PLT<280 days)	104	0	0.0
Overall Percentage					54.6

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	97.606	4	0.000
	Block	97.606	4	0.000
	Model	97.606	4	0.000

The omnibus tests of model coefficients are used to test model fit. In this case p-value (0.000) < 0.05 which shows the model is in a good fit as compared to a null model. So, this model significantly fits the data.

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	217.927 ^a	0.347	0.464

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

The nagelkerke R-square (R^2) adjusts the scale of the static to cover the full range from 0 to 1. In this case, 46.4% change in dependent variable (procurement lead time) can be accounted to the independent variables (sourcing from local, frequently procuring, automating purchase order and using fast mode of shipment). In other word, the key procurement lead time reducing practices share 46.4% of the effects of all procurement lead time reducing practices have on procurement lead time reduction.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	8.755	6	0.188

Hosmer and lemeshow test is also a test of model fit. The Hosmer-Lemeshow statistic indicates a good fit of p is greater than 0.05. Here, P (0.188) > 0.05 which shows the model adequately fits the data.

Contingency Table for Hosmer and Lemeshow Test

		Procurement lead time reduced = No(PL>280 days)		Procurement lead time reduced = Yes(PLT<280 days)		Total
		Observed	Expected	Observed	Expected	
Step 1	1	10	11.637	2	0.363	12
	2	27	26.253	1	1.747	28
	3	8	8.262	1	0.738	9
	4	33	31.923	5	6.077	38
	5	18	17.295	13	13.705	31
	6	13	14.594	23	21.406	36
	7	2	1.684	3	3.316	5
	8	14	13.353	56	56.647	70

From the above table of contingency for Hosmer and Lemeshow test, there is no difference between the observed and expected model. Both values are approximately equal. This also shows the model adequately fits the data.

The classification table

		Procurement lead time reduced		Percentage Correct
		No(PL>280 days)	Yes(PLT<280 days)	
Step 1	Procurement lead time reduced	No(PL>280 days)	90	72.0
		Yes(PLT<280 days)	10	90.4
Overall Percentage				80.3

a. The cut value is .500

The classification table shows how the model is able to predict the correct category once the predictors are added into the study. We can compare this with classification table under block 0, to see how much improvement there is when independent variables are included in the model. The model correctly classified 80.3% cases overall (sometimes referred to as the percentage accuracy in classification: PAC). In other words, this is rate of correct classification if we always predict that the key procurement lead time reducing practices would reduce procurement lead time by using this model, we are correct by 80.3%.

The sensitivity of the model is 90.4% and the specificity of the model is 72.0%. The overall the accuracy rate was very good, at 80.3%. The model exhibits good sensitivity since among items received in the first semi-annual of 2012 whose procurement lead time will be reduced over whose procurement will not be reduced, 90.4% were correctly predicted to have reduced procurement lead time based on the model.

	<i>Procurement lead time reduced?</i>		<i>Crude OR(95% CI)</i>	<i>P</i>	<i>Adjusted OR (95% CI)</i>	<i>P</i>
	No (PLT >280 days)	Yes(PLT <280 days)				
<i>Sourced from local suppliers?(N=229)</i>			1.048(0.474-2.315)	0.908	NS	NS
<i>No</i>	110(54.7%)	91(45.30%)				
<i>Yes</i>	15(53%)	13(46.40)				
<i>Frequently procured?(N=229)</i>			2.718(1.550-4.765)	0.000	3.237(1.647-6.363)	0.001*
<i>No</i>	61(69.3%)	27(30.7%)				
<i>Yes</i>	64(45.4%)	77(54.6%)				
<i>Purchase order automated?(N=229)</i>			3.464(1.503-7.983)	0.004	2.124(0.782-5.774)	0.140
<i>No</i>	28(77.8%)	8(22.2%)				
<i>Yes</i>	97(50.3%)	96(49.7%)				
<i>Fast mode of shipment used?(N=229)</i>			11.487(6.149-21.459)	0.000	12.488(6.473-24.094)	0.000*
<i>No</i>	93(81.60%)	21(18.40%)				
<i>Yes</i>	32(27.80%)	83(72.20%)				

OR=Odd ratio, CI=Confidence interval, *=P<0.05, NS=Non significant in crude model

Table 10 Bivariate and Multivariate Analysis to examine the effect of the key practices on procurement lead time in EPSS Central

Sourcing from local supplier is excluded because it is insignificant in bivariate model analysis

Multivariate Analysis

		Variables in the Equation					Exp(B)	95% C.I. for EXP(B)	
		B	S.E.	Wald	df	Sig.		Lower	Upper
Step 1 ^a	Frequently procured (1)	1.134	.348	10.591	1	.001	3.108	1.570	6.152
	Purchase order automated(1)	.753	.510	2.181	1	.140	2.124	.782	5.774
	Fast mode of shipment used(1)	2.469	.338	53.425	1	.000	11.809	6.091	22.893
	Constant	-2.873	.565	25.826	1	.000	.057		
Step 2 ^a	Frequently procured (1)	1.175	.345	11.600	1	.001	3.237	1.647	6.363
	Fast mode of shipment used(1)	2.525	.335	56.701	1	.000	12.488	6.473	24.094
	Constant	-2.272	.358	40.272	1	.000	.103		

a. Variable(s) entered on step 1: Frequently procured, Purchase order automated, Fast mode of shipment used.

The above tables show the association between dependent variable (procurement lead time) and independent variables (the key procurement lead time reducing practices). B (beta) is the predicted change in Log odds- for 1 unit change in independent variables, there is Exp(B) which the strength of association variables.

In bivariate model, the p-value of sourcing from local supplier is 0.0908 which is greater than 0.05 and its odd ratio is 1.048(~1). This shows sourcing from local suppliers has no association with procurement lead time. This variable is not candidate for multivariate analysis. Sourcing from local suppliers has no significant positive effect on procurement lead time. So, the null hypothesis is accepted.

The p-value of frequently procuring is 0.000 which is less than 0.05, and odd ratio is 2.718 which is greater than 1. This shows this practice is significant and has positive association with procurement lead time reduction so that the variable is candidate for multivariate analysis. In multivariate model, the p-value of

frequently procuring is 0.001 which is less than 0.05 and its odds ratio is 3.237 which is greater than 1. So, it is a significant and has a positive association with procurement lead time reduction. The probability of procurement lead time falls to less than 280 days (<280 days) is 3.237 by this practice. So, frequently procuring has a significant positive effect on procurement lead time in EPSS central. Therefore, the null hypothesis is rejected.

In bivariate analysis, the p-value of automated purchase order is 0.004 which is less than 0.05, and odd ratio is 3.464 which is greater than 1. This shows the variable is a significant and has association with procurement lead time reduction so that it is candidate for multivariate analysis. But in multivariate model, the p-value of automated purchase is 0.140 which is greater than 0.05 and its odds ratio is 2.124 which is greater than 1. This shows this practice is not significant and has weak association with procurement lead time reduction. The probability of procurement lead time falls less than 280 days (<280 days) by automated is 2.124. So, automating purchase order has no a significant positive effect on procurement lead time in EPSS central. So, the null hypothesis is rejected.

In bivariate analysis, the p-value of using fast mode of shipment is 0.000 which is less than 0.05, and odd ratio is 11.487 which is greater than 1. This shows this variable is significant and has positive association with procurement lead time reduction so that it is candidate for multivariate analysis. In multivariate model, the p-value of using fast mode of shipment is 0.000 which is less than 0.05 and its odds ratio is 12.488 which is greater than 1. This shows this practice is significant and has a positive association with procurement lead time reduction. The probability of procurement lead time falls less than 280 days (<280 days) by using fast mode of shipment is 12.488. Using fast mode of shipment has a significant positive effect on procurement lead time in EPSS central. So, the null hypothesis is rejected.

Generally, the p-value of the key procurement lead time reducing practice is 0.000 which is less than 0.05 and the constant is -2.272. This shows the sample data provides sufficient evidence that these practices have a significant effect on procurement lead time. Without these practices the procurement lead time reduction drops by -2.272.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

- $Y = \ln\left(\frac{P_i}{1-P_i}\right)$, pi=probability, β_0 =constant

- β_1 = coefficient of sourced from local suppliers
- X_1 =number of sourced from local suppliers
- β_2 =coefficient of frequently procured
- X_2 =number of frequently procured
- β_3 =coefficient of automated POs
- X_3 =number of automated POs
- β_4 =coefficient of used fast mode of shipment
- X_4 =number of used fast mode of shipment

So, based on the output of the above table of variables in equation

$$Y = -2.275 + X_1 + 1.175X_2 + 0.753X_3 + 2.525X_4$$

Among 229 pharmaceuticals received in first semi-annual of 2012, only 12.2% were sourced from local suppliers. This finding is lower than the finding of the study conducted by (Gebeyaw, February 2020) regarding the extent of manufacturers' market share, 24% of the medicines are supplied by the domestic manufacturers and 25% targeted by (FMOH and MOI, 2015). Regarding the effect of sourcing from local suppliers on procurement lead time; this study found that sourcing from local suppliers has no a significant positive association with procurement lead time reduction. This result disagrees with study conducted by (Golini & Kalchschmidt, 2009) which states sourcing from local can improve delivery lead time by allowing companies to invest in JIT with suppliers. Similarly, (Dan , 2021) domestic suppliers based stateside can automatically reduce your lead time by two weeks or more.

Regarding frequent procurement, 61.6% of pharmaceuticals were either frequently received or ordered in the lot. Most of the pharmaceuticals were health programs 74.36%. The technical staff also agreed EPSS central uses frequent procurement to reduce procurement lead time. This practice reduces both the variability and length of procurement lead time (Godinho Filho & Ribeiro Utiyama, 2016). Frequently procuring has a significant positive effect on procurement lead time. According to (Britannica , n.d.) Placing frequent orders for small quantities creates less of a bullwhip effect than placing larger orders less frequently. Minimizing lot size reduces procurement lead time (Christoph, 2012).

Among 229 pharmaceuticals received in the first 6 months of 2012, purchase order of 84.3% pharmaceuticals were automated and any information is followed by the purchase order. Regarding its

significance, this study found that automating purchase order has no significant positive effect on procurement lead time in EPSS central. This may be because of challenges of procurement lead time and/or EPSS central may use it for information management than for reducing procurement lead time. But, this practice reduces both variances and length of lead time (Godinho Filho & Ribeiro Utiyama, 2016). The adoption of information computer technology tools substantially reduce (about 30%) the amount of time required to reach the final customer (Bertolini & Bottani, October 2007).

From 229 samples, 50.2% of pharmaceuticals were transported by fast mode of shipment. Even though this finding is lower it agrees with finding of study conducted (Gebeyaw, February 2020) which found that air (63%) is the major means of transportations to ship medicines in crossing Ethiopian border. In this study, using fast mode of shipment has a significant positive relationship with procurement lead time reduction. This finding also agrees with finding by (THANGSAMPAN, 2017) air freight is a better transportation mode than sea freight for long distance delivery, even though the probability is less which is 3.00.

4.6 The challenges of procurement lead time reduction in EPSS central

Using four point Likert scale, the respondents showed their perception on the challenges of procurement lead time reduction

Level of agreement: **1=strongly disagree, 2=disagree, 3=agree and 4=strongly agree**

Four point Likert scale (Jonald , 2019)

Likert Scale	Interval	Difference	Description
1	1.00-1.75	0.75	Not much
2	1.76-2.51	0.75	A little
3	2.52-3.27	0.75	Some
4	3.28-4.00	0.72	A lot

The following table shows degree of agreement of the technical staff of inbound logistics in EPSS central.

S/ N		Strongly disagree		Disagree		Agree		Strongly agree		Total	
		N	N %	N	N %	N	N %	N	N %	μ	δ
1	The lack of adequate financial support to the procurement process	6	10.2%	7	11.9%	22	37.3%	24	40.7%	3.08	0.97
2	The lack of Legal and top leadership influence	4	6.8%	14	23.7%	16	27.1%	25	42.4%	3.05	0.97
3	Staff incapacity	5	8.5%	10	16.9%	26	44.1%	18	30.5%	2.97	0.91
4	Socio-political factors	4	6.8%	12	20.3%	19	32.2%	24	40.7%	3.07	0.94
5	Natural disasters	5	8.5%	15	25.4%	20	33.9%	19	32.2%	2.90	0.96
6	Human errors	2	3.4%	12	20.3%	30	50.8%	15	25.4%	2.98	0.78
7	Inefficient inventory management systems	4	6.8%	4	6.8%	21	35.6%	30	50.8%	3.31	0.88
8	The inefficacy of the supply chain and port facility	6	10.2%	9	15.3%	19	32.2%	25	42.4%	3.07	1.00
9	Incomplete specifications	4	6.8%	8	13.6%	25	42.4%	22	37.3%	3.10	0.88
10	A lack of order release mechanisms	5	8.5%	11	18.6%	30	50.8%	13	22.0%	2.86	0.86
11	Imprecise forecasting	6	10.2%	8	13.6%	23	39.0%	22	37.3%	3.03	0.96
12	Absence of supplier monitoring techniques	6	10.2%	4	6.8%	16	27.1%	33	55.9%	3.29	0.98

μ =mean, δ =standard deviation

Table 11: Challenges of procurement lead time reduction

From the listed challenges that negatively affect procurement lead time reduction in EPSS central, the majority of the respondents strongly agreed that inefficient inventory management systems 30 (50.8%) at

a mean of 3.31, and the absence of supplier monitoring techniques 33(55.9%) at a mean of 3.29 negatively affect procurement lead time reduction.

The majority of the respondents also agreed that the lack of adequate financial support to the procurement process 24 (40.7%) at mean of 3.08, the lack of Legal and top leadership influence 15(42.4%) at mean of 3.05, socio-political factors 24(40.7%) at mean of 3.07 the staff incapacity 26(44.1%) at a mean of 2.97, natural disasters 20(33.9%) at a mean of 2.90, the inefficacy of the supply chain and port facility 25 (42.4%) at a mean of 3.07,incomplete specifications 25(42.4%) at a mean of 3.10, a lack of order release mechanisms 30(50.8%) a mean of 2.86, and an imprecise forecasting 23(39.0%) at a mean of 3.03 negatively affect procurement lead time reduction.

All challenges identified by different studies also negatively affect procurement lead time reduction in EPSS central. This study agrees with finding by (Igosangwa, 2014) which stated that the lack of adequate financial support to the procurement process, legal and top leadership influence, staff incapacity and socio-political factors, inadequate financing to the procurement process is a common problem across the firms and the resultant under budgeting affects the lead time management of the firm. But, staff incapacity is not strongly agreed by respondents in this study. According to (KENTON, 2020) the common causes of shipping obstructions and lead time delays include: natural disasters, human error, raw material shortages, and inefficient inventory management systems. This causes also identified as the common challenges of procurement lead time in EPSS. In agreement with finding by (Kader, 2014)the inefficacy of the supply chain and port facility is found as a main challenge of procurement lead time reduction in EPSS central. Incomplete specifications are the main reasons for long lead times to develop alternative suppliers (Alexandre, et al., 2016). In addition to incomplete specification, five possible causes with regard to long lead-times and high variability, of which four are a lack of order release mechanisms, imprecise forecasting, absence of supplier monitoring techniques and low significance for strategic suppliers (Nijkamp, May 29, 2012).

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Procurement lead time reduction is the important strategic objective in EPSS central to increase the availability of pharmaceuticals for public health facilities. But, there are no clear practices and strategies to reduce procurement lead time. The challenges of procurement lead time reduction also needs clarity even though the service tries to identify and minimize them. The effect of the key procurement lead time-reducing practices that reduce the variability and length of procurement lead time needs to be examined in terms of their significances. This study was designed to fill these gaps using a quantitative and qualitative approach.

This study found that EPSS uses seven practices to tighten the supply chain and strengthening partnerships to reduce procurement lead time by making the supply chain integrated and partnerships strong. But, this strategy is poorly effective in EPSS central. This may be because of the service does not create incentives for suppliers with good performances, not practice just in time, and not have horizontal collaboration in transport. In addition to that there are high challenges to PLT reduction.

EPSS has automated potential procurement processes to reduce procurement lead time except the supplier management system. But, the effectiveness of the automation strategy is poor in reducing procurement lead time. Challenges of procurement lead time reduction and manual supplier management practices likely have contributed to the poor effectiveness of the procurement process automation.

Regarding to the practices that streamline procurement operations (from order entry to receiving), EPSS uses seven practices. But, this study found that it doesn't have the practices of reducing non-value-adding activities and vertical integration. In addition to the challenges, this may be reason of poor effectiveness of procurement operations streamlining.

This study examined the effect of the procurement lead time reducing practices which potentially reduce both the variability and length of procurement lead time simultaneously. EPSS central source pharmaceutical from local suppliers, use air transport widely, and frequently procure and automates purchase orders. Frequently procuring, and using a fast mode of shipment have a significant positive effect

on procurement lead time but sourcing from local suppliers, and automating purchase order have no significant positive effect on procurement lead time.

From the listed challenges that negatively affect procurement lead time reduction, the technical staff strongly agreed on the lack of adequate financial support for the procurement process, the lack of Legal and top leadership influence, socio-political factors, Inefficient inventory management systems, the inefficacy of the supply chain and port facility, the absence of supplier monitoring techniques and agreed on the staff incapacity, natural disasters, incomplete specifications, a lack of order release mechanisms, and imprecise forecasting also negatively affect procurement lead time reduction. In other term, all challenges negatively affect procurement lead time reduction.

5.2 RECOMMENDATION

Procurement lead time reduction needs the practices to be implemented and challenges to be minimized. It was found that EPSS central uses procurement lead time-reducing practices to tighten its supply chain and strengthen partnerships, automate its procurement process and streamline its procurement operations. This study also found all procurement lead time reducing strategies are poorly effective. Sourcing from local suppliers and automating purchase orders have an insignificant positive effect but frequent procuring and using fast mode of shipment have a significant positive effect on procurement lead time. All challenges identified by reviewing literatures are also challenges of procurement lead time reduction in EPSS. Based on these findings and limitations of the study, the following recommendations are forwarded for EPSS and further studies.

1. EPSS central

- Should practice just in time (JIT) to tighten its supply chain and reduce procurement lead time
- Should create incentives for suppliers with good performance and collaborate horizontally in transport with importers and/or other governmental pharmaceutical distributors to strengthen partnerships
- Could increase the effectiveness of the automation system or bring all procurement processes onto an automated platform by automating supplier management.
- Should create vertical integration with public health facilities and suppliers to streamline its supply chain operations to reduce procurement lead time
- In addition to that, it should reduce non-value-adding activities by understanding and simplifying its current supply chain operation, especially the procurement process

- Should focus on minimizing the challenges of procurement lead time reduction to maximize the effect of the practices and strategies

2. Further studies

- The effect of other procurement lead time reducing practices on procurement lead time should be conducted to design interventions on maximizing their effects
- The reason of automating purchase order and sourcing from local suppliers have no significant effect on procurement lead time should be investigated
- Cost-benefit analysis should be done for the practices that have a significant positive effect on procurement lead time
- Further studies should be done on the impact of the strategies and practices on procurement considering the factors affecting lead time (quality of service and cost)
- Direct procurement should be treated differently to examine the impact of procurement lead time reducing practices and strategies
- Any further study should be conducted to examine the magnitude of the impact of procurement lead time reduction challenges in EPSS.

Limitations and suggestions for future research directions

Even though the quality of service has an impact on the length and variability of procurement lead time, this study didn't consider the impact of suppliers' and stakeholders' service quality on procurement lead time. The effect of procurement lead time reducing practices was not conducted from a cost perspective. This indicates the cost-benefit analysis should be conducted for the practices which have a significant effect on procurement lead time.

This study considered the procurement method that EPSS uses is only international and national competitive bidding (ICB and NCB). Direct procurement was not treated differently. EPSS doesn't use this procurement method because it is legally prohibited except in special cases. Any further research conducted on procurement lead time should treat direct procurement differently since the procurement lead time is short and the cost is high.

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Annex

Annex 1. Work Plan for the study

Table 1. Work plan for the study on Assessment of procurement lead time reducing practices and challenges in EPSS head office, Addis Ababa, Ethiopia 2021-2022

No.	Tasks to be Performed	Period(2021/22)	Responsible body	Time Required
1	Research topic selection	August, 2021	PI	
2	Research Proposal development	September – October,2021	PI	30 days
3	Presentation of first draft of the proposal for comment	November, 2021	PI, Advisor, Department	1 day
4	Finalizing research proposal and submission	November,2021	PI	5days
5	Defense of research proposal	November,2021	PI, Advisors, Department	1 day
6	Correcting and final submission of proposal	Dec 02-Oct 03	PI	2 days
7	Approval of the proposal, and Securing ethical clearance	Dec 04-Oct 07	Advisors, PI, Ethical committee of SOP	4 days
8	Securing fund and preparation of data collection instrument	De 08– Nov 13	AAU, potential funders, PI	5 days
9	Recruitment and training of data collectors	De 14- Dec 19	PI	5 days
10	review data collection instrument and duplication of materials	Dec 20– Dec 24	PI	4 days
11	Data collection	Dec 25 – March 25	Data collectors + PI	60 days
12	Data entry and cleaning	Mar 26-Apr14	PI	18 days
13	Data analysis and write up	Apr 15-Jun 10	PI	50 days

14	Submission of first draft of the thesis report to advisor for comment	Jun 11	PI	1day
15	Feedback or comment		Advisor	
16	Inclusion of feedback and comments	Jun 17 – July 07	PI	30 days
17	Submission of second draft of report to advisor for comment	July 08	PI	1 day
18	Feedback or comment		Advisor	
19	Accommodation of the comments	July 09- September 19	PI	70 days
20	Submission of final report	After September 20	PI	
21	Defense		PI	

Annex 2. Budget Estimate and Breakdown

Table 2: Budget break down for the study on Assessment of procurement lead time reducing practices and challenges in EPSS central, Addis Ababa, Ethiopia 2020/2021

Budget category	Unit cost (birr)	Multiplying factor	Total cost (Birr)
1. Personnel	Daily wage	(No. of personnel X No. of Working Days)	
Data collectors	300	6x15	27000
Supervisor	300	2x 7	4200
Subtotal (1)		31200	
2. Supplies	Cost per item	Number	Total cost

Questionnaire & tool duplication	2 birr/page	100	200
Pen	6.00 birr	15	90
Pencil	2.00 birr	15	30
Notebook	20.00 birr	15	300
Flash (USB) 8 GB	400	1	400
Telephone / mob card	100	15	1500
Internet subscription	400	3	1200
Printing & binding	300	5	1500
Subtotal (2)			5220
3. Training and refreshment	Cost per item	Number of person – work days	Total cost (in birr)
Refreshment	75 birr/person/day	8 x 2	1200
Per dime	250 birr per day /person	8 x 2	4800
Subtotal (3)			6000
4. Transport	Unit cost	Multiplied factor	Total cost
Traveling expense (2 way)	3birr/km	30days x 50km/day	4500

Subtotal (4)		4500
Total	Subtotals (1+2+3+4)	46920
Contingency (5%)	5% of the total cost	2346
Grand total	Total + Contingency	49266

Annex 3. Questionnaires

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCE
SCHOOL OF PHARMACY
DEPARTMENT OF PHARMACEUTICS AND SOCIAL PHARMACY

Dear respondents:

I am a graduate student at Addis Ababa University College of health science, school of pharmacy. Currently, I am conducting research entitled '**Procurement lead time reducing practices and challenges: In case of Ethiopian pharmaceutical supply service (EPSS) Central**' as a partial requirement for the award of Masters of Science Degree in Health Supply Chain Management. The purpose of this questionnaire is to gather data for the proposed study, and hence you are kindly requested to assist in the successful completion of the study by providing the necessary information. Your participation is entirely voluntary and the questionnaire is completely anonymous. I confirm that the information you share will stay confidential and only be used for the aforementioned academic purpose, thus not affecting you in any way. So, your genuine, frank, and timely response is vital for the success of the study

Any additional suggestion is appreciated

If you have any queries, please do not hesitate to connect me at the address below

Name: Biyensa Negera

AAU, School of Pharmacy MSc, Health Supply Chain Management

Mobile: 0922248424 E-mail: biyanaga2484@gmail.com

I want to thank you in advance for your kind cooperation and dedication of your precious time to fill this questionnaire.

Sincerely yours,

Biyensa Negera

Section 1: Respondent’s Profile

Please tick (✓) in the appropriate box, no need of writing your name

- 1.1 Gender: 1. Male 2. Female
- 1.2 Age: 1. 18-25 years 2. 26-35 years 3. 36-45 years 4. Above 45 years
- 1.3 Highest level of education: 1. Diploma 2. BSc/BA 3. MSc/MA 4. PhD 5. Others: please specify it _____
- 1.4 Directorate currently working in: 1. QMSD 2. TMD 3. CMD
- 1.5 Your work experience at your current position: 1. 1-5 years 2. 6-10 3. 11-20 years 4. Above 20 years
- 1.6 Trainings: 1. Supply chain management 2. Key Performance Indicators 3. Lead time management 4. Others important training for this study, _____

Section 2: Questionnaires to identify procurement lead time reducing practices which EPSS central is using

After you read the questions, please tick (✓) using two points Likert scale 1 = Yes and 2 = No

1. Practices of supply chain integration and partnerships strengthening			
	Procurement lead time reducing practices	1	2
1.1	Does Ethiopian pharmaceutical supply service source pharmaceuticals from local suppliers?		
1.2	Does Ethiopian pharmaceutical supply service consolidate suppliers according to their location or pharmaceuticals they supply?		
1.3	Does Ethiopian pharmaceutical supply service provide pre-order summaries of pharmaceuticals forecasts to suppliers?		
1.4	Does Ethiopian pharmaceutical supply service frequently procure (orders in lot or receives partially)?		

1.5	Does Ethiopian pharmaceutical supply service create an incentive for suppliers with good performance?		
1.6	Does Ethiopian pharmaceutical supply service practice just in time (JIT) technique?		
1.7	Does Ethiopian pharmaceutical supply service make communication with its suppliers?		
1.8	Does Ethiopian pharmaceutical supply service horizontally collaborate in transport with importers and /or other governmental pharmaceutical distributors?		
1.9	Does Ethiopian pharmaceutical supply service practice strategic suppliers' relationship Management (SRM) and customers' relationship management (CRM)?		
Practices of procurement processes automation			
2.1	Does Ethiopian pharmaceutical supply service have automated purchase order approval?		
2.2	Does Ethiopian pharmaceutical supply service have automated purchase requisitions?		
2.3	Does Ethiopian pharmaceutical supply service have automated invoice management?		
2.4	Does Ethiopian pharmaceutical supply service have automated contract approval?		
2.5	Does Ethiopian pharmaceutical supply service have automated inventory management?		
Practices of procurement operations streamlining			
3.1	Does Ethiopian pharmaceutical supply service use fast mode of shipment?		

3.2	Does Ethiopian pharmaceutical supply service refine forecasting method?		
3.3	Does Ethiopian pharmaceutical supply service gain preferential (necessary) resources?		
3.4	Does Ethiopian pharmaceutical supply service practice strategic suppliers' selection?		
3.5	Does Ethiopian pharmaceutical supply service decompose procurement lead time and manage each component separately?		
3.6	Does Ethiopian pharmaceutical supply service reduce non-value added activities?		
3.7	Does Ethiopian pharmaceutical supply service have procurement SOP for improving consistency?		
3.8	Does Ethiopian pharmaceutical supply service have vertical integration backward and forward?		
3.9	Does Ethiopian pharmaceutical supply service use business management process tool?		

Section 3: Questionnaires to examine the effectiveness of procurement lead time reducing strategies in reducing procurement lead time in EPSS central

3.1 Where do you place the current average procurement lead time of EPSS central? (please encircle your choice)

1. < 110 days 2. 110-160 days 3. 160-280 days 4. >280 days

3.2 After you read the statement, please rate the effectiveness of procurement lead time reducing practices in reducing procurement lead time (PLT) using the degree of effectiveness (**only those you have said “Yes” in the section 1**)

Please tick (✓) under:

- **4= very effective** (if the practice reduces the PLT to <110 days in EPSS)

- **3= moderately effective** (if the practice reduces the PLT to **110-160 days** in EPSS)
- **2= poorly effective** (if the practice reduces PLT to **160-280 days** in EPSS)
- **1= Ineffective** if the practice does not reduce PLT (**>280 days**) in EPSS

1. Supply chain integration and partnerships strengthening					
	Procurement lead time reducing practices	4	3	2	1
1.1	Sourcing from local suppliers reduces procurement lead time in Ethiopian pharmaceuticals supply service				
1.2	Consolidating suppliers according to their location or pharmaceuticals that they supply reduces procurement lead time in Ethiopian pharmaceuticals supply service				
1.3	Providing pre-order summaries of forecasts to suppliers reduces procurement lead time in Ethiopian pharmaceuticals supply service				
1.4	Procuring frequently (ordering in lot or partially receiving) reduces procurement lead time in Ethiopian pharmaceuticals supply service				
1.5	Creating an incentive for suppliers which have good performance reduces procurement lead time in Ethiopian pharmaceuticals supply service				
1.6	Practicing just in time (JIT) technique reduces procurement lead time in Ethiopian pharmaceuticals supply service				
1.7	Making communication with suppliers reduces procurement lead time in Ethiopian pharmaceuticals supply service				

1.8	Horizontal collaboration in transport with importers and /or other governmental pharmaceutical distributors reduces procurement lead time in Ethiopian pharmaceuticals supply service				
1.9	Practicing strategic suppliers' relationship Management (SRM) and customers' relationship management (CRM) reduces procurement lead time in Ethiopian pharmaceuticals supply service				
Procurement processes automation					
2.1	Automated purchase order approval reduces procurement lead time in Ethiopian pharmaceuticals supply service				
2.2	Automated purchase order process reduces procurement lead time in Ethiopian pharmaceuticals supply service				
2.3	Automated purchase requisitions reduces procurement lead time in Ethiopian pharmaceuticals supply service				
2.4	Automated invoice management reduces procurement lead time in Ethiopian pharmaceuticals supply service				
2.5	Automated suppliers management reduces procurement lead time in Ethiopian pharmaceuticals supply service				
2.6	Automated contract management reduces procurement lead time in Ethiopian pharmaceuticals supply service				
2.7	Automated inventory management reduces procurement lead time in Ethiopian pharmaceuticals supply service				
Procurement operations streamlining					
3.1	Using fast mode of shipment reduces procurement lead time in Ethiopian pharmaceuticals supply service				

3.2	Refining forecasting method reduces procurement lead time in Ethiopian pharmaceuticals supply service				
3.3	Gaining preferential (necessary) resources reduces procurement lead time in Ethiopian pharmaceuticals supply service				
3.4	Practicing strategic suppliers' selection reduces procurement lead time in Ethiopian pharmaceuticals supply service				
3.5	Decomposing procurement lead time and manage each components separately reduces procurement lead time in Ethiopian pharmaceuticals supply service				
3.6	Reducing non-value added activities reduces procurement lead time in Ethiopian pharmaceuticals supply service				
3.7	Procurement SOP for improving consistency reduces procurement lead time in Ethiopian pharmaceuticals supply service				
3.8	Vertical integration backward and forward reduces procurement lead time in Ethiopian pharmaceuticals supply service				
3.9	Using business management process tool reduces procurement lead time in Ethiopian pharmaceuticals supply service				

Section 4: Questionnaires to identify challenges of procurement lead time reduction in EPSS central

Please indicate your level of agreement using a four-point Likert scale using a tick mark (✓) where 1 =strongly disagree, 2=disagree, 3=agree and 4=strongly agree

	Challenges of procurement lead time reduction	1	2	3	4
1	The lack of adequate financial support to the procurement process negatively affects procurement lead time in Ethiopian pharmaceuticals supply service				
2	The lack of Legal and top leadership influence negatively affects procurement lead time in Ethiopian pharmaceuticals supply service				
3	Staff incapacity negatively affects procurement lead time in Ethiopian pharmaceuticals supply service				
4	Socio-political factors negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
5	Natural disasters negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
6	Human errors negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
7	Inefficient inventory management systems negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
8	The inefficacy of the supply chain and port facility negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
9	Incomplete specifications negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
10	A lack of order release mechanisms negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
11	Imprecise forecasting negatively affects procurement lead time in Ethiopian pharmaceuticals supply service				

12	Absence of supplier monitoring techniques negatively affect procurement lead time in Ethiopian pharmaceuticals supply service				
13	Low significance for strategic suppliers negatively affects procurement lead time in Ethiopian pharmaceuticals supply service				

Annex 4: Data collection tool

The effect of key procurement lead time reducing practices on procurement lead time will be measured by collecting data of pharmaceuticals procured in the first semiannual of 2012 E.C (01/01/12-30/06/12). Since the number of study subjects is very large, the table shows only some serial number of 229 samples.

S/N	Item	Unit	Lead time reducing practices								Recei ved date (dys)	Order date (dys)	PLT= received date – request date	PLT <280 days = Yes, If PLT > 280 days=No,	
			Sourced from local suppliers?		Fast mode of shipment used?		Purchase order automated?		Frequently purchased?					Y es	No
			Yes	No	Yes	No	Yes	No	Yes	No					
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
.															
.															
229															