



**UNIVERSITY of
RWANDA**

**EFFECT OF CYCLE TIME AND SUPPLIER LEAD TIME ON TIMELY
PROCUREMENT OF MEDICINES IN TANZANIA: A CASE STUDY OF THE
MEDICAL STORES DEPARTMENT**

by

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A dissertation submitted to the College of Medicine and Health Sciences School of Public Health EAC Center of Excellence for Vaccines, Immunization and Health Supply Chain Management, University of Rwanda in partial fulfilment of the requirements for the degree of Master of Science in Health Supply Chain Management (MSc HSCM)

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JULY 2023

DECLARATION

I, **Faith Edmin**, hereby declare that this dissertation titled ***“Effect of cycle time and supplier lead time on timely procurement of medicines in Tanzania: A case study of the Medical Stores Department”*** has been written by me without any external unauthorized help, that it has been neither presented to any institution for evaluation nor previously published in its entirety or in parts. Any parts, words or ideas, of the thesis, however limited, which are quoted from or based on other sources, have been acknowledged as such without exception.”

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DEDICATION

I dedicate this thesis and my unlimited gratitude to my husband, Mr. Ian Shanghvi, for accompanying me on this journey, for his constant love, his patience and for always being there every minute I needed support and encouragement during my study period.

To my children Rhys Logan Shanghvi, Rylen Kaius Shanghvi and Reiona Taryn Shanghvi, thank you for your understanding when I was not fully present for you during my studies, I love you very much.

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ABSTRACT

Introduction

This study was conducted to determine the effect of cycle time and supplier lead time on timely procurement of medicines in Tanzania. This study drew on the case study of the Medical Stores Department (MSD) which is the Government of Tanzania's procuring entity.

Methodology

The study used both quantitative and qualitative methodology. Descriptive and inferential statistics such as mean and regression analysis were used to analyze the data with the help of SPSS version 25.

Results

Regression results showed that cycle time and supplier lead time affect timely procurement of medicines by increasing the total time taken for the PE to receive medicines from suppliers if all steps and activities are not processed on time as well as when goods are delayed from suppliers. Thus PO cycle time influences timely procurement by 34%, payment processing time influences timely procurement of medicines by 26% and supplier lead time influences timely procurement of medicines by 40%. Internal and external factors were identified to affect timely procurement of medicines. Internal factors included MSD based delays while external factors include Supplier Based delays and other factors.

Internal factors which are MSD based delays were rooted in PO Cycle delays and Payment processing delays which included delays in concluding tender procedures, inadequate staff performance recognition, poor supplier management and delays in opening letters of credit. and on the other hand, external factors that are supplier based delays were rooted in noncompliance with contracts and delays in clearance of shipments by GPSA at the port of entry also other included delays in government's funding disbursement, delays in contract vetting by the Attorney General and delays in clearance of shipments at the port of entry by GPSA under CFR, CIF and FOB incoterms.

Conclusion

Timely procurement of medicines was found to be affected by cycle time (PO cycle time and payment processing time) and supplier lead time. Any change in these variables could have a significant impact on timely procurement of medicines, resulting in delays in the receipt of goods. MSD is in a better position to ensure that most delays are avoided, since PO cycle time and payment processing time lie within MSD. Therefore, ensuring that all deadlines are met could reduce delays somewhat. On the other hand, even though supplier lead time is the supplier's responsibility, MSD is able to improve it by ensuring that all suppliers comply with contracts, failing which they are blacklisted and can no longer participate in tendering procedures.

CHAPTER ONE: INTRODUCTION

This chapter presented information on the background of the study, its related problem statement and purpose. It also covered information about the study aim and objectives as well as its significance and anticipated output, delimitations and limitations. The key conceptual terms were also defined in the scope of this study.

1.1 Study background

Medicines are critical to the delivery of quality healthcare services in health facilities, so their continuous and timely availability is crucial. This is testified by a 2016 World Health Organization (WHO)'s study that was conducted in Europe with the intention of improving access to treatment which revealed that the procurement system efficiency needed to be enhanced to increase access to medicines¹. It suggests that a timely and efficient procurement practice is essential for assuring the continuous availability of the medicines at the health facilities. This is only achievable when there is a good balance between the cycle time (internal) and lead time (external) components of procurement. It therefore calls for sufficient and appropriate manpower, technical and financial resources in implementing the procurement functions of any organization. The role of oversight bodies is also very important in ensuring the procurement processes abide by the stipulated rules and regulations and adhere to the established contractual agreements – with time.

Globally, procurement of medicines is a challenge that requires solutions so as to increase medicine availability and improve order fill rate in health facilities. Faradiba *et al* revealed that long lead time in the procurement of medicines is one of the stressful challenges². It carries with

it detrimental threats on the health of the patients and, as such, threatens the overall well-being of societies. The need to overcome the challenge of long lead time, particularly in the procurement of medicines, cannot be overemphasized – but this must be accompanied by a strong political will.

In Africa, procurement is not any different from other parts of the world. It stems from various reasons, like the manner in which procurement is implemented, the responsiveness of the suppliers, shortages of funding and complicated bureaucratic procedures. For instance, a study by Cynthia *et al* in South Africa revealed a problem in the method used in the procurement of medicines as well as low supplier performance³, which ultimately leads to long lead time in the procurement of medicines. Also, a study in Kenya, Joy Muhia *et al* found out that the major challenge affecting the procurement of pharmaceutical drugs in Kenya lied on inadequate funding and delay in paying the suppliers owing to bureaucracy required to acquire money from the local government⁴.

The procurement of medicines in Tanzania, which is carried out centrally by the government's procuring entity (PE), is characterized by similar challenges. The country's public health facilities, which depend on the PE in filling their orders, have had a fair share of complaints against the system's performance in, among other things, the availability of medicines⁵. This is further confirmed by the establishment of the Jazia prime vendor system, which is a partnership between the public and private sector, to improve the availability of medicines to the health facilities in Tanzania following the PE-associated medicines supply shortages⁶.

Efforts towards ending or reducing the procurement challenge cite procurement regulations for causing long lead time and subsequent stock outs owing to inefficiencies in the PE's procurement procedures as well as insufficient and delayed disbursements of funding by the Ministry of Finance^{7,8,9,10}. In 2015, the government through its PE came up with an innovative solution to reduce the problem of procurement lead time and increase the availability of medicines by introducing community outlets which are strategically located in seven regions. Also, in 2016, the government instructed the PE to also procure all medicines directly from manufacturers without contracting middlemen¹¹. This was due to the reason that most of what was being procured through suppliers had to be ordered from manufacturers first since the PE required huge quantities that most suppliers could not store at all points in time. By 2019, the PE had contracted 130 manufacturers of different medicines from different countries, including Tanzania¹². All these moves succeeded in increasing the stock at certain points in time, with little impact on reducing the problem of long lead times in procurement of medicines.

Despite of the observed efforts, the effect of purchase order cycle time, payment processing time and supplier lead time has not been well studied in the context of timely procurement of medicines. The interrelationship between the PE and suppliers often sees one party failing to honor the scheduled delivery provision of the contracts between them, thus leading to the long lead time challenge. Unfortunately, the tendency has often been to put the blame on the suppliers when long lead times occur^{13,14}. Doing this typically disregards the manner in which the orders were attended to in terms of payments in the first place which may simply result from the PE giving the orders a low priority thereby affecting its decisions; inexperienced, overburdened or unequipped staff; ineffective internal processes; etc.¹⁵

A study that was carried out in India to find out the average lead time in procuring medicines discovered that there was a long lead time in procuring medicines, with internal lead time (cycle time) being four times higher than external lead time (supplier lead time)¹⁶. It is essential therefore to evaluate internal processes of the PE specifically from the date the procurement department receives the requisition to issuing of contracts to suppliers and later on opening the letter of credit for suppliers to proceed with other procedures in production of the requested items as well as the suppliers' adherence to scheduled delivery time. With cycle time in question, which describes the internal or PE's own process in the procurement of medicines in terms of the time it takes from its start to its end¹⁷, the evaluation of such activities like PO cycle time and payment processing time is absolutely essential.

In summary, as far as the health facilities are concerned, the juncture at which whether or not the health facilities are delivered in time depends on the degree of activeness of the PE in preparing the purchase orders and processing supplier payments, as well as following up on the delivery of the orders. In the end, the promptness of the PE and the corresponding adherence of the suppliers to the agreed delivery schedules account for the timely procurement and conforming delivery of the orders to the health facilities. Thus, effective research-backed solutions to timely procurement of medicines must, therefore, be carried out by considering a holistic integration of the cycle time and supplier lead time components which reveal the manner in which the PE plays role in the time it takes for the orders of the health facilities to be obtained.

1.2 Problem statement

Several studies and reports have revealed that order fill rate in health facilities is very low. Thus, due to shortages in supplying medicine by the PE, Jazia prime vendor system that is a partnership between the public and private sector was established so as to improve the availability of medicine to health facilities in Tanzania¹⁸. It is well known that the government has been striving to ensure that order fill rate to health facilities is improved and has, in related efforts, come up with innovative ways towards optimizing the healthcare supply chain system and quality of healthcare services in the country.

In 2015, the government through its PE came up with an innovative solution to reduce the problem of procurement lead time and increase the availability of medicines by introducing community outlets which are strategically located in seven regions. These outlets store medicines that can be sold to public health facilities and walk in patients at good prices. Also, in 2016, the government instructed the PE to also procure all medicines directly from manufacturers without contracting middlemen¹⁹. This was due to the reason that most of what was being procured through suppliers had to be ordered from manufacturers first since the PE required huge quantities that most suppliers could not store at all points in time. By 2019, the PE had contracted 130 manufacturers of different medicines from different countries, including Tanzania²⁰. All these moves succeeded in increasing the stock at certain points in time, with little impact on reducing the problem of delays in procuring medicines.

Remarkably, the PE has also started to manufacture certain medicines in its resolve to reduce delays for specific items especially in the face of the fact that local manufacturing capacity is

inadequate thus causing dependence on overseas purchases^{21,22}. However, delays in procurement of many other medicines is still noticed²³. Delays of 6 to 27 months have been recorded²⁴. Delays in procurement of medicines continue to compromise the supply chain system and quality of healthcare services in Tanzania. Thus, a study on internal processes of the PE and supplier adherence to delivery schedules was crucial to further find out the reasons for delays in procurement of medicines by the PE.

1.3 Purpose of the study

This study identified loopholes and suggested ways to revamp the supply chain and quality of healthcare in the country relative to timely procurement of medicines. Precisely, it examined cycle time of the PE as well as supplier lead time to determine how they affect timely procurement of medicines from manufacturers that affects timely delivery of medicines to health facilities in the effort of optimizing the supply chain and quality of healthcare in Tanzania.

In so doing, the study not only generated understanding of the subject matter but also guides future and further studies. It would bring the stakeholders together in finding solutions and, in the process, focus their relationship in implementing the same. The study proposed areas for improvement in the policy and regulatory environment as well as operating and oversight procedures in the concerted efforts to optimize the supply chain and quality of healthcare in Tanzania.

1.4 Objectives of the study

The objectives of this study were divided into two groups, namely main objective and specific objectives.

1.4.1 Main objective

The main objective of this study was to assess the effect of cycle time and delivery on timely procurement of medicines in Tanzania.

1.4.2 Specific objectives

- (i) To measure the effect of cycle time on timely procurement of medicines.
- (ii) To measure the effect of supplier lead time on timely procurement of medicines
- (iii) To identify challenges that affect timely procurement of medicines.

1.5 Research questions

The overarching question governing this study was: how do cycle time and supplier lead time affect timely procurement of medicines? To answer this question, the study made use of the following specific questions relative to each of its specific objectives:

- (i) To what magnitude does cycle time affect timely procurement of medicines?
- (ii) To what extent does supplier lead time affect timely procurement lead time?
- (iii) What are the other challenges that affect timely procurement lead time?

1.6 Significance of the research

The essence of this study was to provide required solutions for addressing some of the key issues affecting timely procurement of medicines. This way, the study will contribute to an inventory of solutions aimed at eradicating the challenges affecting timely procurement of medicines and, in this manner, facilitate in achieving the goal of higher-quality livelihood for all Tanzanians as documented in the Tanzania Development Vision 2025. This is foreseen at the entry level of policy improvement and implementation of the same by the operating bodies.

Again, as focused and exhaustive studies on timely procurement relative to the selected variables are scanty – especially in relation to the PE, this study marked a milestone in attempts to rectify the situation. Thus, not only did it contribute to an in-depth understanding of the subject matter but also serve as a reference in other alike studies.

To the researcher, a thesis derived from this study played a key role in satisfying the requirements for partial fulfillment of a Masters of Health Supply Chain Management at the University of Rwanda and conferring of the subsequent Master's degree.

1.7 Scope of the study

The study focused on assessment of the effect of cycle time and supplier lead time on timely procurement of medicines by the PE. The scope of the research covered the theoretical and the geographical dimensions of the study.

Theoretically, the study covered the concepts of procurement process relative to supplier lead time, PO cycle time and payment processing time and which have been identified as the key variables of interest. These variables could be viewed from many perspectives. However, for the purpose of this research, they were viewed and examined at the PE level.

Geographically, this study focused on Tanzania while drawing on the case of the PE with respect to its headquarters, which is located in Dar es Salaam. It particularly engaged the staff working in the departments of Finance, Logistics and Operations, and Procurement at MSD, selected health facilities and suppliers in data collection.

It was expected that the findings of this study would add value in its areas of scope. The same would be generalized to give a holistic picture of how PO cycle time, payment processing time and supplier lead time affect timely procurement of medicines for the health facilities.

1.8 Study limitations

Literature on the selected variables in relation to Tanzania and the PE in particular was severely inadequate. This limited the researcher's understanding of the subject matter while preparing the study. Instead, much was based on the researcher knowledge and experience with the field. Therefore, it was important that this study be regarded not only for its findings but also for shading some light on future and further studies.

Practicality constraints (resources and time) have additionally forced the researcher to only consider only the selected variables and with respect to the PE alone amidst the other key

stakeholders, such as the government and other entities alike. This of course limited the breadth of ensuing recommendations and their overall impact in improving the procurement lead time of medicines in Tanzania.

Chapter Two: Literature Review

This chapter carried a review of theoretical and empirical literatures associated with the study as well as its conceptual framework and identified literature gap. It began with defining the key conceptual terms used in the study.

2.1 Definition of conceptual terms

The key conceptual terms used in this study include: *purchase order cycle time*, *payment processing time*, *supplier lead time* and *cycle time*. There were no universal definitions of these terms, hence the need to define them in accordance to their use in this study.

2.1.1 Purchase order cycle time

Consistent with the definitions by Abby Jenkins and Rob Bledron, purchase order cycle time or PO cycle time is the average amount of time (hours or days) it takes for a purchase requisition to generate a purchase order that is then sent to the supplier^{25,26}. This constitutes an initial step in managing the time required to serve the customer by the PE.

2.1.2 Payment processing time

Associated with the definition by USAID, this is used to measure the percentage of supplier payments that were made on time according to the payment period called for in the contract²⁷.

2.1.3 Supplier lead time

This study adopts the definition by Abby Jenkins that cites supplier lead time as the average number of days it takes for suppliers to send items after they receive a purchase order²⁸. However, for the sake of this study, the average will be converted into a percentage value for more clarity in interpretation of the product.

2.1.4 Cycle time

The term refers to an assortment of the internal stages preceding supplier engagement which, for this study, they include purchase order (PO) cycle time and payment processing time.

2.2 Theoretical literature review

Theory is fundamental for the academic credentials of any discipline. This chapter reviews two particular theories which are borrowed from other fields in linkage to the selected variables to guide the study. This owes to the fact that no individual theory suffices to explain the variables of this study, hence the need for eclecticism in this study by referring to different theoretical perspectives. The identified theories include Agency Theory (Economics) and Decision-making Theory (Systems Neuroscience and Cognitive Neuroscience). The former is the overriding theory that explains most of the variables of the study. It is complemented by the latter in explaining the effect of decision-making choices among the stakeholders due to information manipulation. All in all, both theories are in sync at suggesting that timely and efficient procurement

reduces lead time and improves the health facilities' satisfaction while safeguarding the PE's image and trust. This secures and improves the latter's relationship with the suppliers and other stakeholders involved in the procurement process.

2.2.1 Agency theory

This is an economic theory that postulates of the existence of an asymmetry of information between parties in a given decision-making environment, whereby there is an agent who acts on behalf of or represents the other party, known as the principal²⁹. A 2017 paper by Agnieszka Chrisidu-Budnik and Justyna Przedańska, entitled *The Agency Theory Approach to the Public Procurement System*, traces the theory back to the early 1970s in the work of Stephen Ross and Barry Mitnick³⁰. The authors argue that agency relationship comes into force when one party must depend on the acts of the other. In this case, the efficiency of the principal's operations is particularly determined by the agent's acts and decisions, with both parties assumed to have a certain degree of conflicting objectives³¹. It is assumed that the agent has information advantage over the principal that can make the former to generate opportunistic behavior or opportunism (inclination to implement own interests)^{32,33}. This can have negative or positive consequences to each of the parties, thus making the chosen actions of the agent capable of affecting the welfare of both - sometimes to the detriment of the principal³⁴. For example, the agent can claim to have the knowledge and resources needed to implement the contract without the principal being able to verify the agent's reliability. This is referred to as a phenomenon of hidden information which limits the principal to an observer role without being able to detect and authenticate the external factors dictating the agent's choice of actions³⁵. Also, during the performance of the contract, the agent can do what is referred to as a phenomenon of hidden action by taking actions which are

difficult for the principal to monitor and therefore fail to realize the relationship between the agent's effort and the resulting achievement³⁶. Another incidence is the phenomenon of hidden activity which means the principal cannot see the agent's actions but only the outcome³⁷. However, the theory does not assume that the agent will willingly misrepresent or lie about their duties to the contract with the principal³⁸. It remains important to monitor and evaluate the performance of the parties to the relationship in an effort to lower the asymmetry of information and/or streamline the agent's activities with the expectations of the principal. The agent has to be appropriate for the principal to also benefit from their relationship.

2.2.1.1 How the theory relates to this study

During the performance of the contract, the supplier can choose to hide internal weaknesses with the subsequent impact on timely procurement of the medicines. This affects relationships with the PE which can then lead to the latter blacklisting the former in its list of suppliers.

Moreover, the health facilities typically lack information on the PE's willingness or ability to prepare and submit purchase orders in time (the hidden information phenomenon). This information is controlled by the PE which then affects the health facilities' promised time expectations for receiving the ordered medicines - and this has the potential of hampering the latter's operations. It can also erode the trust between the two parties.

The supplier also tends to lack information on the PE's willingness or ability to process payments in time. The information is controlled by the PE (the hidden information phenomenon). This can also affect the health facility's promised time expectations for receiving the ordered items and,

subsequently, its operations. It can also eat on the trust between the parties - PE vs. suppliers vs. health facilities.

2.2.2 Decision-making theory

This theory was first introduced by Herbert A. Simon in 1978 to guide rational individuals on how they should behave under risk and uncertainty³⁹. It suggests that decision-making points toward the adoption and application of rational choice for the management of any kind of firm in an efficient manner⁴⁰. This way, making a decision is choosing between alternative options – including non-action. The decision-making theory is a tool that guides on understanding of the principles behind uncovering answers to questions and identifying solutions to achieve goals⁴¹. With it, decision makers can analyze decisions into possible options and their potential consequences. A 2010 paper by Csaba Csáki and Frederic Adam, entitled *Public Procurement as Regulated Decision Making Problem: Challenges for DSS*, presents a commendable example of how to use this theory in explaining and understanding public procurement⁴².

The theory considers decisions as being critical and should therefore be taken on time to ward off negative impacts of the firm's objective. It considers not only the decisions made but also the process or actions taken. This means that the importance of performing a decision is tantamount to making that decision. As decisions are based on confined rationality, humans behave differently when faced with accompanying risks and uncertainties.

The notion of satisficing lies at the core of this theory, i.e., a combination of satisfying and sufficing⁴³. It guides one to pursue objectives or make decisions that involve minimum risks and

complications as opposed to aiming at maximizing profits⁴⁴. Its theorist postulates of the inexistence of one best course of action or decision due to incomplete information about something; but rather a better course of action or decision that is often there⁴⁵. This is of essential value to public procurement entities which play a vital role in the public sector and regularly involve making decisions of broad effects⁴⁶.

2.2.2.1 How the theory relates to this study

The suppliers can, on own volition, choose whether or not to honor their delivery schedule obligations by simple neglect or through responding to other priorities. This can make them actually decide to deliver medicines beyond the stipulated lead times. It is therefore minimally expected of them to rather be approaching their decisions in a satisficing manner. However, as unfortunate as it could be, it should also not be surprising to see their focus is alternatively vested on maximizing profits.

This theory guides the procurement experts in making decisions to achieve the determined levels of satisfaction and strengthened relationships around such areas as PO cycle time and supplier lead time for the health facilities, in the case of the PE, as well as payment processing time, for the sake of the suppliers. All the relevant experts should be making appropriate and timely decisions to counteract the undesirable consequence of not doing the same, including the affected social and economic well-being of the population/consumers.

The theory also points out to an obvious need to make decisions which takes the evaluation of timely procurement seriously. This generated information that should provide feedback and

influence decisions concerning the way forward in consideration of the various possible options and potential consequence, like compromised relationships between and among stakeholders due to decisions which are made overdue or confusingly avoided.

2.3 Empirical Literature Review

This section emphasized on the essence evaluation of timely procurement of medicines relative to the three variables namely: purchase order cycle time, payment processing time and supplier lead time. It also covered the study's conceptual framework and identified literature gap.

The empirical literature on timely procurement of medicines is scanty and that is the reason to why more research should be carried out. A 2013 study that examined the challenges of medical supply chains in sub-Saharan Africa in association with inventory management, transport and distribution discovered that, among other factors, the long lead time impacts the national health system and supply chain⁴⁷. This is complemented by another 2013 study in Kenya which observed that lead time affects procurement performance, hence the need for timely procurement in providing quality healthcare to all⁴⁸. Furthermore, a 2016 study on procurement that was carried out in India observed that procurement lead time was momentous where the internal lead time (cycle time) was four times the external lead time⁴⁹.

Again, the 2013 Strategic Review Report in Tanzania stated that there was a long lead time in procuring medicines and, medical supplies and equipment especially from international manufacturers⁵⁰. It is not surprising, therefore, that the Tanzania Public Procurement Regulatory Authority reported in 2020 that there was a delay in procuring customer requirements by 6-27 months⁵¹.

Several solutions to overcome challenges in procurement of medicines have been noticed however, the extent to which the observed shortcomings are really addressed remains a matter of another research interest. This is because the problem of long lead time is still affecting the Government of Tanzania's procuring entity (PE) despite its improvements in supplying medicines to the health facilities around the country. Different processes are attributed to the problem of long lead time at the PE. Procurement regulations were cited for causing long lead times^{52,53}. The PE tackled this challenge by initiating framework agreements with Delivery Duty Paid (DDP)⁵⁴. Inefficiencies in procurement as well as insufficient and delayed disbursements of funding by the Ministry of Finance were also mentioned to among things to affect the lead times^{55,56}.

Nevertheless, the PE came up with an innovative solution in 2015 to reduce the problem of long lead time and increase the availability of medicines by introducing community outlets which are strategically located in seven regions. These outlets store items that can be sold to public health facilities and walk in patients at good prices. In 2016, the government instructed the PE to also procure all medicines directly from manufacturers without contracting middlemen⁵⁷. This was due to the fact that most of what was being procured through suppliers had to be ordered from manufacturers first since MSD required huge quantities that most suppliers could not store at all points in time. By 2019, MSD had contracted 130 manufacturers of different medicines from different countries, including Tanzania⁵⁸. The move succeeded in increasing the availability contrary to the initial expectations, with little impact on reducing the problem of long lead time.

Remarkably, MSD has also started to manufacture certain medicines in its resolve to end the problem of long lead time in procurement of medicines for some specific items especially in the face of the fact that local manufacturing capacity is inadequate thus causing dependence on overseas purchases^{59,60}. However, the problem of long lead time still remains for many other commodities that are procured from other manufacturers as evidenced in relentless complaints by the health facilities⁶¹. Delays of 6 to 27 months have been recorded⁶². The challenge continues to compromise the supply chain system and quality of healthcare services in Tanzania. Few studies have been conducted on PO cycle time, payment processing time and supplier lead time even though there was no direct correlation of the above-mentioned variables to long lead time in procurement of medicines as described below:

2.3.1 Purchase order cycle time

A 2013 study on how procurement operations affect health care delivery in Malawi concluded that long procurement cycles should be avoided specifically for healthcare procurement⁶³. Reduction of a PO cycle time lessens immediate expenses for every purchase and contributes substantially to customer satisfaction. Thus, PEs which optimize their PO cycle times tend to achieve substantial cost savings and value creation through constant improvement initiatives. Regrettably, amid the lack of literature on the subject of PO cycle time with regards to Tanzania, this section will be expounded with information that will be obtained from the PE during the data collection exercise.

2.3.2 Payment processing time

A 2013 analysis of challenges of medical supply chains in sub-Saharan Africa regarding inventory management and transport and distribution found that delays in disbursement of funds affects the health system nationwide as well as the supply chain⁶⁴. Paying suppliers on time enables the PE to better plan and control spending while laying ground for being able to negotiate more favorable price agreements or payment terms. Completing and tracking external payments is indeed a complex process but, when implemented effectively, can enable PEs to realize substantial benefits that can spur growth. Timely and effective payments also improve the availability of medicines and medical supplies in a significant manner⁶⁵. This means that if payments to suppliers are delayed, the availability of medicines and medical supplies becomes compromised.

In their study on medicine shortages and challenges associated to procurement processes among public sector hospitals in South Africa, Cynthia *et al*, realized that the determinants of medicines shortages included delayed payments to suppliers among other things⁶⁶. Also, in 2017, Joy Muhia *et al* studied the factors affecting the procurement of pharmaceutical drugs in Kenya only to find out that the major challenge lied on inadequate funding and delay in paying the suppliers owing to bureaucracy required to acquire money from the Narok county office⁶⁷. Furthermore, one of the studies carried out in South Africa revealed that non-payment of suppliers can cause medicine shortages in hospitals⁶⁸. Ironically, it was further found in the study that those suppliers did not even probe for payment⁶⁹.

2.3.3 Supplier lead time

The supplier lead time plays an important role in ensuring that medicines are timely delivered to health facilities. For instance, a 2022 study that was conducted in England on factors affecting supply of palliative medicines revealed that stock availability depends on, among other things, the supplier lead time⁷⁰. Similarly, another 2013 study that examined the challenges of medical supply chains in sub-Saharan Africa in association with inventory management, transport and distribution discovered that, among other factors, the long lead time impacts the national health system and supply chain⁷¹. Also, another study that was carried out by Cynthia *et al* on medicine shortages and challenges with the procurement processes among public sector hospitals in South Africa hinted that the determinants of medicines shortages included among other things non-performance of suppliers⁷².

Interestingly, literature on how PO cycle time, payment processing time and supplier lead time affect procurement lead time is scanty specifically in Tanzania hence the need to carry out sufficient studies in an effort to overcome procurement lead time. Effective research-backed solutions are needed to optimize the supply chain and quality of healthcare with a keen attention to the problem of procurement lead time. This is because a medicines supply chain management encompasses the management of all the activities in the supply chain from product selection to procuring, manufacturing, logistics and also the information system⁷³.

2.4 Conceptual framework of the study

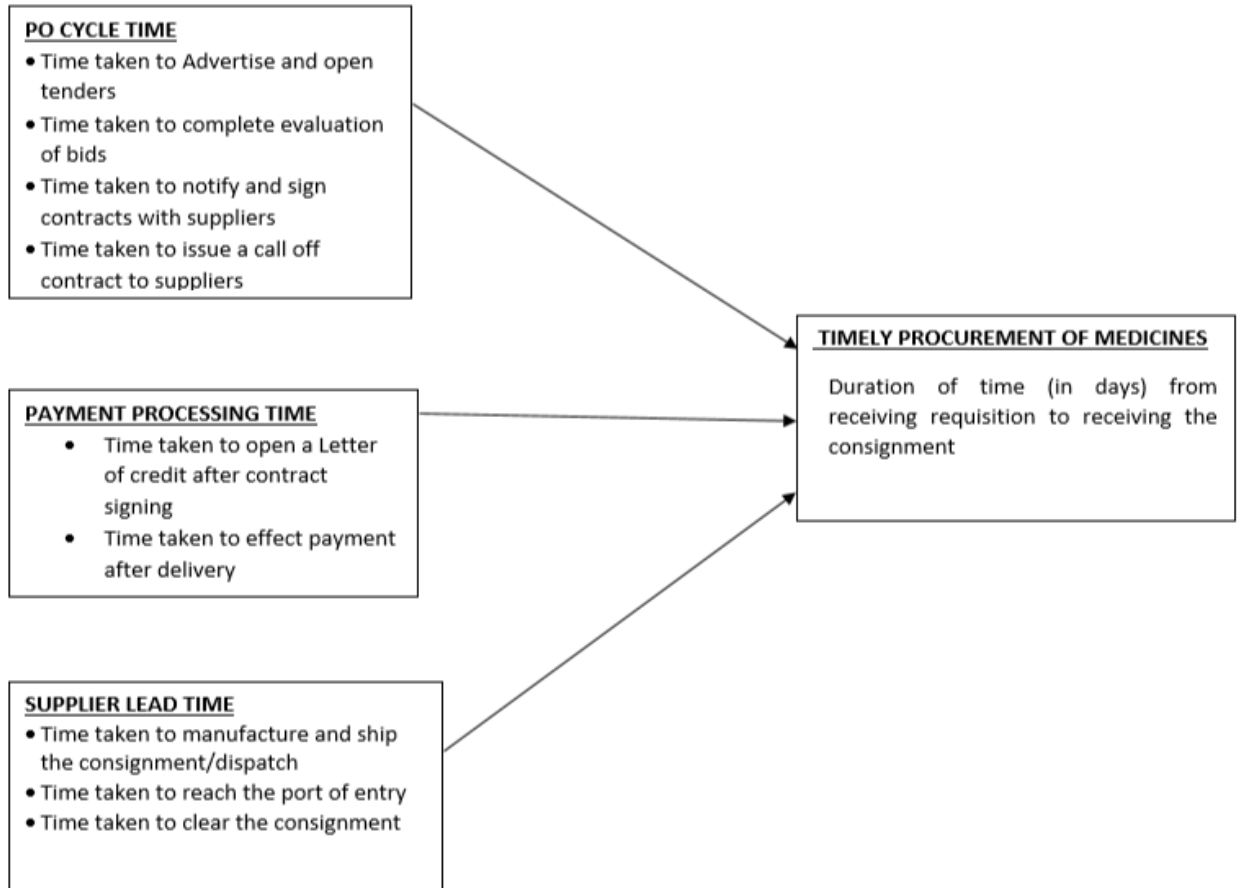
The reviewed literature, synonymous with the objective of this study, is portrayed in the conceptual framework represented by Figure 1. It establishes the link between its independent

variables and dependent variables. It pinpoints PO cycle time, payment processing time and supplier lead time as the independent variables that determine lead time in procurement of medicines which is the dependent variable. In other words, in order for procurement lead time to be improved it begins with PE's activeness in preparing the POs and processing supplier payments and ultimately the supplier's adherence to the delivery schedule. Considerable health facility's success therefore begins with PE's prompt preparation and submission of POs to the suppliers and following up with timely processing of required payments. This desirable scenario of teamwork between the PE and the suppliers should enable realization of improvement in timely procurement of medicines as assessed in the satisfaction derived by the health facilities. In other words, both parties should join forces as one team with the overriding objective of serving the health facilities and other stakeholders as well as assess their performance in the satisfaction they derive among the consumers (patients).

Figure 1: Conceptual framework

Independent variable

Dependent variable



Source: Author (2022)

2.5 Identified literature gap

In the perspective of the health facility and, subsequently, the fulfillment of the consumer/patient's needs for medicines, the time it takes for the PE to deliver the ordered items must be assessed beginning at the cycle time component all the way to the supplier adherence to delivery schedules. Internal processes of the PE and supplier lead time have a momentous effect on the timely procurement of medicines yet there are no sufficient studies on PO cycle time,

payment processing time and supplier lead in correlation to procurement lead time specifically in Tanzania. This study therefore examined whether or not the PO cycle time, payment processing time and supplier lead time play part in influencing the timely procurement of medicines.

Chapter Three: Research Methodology

This chapter described how the study would be approached. It specifically narrated on its research design, location, target and study population. It also covered information about the data collection instruments and related data collection techniques, and validity and reliability. Other issues covered include the study's ethical considerations, study work plan and budget.

3.1 Research design

The study made use of quantitative and qualitative methodology. A descriptive cross section research design was employed whereby data was collected, analyzed and presented to produce an in-depth understanding of the extent to which the selected variables are affecting the timely procurement of medicines at the PE. Also, a five-point agreement scale was used where both quantitative and qualitative method were used to analyze the primary data. Responses on each given items were estimated using SPSS, whereby qualified items were compiled for further analysis where the qualitative analysis technique known as thematic analysis with six stages was applied.

The research effectively employed the Medical Stores Department (MSD), which is a government PE that is an autonomous department under the Ministry of Health established in 1993⁷⁴, as a case study in evaluating timely procurement in procurement of medicines. MSD specifically deals with procurement, storage and distribution of medicines and medical supplies to all public health facilities. MSD has also established manufacturing plants for pharmaceuticals and medical supplies⁷⁵. MSD was selected because it was the only government PE that procures health commodities for all the country's public health facilities, hence was its suitability for this study.

The researcher would not control or change any of the variables but simply just observe and measure them. To achieve this, therefore, the study collected both primary and secondary data. However, the main data that the study used were secondary which involved a review of the MSD's procurement-related documents per the identified variables. Table 3.1 specifies the documents which were reviewed to generate the secondary data as inputs for these said calculations.

Table 3.1: MSD documents for the gathering of secondary data for each study variable

Variable	Documents to be reviewed
Adherence to standard purchase order (PO) cycle time	Contracts / Call-Off Orders
	Registry of Procurement Requisitions
Adherence to payment processing time	Letter of credit
	Call off contracts
	Goods Received Note (GRN)
	Payment advise/Certificate of acceptance
Supplier adherence to lead time	Shipment Invoice (foreign-based manufacturers)
	Contracts / Call-Off Orders

All the documents were reviewed for time range of January 2019 to December 2022 based on records kept as of 31 December 2022. Meanwhile, the primary data were gathered by the use of a close-ended questionnaire that were administered amongst 99 of the respondents which include MSD's departmental staff in custodianship of the aforementioned documents (Appendix B),

suppliers and health facilities to complement the secondary data. The questionnaire involved a 5-point Likert scale to generate analytical and inferential data for measuring the experience of specific MSD employees, suppliers and health facilities about the organization's timely procurement of medicines. The responses generated from the questionnaire were used to corroborate the products of the formula-driven calculations in gauging the employee (MSD)'s levels of: (a) determination or need for improvement of the procurement performance, (b) neutrality and (c) contentment or complacency with procurement lead time performance, supplier's perception on how the organization is performing on reducing procurement lead time as well as the end customer's experience in timely delivery of medicines from MSD.

3.2 Study area

The study was conducted at the MSD headquarters that is located in Dar es Salaam region, MSD zonal offices located in Dar es Salaam, Dodoma and Mbeya as well as health facilities in the aforementioned zonal offices.

3.3 Target and study population

The targeted population for this study was the Procurement, Logistics and Operations, and Finance departments at the MSD headquarters, 3 MSD zonal offices, oversee suppliers as well as health facilities present in three zones as depicted in Table 3.2.

3.4 Sample and sampling strategies

3.4. 1 Sampling technique

Probability and non-probability sampling technique was used in this research. Simple random sampling and purposive sampling was used. Simple random sampling is the probability sampling whereby each member in the population has an equal chance of being selected to form a sample⁷⁶, simple random sampling technique was used because it would give each individual the chances of being selected to the sample and all sampling errors could be easily determined.

The purposive or judgmental sampling technique was used in this study. This approach was used to select the members who have expertise or experience about the problem under investigation⁷⁶. For this reason, specific respondents were selected primarily because of their experience, knowledge, skills and exposure – relative to the study objectives.

Respondents from MSD headquarters were chosen because of their positions and experience in procurement, receiving and warehousing as well as paying suppliers. Three zones (Dar es Salaam, Dodoma and Mbeya) out of nine were chosen. These were chosen due the high number of customers served by these zones but also due to the fact that the researcher cannot be able to visit all zones because of time and finance limitation. 4 health facilities which include the national hospital and 3 health centers in each zone were chosen depending on their closeness from MSD zonal offices. Suppliers were chosen because of their experience, duration of years worked with MSD (3 years and above), and only those who were active at the time the research was being carried out.

3.4.2 Sample size

The study was carried out through a sample of 99 respondents from the population of 132 respondents as shown in the table below. This study targeted to obtain at least 75% for respondents from the whole population.

Table 3.2: MSD departments and staff identified to respond to the questionnaire

Departments	No. of Staff
Procurement	17
Logistics and Operations at HQ	30
Finance	13
MSD zonal officers	24
Suppliers	30
Health facilities	18
Total	132

Source: MSD

3.5 Data collection instruments and techniques

The study made use of primary and secondary data collection methods to get comprehensive and relevant data to address the objectives of the study. But, as previously stated, the main source of the data stem from a review of secondary data sources which include the MSD's procurement-related documents. Again, primary data were collected using a close-ended questionnaire that was sent to 132 correspondents. The study anticipated a return rate of at least 75%.

3.6 Data validity and reliability

The study focused on collection of relevant data that represents the real practice at MSD. The specifics of validity and reliability of the data are as described below.

3.6.1 Validity

This did not apply to the analysis of documents. Thus, in determining that the questionnaires used for primary data collection were valid (correct and true), the researcher began with consulting fellow students prior to undertaking actual data collection who reviewed and assessed their functionality in addressing the objectives of the study. In the end, the questions and accompanying instructions were reviewed to ensure they can be clearly understood and are encouraging to the respondents.

3.6.2 Reliability

This also did not apply to the analysis of documents. Thus, to ensure the questionnaires were reliable and that the study can be replicable in the future, the researcher conducted a pilot exercise among fellow students who responded to the questions and submitted their responses. This would follow the validity test phase (above). Their answers were analyzed to see whether they were consistent or not. Irrelevant items were eliminated and the questionnaires were adjusted accordingly prior to commencement of the study. Unfortunately, there was no other organization similar to MSD that lies within the reach of the researcher to be engaged in the piloting exercise of the data collection instruments as an alternative.

3.7 Data analysis techniques

The procedure for analyzing the data involved editing, coding and interpretation to obtain correctness and relevance of the data to the study. Data collected from the review of documents were cleaned and organized in a dataset before the calculations and ensuing analyses for each of the selected variable to measure the timely procurement at MSD.

Meanwhile, primary data were analysed using a Statistical Package for Social Sciences (SPSS) software. The study engaged a descriptive analytics model⁷⁵ to determine “what happened” in terms of the MSD’s timely procurement of medicines relative to the selected variables. Thus, the primary data enhanced the understanding of the reasons behind the observed MSD’s procurement performance trend.

3.8 Ethical considerations

The study purpose was paraphrased to the potential research participants. They were informed of their rights concerning participation (voluntary participation and no risk involved). They were also informed of the fact that their information will be held in confidence and anonymity observed in reporting of the findings. A letter from the university was acquired to introduce the researcher to the MSD’s administration and research participants before collecting the data.

4. Chapter four: results and discussions

4.0: Introduction

The study runs for four years, from 2019 to 2022. Four years were picked to increase data diversity in order to eliminate the potential of a COVID19 homogeneity spike in data. Each quarter's procurement orders had an equal chance of being selected, resulting in sixteen (16) orders (one quarter one procurement order). The goal was to eliminate data collection bias as well as anticipating COVID19-related bias. Each quarter, one order was chosen at random, and fifteen (15) products were chosen at random from the selected orders. A benchmark of fifteen items per order was established not only because three of sixteen randomly selected orders had at most 15 items each, but also to reduce the possibility of duplication dates of activities within PO cycle procedures. As result, 240 items were chosen at random from procurement orders, and data were entered into SPSS. Following data entry, the researcher found and removed five (5) duplicates, as well as eight (8) outlier cases (see appended Figure 1). As a result, 227 items (or 94.6 percent) of the 240 selected items were included in the study.

4.1 Cycle time

In this study, cycle time includes purchase order cycle time and payment processing time. Each variable has an impact on timely procurement of medicines. The study's findings point out the size of the effect on each determinant variable on timely procurement of medicines.

4.1.1 Purchase order (PO) cycle time

Purchase order (PO) cycle time is the total amount of time from the requisition approval date to call off contract date in days. There are several stages within PO cycle time including advertisement and opening of tender, evaluation of bids, contract signing with supplier and finally the call off contract stage. Descriptive results for each of the stages are presented in Table 4.1.

Table 4.1: purchase order (PO) cycle time

PO cycle time	No. of items	Min	Max	Mean	Std. error of Mean	standard deviation
Time taken to advertise and open tenders	190	45	90	65.73	0.744	11.18
Time taken to complete evaluation of bids	190	1	110	58.22	2.43	36.61
Time taken to sign contracts with suppliers	190	30	89	58.15	1.119	16.85
Time taken to issue a call of contract to suppliers	227	4	36	23.77	0.618	9.3

The results in Table 4.1 reveal that the shortest time required to advertise and open bids was 45 days and the highest time was 90 days for 190 (100%) items. The average time to advertise and open bids is anticipated to be 65.73 days. A standard deviation of 11.18 days is higher, meaning that data were distributed from the mean in some way. However, a standard error of the mean estimated at 0.744 days is small, indicating that the estimates were a good representation of the

population - at any chosen point in time, expected results would be more of the same as expected (p-value=0.05) with a 5% significance level *ceteris paribus*.

The statistics also show that for 190 (100%) items, the minimum duration required to complete bid review was 1 day and the maximum duration was 110 days. The average time required to complete bid evaluation is projected to be 58.22 days. A standard deviation of 36.61 days indicates that data were widely spread from the mean. However, a standard error of the mean estimated at 2.43 days is small, indicating that the estimates were a good representation of the population - at any chosen point in time, expected results would be more or less the same as expected (p-value=0.05) with a 5% significance level *ceteris paribus*.

The results suggest that the lowest time required to inform and sign contracts with suppliers was 30 days and the highest time was 89 days for 190 (100%) items. The average period for notifying and signing contracts with suppliers is anticipated to be 58.15 days. A lower standard deviation of 16.85 days indicates that data were less distributed from the mean. However, a standard error of the mean estimated at 1.119 days is small, indicating that the estimates were an accurate portrayal of the population - at any chosen point in time, expected results would be more or less the same as expected (p-value=0.05) with a 5% significance level *ceteris paribus*.

The findings presented in Table 4.1 indicate that the least time taken to issue a call off contract to suppliers was 4 days and the maximum was 36 days for 227 (100%) items. The mean time frame for issuing a call off contract to suppliers is estimated to be 23.77 days. A standard deviation of 9.30 days implies that data were converging to the mean. However, a standard error of the mean estimated at 0.618 days is small, indicating that the estimates were an accurate depiction of the population - at any selected point in time, expected results would be more or less the same as expected (p-value=0.05) with a 5% significance level.

4.1.1.1 Adherence to standard PO cycle time

The standard PO cycle time at MSD is 125 days in total (i.e., 120 days from receiving the approved requisition to contract signing with suppliers and 5 days to sign call off order contracts with suppliers). The adherence to the standard PO cycle for 227 items is shown in table 4.2 below:

Table 4.2: Adherence to standard PO cycle time

Description	No. of items	Percent
Items completed within time	154	67.8
Items delayed	73	32.2
Total	227	100

Findings in table 4.2 show that out of 227 items, the PO Cycle time was met for 154 items equivalent to 67.8% whereas the PO cycle time for the remaining 73 items equivalent to 32.2% was longer than expected.

Discussion: Findings show that there were delays in every stage of the PO cycle. If the total PO cycle time is 125 days, a maximum of 90 days in advertising and opening tenders is way out of range because it is equivalent to 72% of the total Po cycle time. Similarly, a maximum number of 110 for evaluation of bids is equivalent to 88% of the total PO cycle time. Correspondingly 89 days for contract signing is equivalent to 71.2% of the total PO cycle time. If the PO cycle time is delayed in every stage to such extent, it in turn affects the total lead time. On the other hand, although the results show that 154 items, or 67.8%, fall within the PO cycle time range, 73

items, or 32.2%, represent a considerable number of items outside the time frame of the PO cycle.

Nevertheless, although there are not many studies on how the length of the PO's cycle can affect timely procurement of medicines, a 2013 study in Malawi concluded that procurement operations resulted in long procurement cycles that further affected healthcare delivery hence long procurement cycles should be avoided specifically for healthcare procurement⁶³. This is also testified by a 2016 World Health Organization (WHO)'s study that was conducted in Europe with the intention of improving access to treatment which revealed that the procurement system efficiency needed to be enhanced to increase access to medicines¹. It suggested that a timely and efficient procurement practice is essential for assuring the continuous availability of the medicines at the health facilities.

Interpretation: The results and discussion conclude that the length of the PO cycle affects timely procurement of medicines by increasing the total time taken to receive medicines from suppliers at MSD, which also affects the timely delivery of medicines to healthcare facilities.

4.1.2 Payment processing time

Payment processing time is the amount of time that combines the interval from time of signing the purchase contract to time of opening of letter of credit and an interval of time from delivery of consignments by suppliers to the time of paying the remaining final payment. All the contracts analyzed by the researcher, the payment conditions were as follows: 80% of the total amount of the purchase contract was paid as an initial payment (by letter of credit) immediately after the call off contract was signed by both parties, and the remaining 20% was paid after delivery of the goods. Major steps in the payment process include: The Director of Procurement (DP) writing a memo to the Director of Finance (DF) to open the letter of credit after signing the purchase

contract for the initial payment, the DF opening the letter of credit also the DF finalizing the final payment after receiving documents from the warehouse on suppliers who have delivered goods. Therefore, the study analyzed the time taken to issue the LC from the date the DF received the LC opening request and also the time taken to effect final payment after the DF receiving the documents on orders delivered as shown in table 4.5 below:

Table 4.3 Payment processing time

Variable	Minimum days	Maximum days	Mean	Std. error of Mean	standard deviation
Time taken to open Letter of Credit	10	50	24.34	0.723	10.9
time taken to effect final payment after delivery	20	193	101.53	3.839	57.845

The results in Table 4.3 indicate that the minimum duration in opening letter of credit was 10 days and the maximum duration was 50 days for 227 (100%) items. The average duration in opening the letter of credit was estimated to be 24.34 days. A standard deviation of 10.90 days indicates that the data was widely distributed from the mean. However, a standard error of the mean estimated at 0.723 days is small, indicating that the estimates were a good representation of the population - at any chosen point in time, expected results would be more or less the same as expected ($p\text{-value}=0.05$) with a 5% significance level *ceteris paribus*.

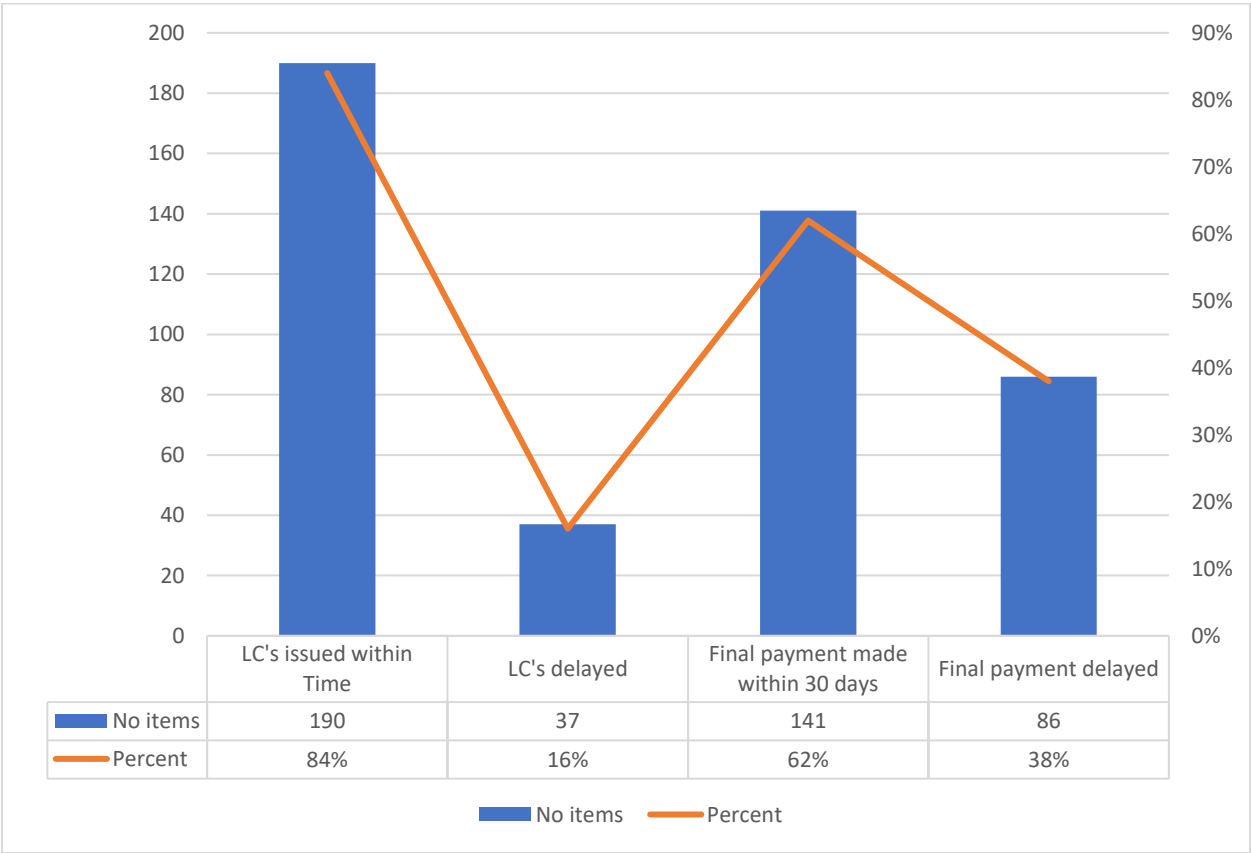
The results illustrate that the minimum period taken to effect final payment after delivery was 20 days and the maximum was 193 days for 227 (100%) items. The average time it takes to

complete final payment after delivery is anticipated to be 101.53 days. A standard deviation of 57.84 days indicates that the data was widely distributed from the mean. However, a standard error of the mean estimated at 3.839 days is small, indicating that the estimates were a good representation of the population - at any chosen point in time, expected results would be more or less the same as expected (p-value=0.05) with a 5% significance level ceteris paribus.

4.1.2.1 Adherence to standard payment processing time

At MSD, LCs should be issued within 14 days of receiving the LC opening request from the procurement department and also invoices should be paid within 30 days of receiving all documents related to payments from the warehouse. Figure 4.1 below illustrates the number of LCs that were issued within time as well as invoices that were affected on time.

Figure 4.1: Adherence to standard payment processing time



Results in figure 4.1: show that out of 227 items equivalent to 100% LCs, 190 items equivalent to 84% were issued within the accepted range of 14 days whereas the remaining LCs for 37 items equivalent to 16% were issued beyond the accepted range of 14 days. The findings indicate a delay of about 16% in the initial stage of LC issuance to suppliers. Also, results show only invoices for 141 items equivalent to 62% were paid within 30 days as agreed in contracts whereas the remaining Invoices for 86 items equivalent to 38% were paid beyond 30 days.

Discussion: The results indicate a maximum of 50 days for initial payment, which represents a considerable delay. All orders with such delays will automatically delay the production phase for the supplier, since the latter cannot start production without confirmation of the first payment, which will ultimately result in a long procurement lead time. The results also show a considerable delay in the final payment, of up to 193 days, which could affect the supplier's ability to obtain good results for future orders. Findings indicate a delay in effecting initial payment for 37 items that is equivalent to 16% and on the other hand, a considerable delay in final payment for as many invoices as equivalent to 38% of the total. This indicates that MSD needs to review late payment of supplier invoices to determine the cause for delays and encourage efforts to improve on time payments.

The findings are not far from the results in a study on medicine shortages and challenges associated to procurement processes among public sector hospitals in South Africa, Cynthia *et al*, which realized that the determinants of medicines shortages included delayed payments to suppliers among other things⁶⁶. Also, in 2017, Joy Muhia *et al* studied the factors affecting the procurement of pharmaceutical drugs in Kenya only to find out that the major challenge lied on inadequate funding and delay in paying the suppliers owing to bureaucracy required to acquire money from the Narok county office⁶⁷. Furthermore, one of the studies carried out in South

Africa revealed that non-payment of suppliers can cause medicine shortages in hospitals⁶⁸. Even though the initial payment can be effected on time delaying the remaining payment may affect the suppliers' ability to process other orders.

Interpretation: Results and the discussion infer that long payment processing time affect timely procurement of medicines by increasing the total time taken to receive medicines from suppliers at MSD. Also, in this study MSD needs to find out the stage which delays payments to ensure all payments are effected timely.

4.2. Supplier Lead Time

Supplier lead time is the amount of time in days from signing of contracts through manufacturing and shipment of consignment/dispatch to delivery at the port of entry. It was not possible to obtain dates for each step from suppliers. Therefore, the researcher analyzed the overall supplier lead time by considering dates of call off contract signing and delivery at port of entry. The results are presented in Table 4.4.

Table 4.4 Supplier lead time

Items	Minimum	Maximum	Mean	Std. Error of Mean	Std. Deviation
227	23	160	80.69	3.05	45.94

The results in Table 4.4 indicates that the lowest overall supplier lead time was 23 days and the maximum was 160 days for 227 (100%) items. A maximum of 160 days exceeds the projected

120-day maximum supplier lead time. The average supplier lead time is estimated to be 81 days. A standard deviation of 45.94 days is ideal, suggesting that data were somewhat deviated from the mean. However, a standard error of the mean estimated at 3.05 days is small, indicating that the estimates were a good representation of the population - at any selected point in time, expected results would be more or less the same as expected (p-value=0.05) with a 5% significance level.

4.2.1 Adherence to supplier lead time

The adherence to supplier lead time was measured by taking into consideration the number of days agreed in the call off contract between MSD and suppliers. The minimum time frame in all call off contracts examined by the researcher was 30 days while the maximum was 120 days. Figure 4.2 illustrates the number of suppliers who delivered goods within the agreed range of time.

Figure 4.2: Adherence to supplier lead time

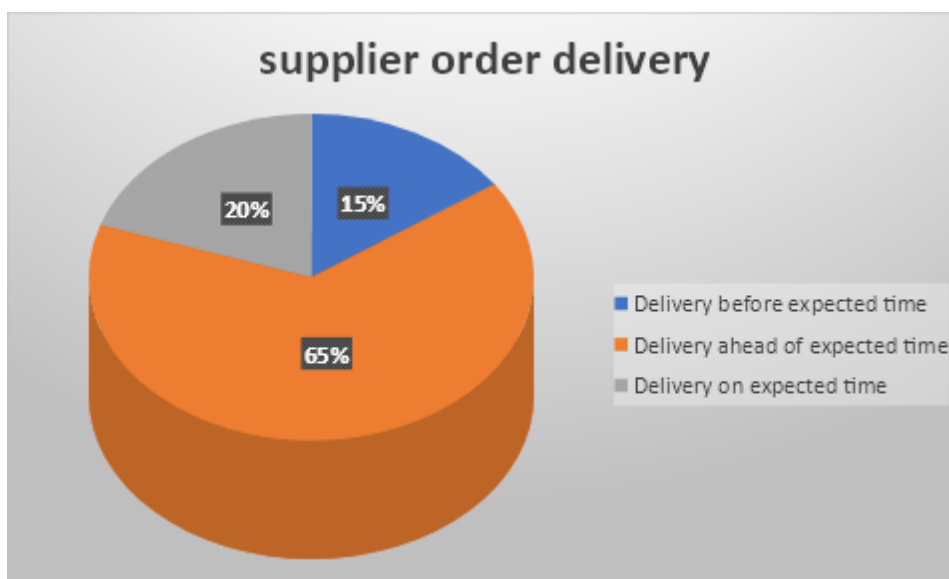


Figure 4.2 show that out of 227 items, 35 (15%) items were delivered before expected time, 147 (65%) items were delivered ahead of expected time and the remaining 45 (20%) items were delivered on time. The findings indicate that there was variation in exact order delivery dates in respect of call off order delivery dates.

Discussion: Findings indicate that majority 147 items equivalent to 65% of all items were delivered late which is a serious concern and negatively affects the timely procurement of medicines and only 80 items equivalent to 35% were delivered within the time range. Results show that such a delay will ultimately affect the total procurement lead time. This is similar to a study that was carried out by Cynthia *et al* on medicine shortages and challenges with the procurement processes among public sector hospitals in South Africa which hinted that the determinants of medicines shortages included among other things non-performance of suppliers⁷². Also another study that was conducted in 2022 in England on factors affecting supply of palliative medicines revealed that stock availability depends on, among other things, the supplier lead time⁷⁰. This means that medicines have to be delivered timely to ensure that the supply chain is not disrupted. In addition, it is essential to constantly evaluate suppliers' performance to ensure that they comply with all contractual conditions.

Interpretation: The results and discussion infer that supplier lead time affects timely procurement of medicines by increasing the total time taken to receive medicines from suppliers at MSD. Also in this study, findings indicate that MSD needs an emergency action plan to ensure suppliers adhere to the agreed lead time so that orders are timely delivered to MSD and finally to health facilities. Furthermore, MSD needs a contingency plan to ensure the supply chain is not disrupted in future events of order delays.

4.3 Effect of Cycle time (PO cycle time and payment processing time) and supplier lead time on timely procurement of medicines

The effect of purchase order (PO) cycle time, payment processing time, and supplier lead time on timely procurement of medicines was investigated using a linear regression model. To establish independence, the normality and non-multicollinearity assumptions were checked, and data were converted using natural logarithms after outliers were removed. To reduce independent variables that could show singularity concerns, a stepwise strategy was adopted.

The model summary shows that the three parameters, purchase order (PO) cycle time, payment processing time, and supplier lead time, explain at least 96.7% of variation in timely procurement of medicines (see appended Table 4). Appended Table 6 shows that all three models were fit at all three stages. A first model with only OLT included yields $F = 318.9$, $p = 0.000$, and $df = 1$, suggesting that the model was fit. A second model with OLT and PLT added yields $F = 566.34$, $p = 0.000$, and $df = 2$, suggesting that the model was also fit. A third model, which included OLT, PLT, and SLT, yielded $F = 221.3$, $p = 0.000$, and $df = 3$, suggesting that the model was also fit. Table 4.5 contains further regression coefficient results.

Table 4.5 Regression results on effect of cycle time and supplier lead time on timely procurement of medicines

Variables	B	t	p-value	95% CI		VIF
				Lower CI	Upper CI	
Constant	1.14	15.98	0	0.998	1.279	-
Natural log of PO Cycle time	0.34	46.51	0	0.326	0.355	1.09
Natural log of payment lead time	0.26	30.17	0	0.24	0.274	1.23
Natural log of supplier lead time	0.4	61.05	0	0.387	0.413	1.19

Dependent Variable: Natural log of timely procurement of medicines.

(F = 221.3, p = 0.000, df = 3, Adjusted R square statistic = .967)

Table 4.5 regression results show that a natural log of PO cycle time has a positive effect on a natural log of timely procurement of medicines (B =.340, p-value =.000, CI: .326-.355, VIF 1.086). At a 5% level of significance, the finding demonstrates that PO cycle time influences timely procurement of medicines by 34%. A variance inflation factor (VIF) of 1.086, less than 4, suggests that there was no severe difficulty with multicollinearity and that the model was not over-fitted by considering PO cycle time. The PO cycle time coefficient is the second largest of all the coefficients, indicating that PO cycle time has a second considerable predictive power on timely procurement of medicines.

Table 4.5 shows that a natural log of payment processing time had a favorable effect on the natural log of timely procurement of medicines ($B = .257$, $p\text{-value} = .000$, $CI: .240\text{--}.274$, $VIF = 1.226$). At a 5% level of significance, the finding implies that a change in payment processing time would positively affect timely procurement of medicines by 26%. A variance inflation factor (VIF) of 1.226, less than 4, suggests that there was no severe difficulty with multicollinearity and that the model was not over-fitted by integrating payment processing time. The payment processing time coefficient is the smallest of all the coefficients, indicating that payment processing time has the least predictive potential on timely procurement of medicines.

Table 4.5 regression findings indicate that a natural log of supplier lead time has a positive effect on a natural log of timely procurement of medicines. ($B = .400$, $p\text{-value} = .000$, $CI: .387\text{--}.413$, $VIF = 1.192$). Thus, at a 5% significance level, a unit increase in supplier lead time would positively improve timely procurement of medicines by 40%. A variance inflation factor (VIF) smaller than 4 shows that there was no severe difficulty with multicollinearity and that the model was not over-fitted by considering supplier lead time. The supplier lead time coefficient is the greatest of all the coefficients, indicating that supplier lead time has a significant predictive potential on timely procurement of medicines.

4.4 Challenges that affect timely procurement of medicines

Primary data were obtained from MSD staff, health facilities (MSD customers) and suppliers. A total of 55 items were measured with regard to challenges that affect timely procurement of medicines. A five-point agreement scale was used. The scale was given as Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4 and Strongly Agree = 5. Both quantitative and qualitative techniques were used to analyse primary data. Means for responses on each of given 55 items were estimated using SPSS. For data reduction purposes a threshold of lowest value 1 through

2.4 was used to negating a positive statement or item into a negative statement (considered strongly disagree or disagree). Also a threshold of 3.5 through highest value 5 was used to affirm a positive statement (considered Agree or strongly agree). Qualified items were compiled for further analysis where qualitative analysis technique referred to as “Thematic Analysis” with six stages was applied.

Step 1: Familiarity with data

At this step an overall overview of data was extracted. The data overview revealed respondents were ending up with challenges related to PO cycle time, payment processing time, suppliers and challenges related to MSD as perceived by health facilities. Therefore, in the next step coding of data was following the arrangement as Factors related to PO cycle time, Factors related to Payment processing time, Factors related to Supplier lead time, MSD versus Health facilities and MSD versus Supplier. Details of data as were familiarized are presented in appended Table 7. The next step was data coding.

Step 2: Generating initial codes

At this step a theoretical thematic analysis was preferred to inductive one because the researcher intends to answer a specific research question on challenges that affect timely procurement of medicines.

An open coding was used to save time and avoid unnecessary deviation from the key question of research. The generated codes are presented in Appended Table 8. The next step was to search for themes out of the codes as shown in details of Step 3.

Step 3: Search for themes

At this step the generated codes were grouped under similarity bases to form a theme out of the significance of each code in the group. The preliminary themes were created and presented in Appended Table 9. Having organized preliminary themes in Step 3 above the next step was to review the themes as shown in details of Step 4.

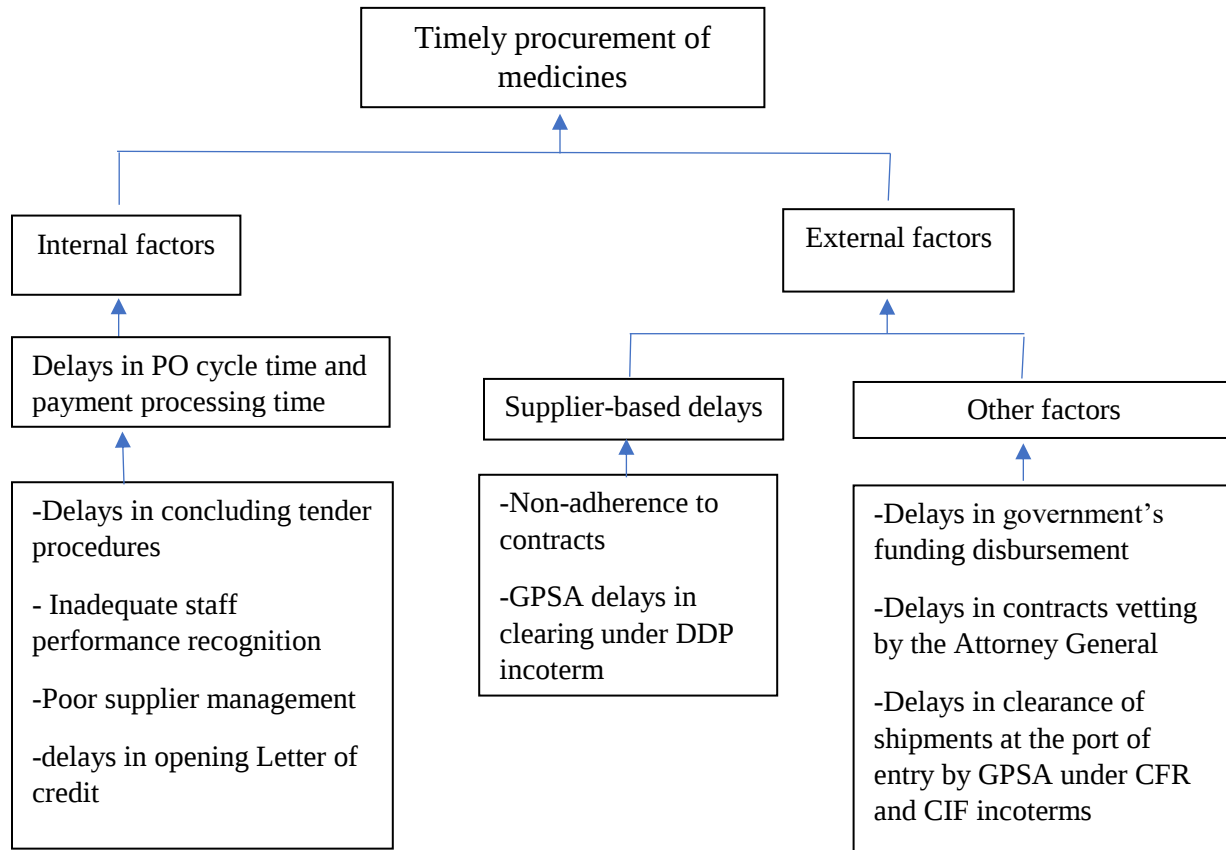
Step 4: Review of themes

At this step themes were reviewed to ensure that themes make sense, data fit the themes and whether there are overlaps and themes within themes. Therefore, themes were regrouped and reviewed to connect to the meaning of data within each theme. The results are presented in Appended Table 9. Having reviewed themes in Step 4 above the next step was to define the themes as shown in details of Step 5 below.

Step 5: Defining the themes

This was the final filter to make sense of what the themes were about and interconnectedness of the themes with subthemes. The thematic map was drawn and presented in Figure 4.3.

Figure 4.3 Thematic map



From the thematic map in Figure 4.3 it is clearly presented that challenges that affect timely procurement of medicines are grouped as internal factors and external factors. Internal factors include MSD based delays while external factors include Supplier Based delays and other factors. Internal factors which are MSD based delays are rooted in PO Cycle delays and Payment processing delays and on the other hand, external factors that are supplier based delays are rooted in noncompliance with contracts and delays in clearance of shipments by GPSA at the port of entry.

Step 6: Write up

In this step the purpose is to link the findings in the previous step with the study context and supportive data to make a conclusive presentation of findings. The write up is drawn from the themes presented in Figure 4.3 as follows: -

4.4.1 Challenges associated with MSD delays

MSD based delays are rooted in PO Cycle delays and Payment processing delays. Also, both PO cycle and payment processing delays are rooted in Delays in concluding tender procedures, Inadequate staff performance recognition, Poor supplier management and delays in opening the letter of credit.

4.4.1.1 Delays in concluding tender procedures

Tender procedures must be fast to allow other processes to run on time. Any delay in the tendering process adds many days to the order cycle, which ultimately lengthens procurement lead times. In addition, delays at any stage can put pressure on suppliers, who need time to plan and allocate funds for each upcoming production run

4.4.1.2 Inadequate staff performance recognition

The findings suggest that there is inadequate staff performance recognition which de-motivates staff especially in the procurement department. Unmotivated staff cannot perform well in execution of responsibilities including timeliness in all manners. The trend of delayed actions and execution of responsibilities have negative effect on PO cycle time and payment processing time which in turn prolong procurement lead time.

4.4.1.3 Poor supplier management

Supplier management is critical to ensuring that suppliers comply with contracts. However, the findings show that supplier management is sometimes deficient due to poor supplier monitoring. Poor supplier management means that suppliers behave in ways that cause unnecessary delays in order delivery. Suppliers typically have multiple customers in different countries around the world, so close monitoring is needed to ensure that they do not skip or postpone MSD orders for other orders from other customers. As a result, failure to track suppliers can potentially extend order delivery dates and affect timely procurement of medicines..

4.4.1.4 Delays in opening letter of credits

The findings show that there are several delays in opening letters of credit at MSD, which causes delays for suppliers. This is because suppliers cannot start manufacturing medicines if the letter of credit has not been issued. Delays in the issuance of the letter of credit therefore lead to delays in the delivery of orders, which affects the lead time for procurement of medicines.

4.4.2 Challenges associated with suppliers' delays

There were two findings under supplier delays which included non-compliance to contacts and delays in clearance of shipments by GPSA at the port of entry.

4.4.2.1 Non-compliance to contracts

Contracts have several conditions that both parties must meet. However, this study reveals that most suppliers do not adhere to the delivery schedules in the contracts. In each contract between MSD and suppliers, specific dates are set for delivery of shipments to MSD under DDP incoterm or to the port of entry under CFR, CIF or FOB incoterms. The dates set in the contracts represent the exact time when the procured goods are required by MSD to ensure an uninterrupted supply chain. Failure to meet these dates affects timely procurement of medicines and in turn disrupts the supply chain.

4.4.2.2 Delays in Clearance of shipments by GPSA at the port of entry

Government Procurement Services Agency (GPSA) is a government entity whose responsibilities include clearance of shipments at the port of entry. GPSA clears all the shipments for MSD under all incoterms. Findings reveal that GPSA does not clear shipments on time resulting in delays in order delivery and consequently the procurement lead time.

4.4.3 Other factors

A number of other external factors are linked to decisions and actions outside the jurisdiction of MSD and MSD staff. Externally engineered decisions and actions can interfere PO cycle and payment processes. Other external factors included delays in disbursing funds from the Government, delays in vetting contracts by the Attorney General and delays in clearance of shipments at the port of entry by the Government Procurement Services Agency (GPSA) which may have to inevitably prolong PO cycle time and payment processing time consequently the timely procurement of medicines.

5. CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter provides summary of findings, conclusion and recommendations. The overall objective of this study was to assess the effect of cycle time and supplier lead time on timely procurement of medicines in Tanzania. The study aimed at achieving three objectives. The first objective was to measure the effect of cycle time on timely procurement medicines, the second objective was to measure the effect of supplier lead time on timely procurement of medicines and the third objective was to identify challenges that affect timely procurement of medicines.

The study collected data from procurement related documents as per each variable and also data was collected by using a close ended questionnaire. A sample size of 132 respondents was targeted however, only 99 respondents participated in providing responses.

5.1 Summary of research findings

Findings for the first objective indicate that cycle time (PO cycle time and payment processing time) affects timely procurement of medicines by increasing the total time taken for MSD to receive medicines from suppliers if all steps and activities are not processed on time. PO cycle time affects procurement of medicines by 34% and similarly payment processing time affects the timely procurement of medicines by 26%.

Findings for the second objective indicate that supplier lead time also affects timely procurement of medicines by increasing the total time taken for MSD to receive medicines from suppliers if the goods are delayed. Supplier lead time affects timely procurement of medicines by 40%.

Findings for the third objective showed that challenges that affect timely procurement of medicines were grouped as internal factors and external factors. Internal factors included MSD based delays while external factors include Supplier Based delays and other factors. Internal factors which are MSD based delays were rooted in PO Cycle delays and Payment processing delays which included delays in concluding tender procedures, inadequate staff performance recognition, poor supplier management and delays in opening letters of credit. and on the other hand, external factors that are supplier based delays were rooted in noncompliance with contracts and delays in clearance of shipments by GPSA at the port of entry also other included delays in government's funding disbursement, delays in contract vetting by the Attorney General and delays in clearance of shipments at the port of entry by GPSA under CFR, CIF and FOB incoterms.

5.2 Conclusion

In relation to the first to Objective, timely procurement of medicines was found to be affected by cycle time (PO cycle time and payment processing time). Any change in these variables could have a significant impact on the total lead time, resulting in delays in the receipt of goods. MSD is in a better position to ensure that most delays are avoided, since PO cycle time and payment processing time lie within MSD. Therefore, ensuring that all deadlines are met could reduce delays somewhat.

Similarly, for the second objective, timely procurement of medicines proved to be affected by supplier lead time. Suppliers must adhere to the delivery schedule agreed in their contracts, so as not to disrupt the supply chain. On the other hand, even though supplier lead time is the supplier's responsibility, MSD is able to improve it by ensuring that all suppliers comply with

contracts, failing which they are blacklisted and can no longer participate in tendering procedures,

Finally, the third objective showed that challenges that affect timely procurement of medicines were found to originate internally from MSD and also externally from suppliers and other factors that were outside the jurisdiction of MSD. Internally MSD caused delays in different ways such as delays in concluding tender procedures, inadequate staff performance recognition, poor supplier management and delays in opening letters of credit. Externally suppliers affected timely procurement of medicines by non-adherence to contracts and delays caused by GPSA in clearing goods under DDP incoterm. On the other hand, other factors outside MSD's jurisdiction included delays in government's funding disbursement, delays in contract vetting by the Attorney General and delays in clearance of shipments at the port of entry by GPSA under CFR, CIF and FOB incoterms.

5.3 Recommendations

Based on the outcomes of the study, the researcher recommends that: -

- a. MSD should ensure that framework contracts are always in place so that new orders are placed with suppliers as soon as they are received, in order to reduce the PO cycle time.
- b. MSD should ensure that all timelines set are being followed to avoid unnecessary delays in PO cycle time and payment processing time.
- c. MSD must carry out a progressive evaluation of suppliers in order to eliminate non-compliant suppliers and thus improve supplier lead times.

- d. The Ministry of Health should direct GPSA to clear goods on time, failing which customs clearance of the medicines would be the responsibility of the suppliers under the DDP incoterm and of MSD under the CFR, CIF and FOB incoterms.
- e. The Government should ensure that funds are disbursed on time to MSD to avoid delays due to late payments or lack of fund.
- f. MSD should reach an agreement with the Attorney General on the number of days required for contract vetting in order to reduce delays caused by late signing of contracts.

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APPENDICES

Appendix A: Ethical Approval

The Director General,
Medical Stores Department,
P.O. Box 9081,
Dar es Salaam,



5 September 2022

RE: PERMISSION TO COLLECT DATA AT MSD ON PROCUREMENT LEAD TIME WHICH IS A REQUIREMENT FOR PARTIAL FULFILLMENT OF A MASTERS OF HEALTH SUPPLY CHAIN MANAGEMENT AT THE UNIVERSITY OF RWANDA

Kindly refer to the subject above.

2. My name is Faith Edmin, an employee at the Medical Stores Department and a student at the University of Rwanda. I am enrolled in a master's program in Health Supply Chain Management that both coursework and thesis requirements. I started the coursework in November 2020 and I am now in the process of writing my thesis.
3. The title of my thesis is "FACTORS AFFECTING PROCUREMENT LEAD TIME OF MEDICINES IN TANZANIA: A CASE STUDY OF THE MEDICAL STORES DEPARTMENT". Having worked in a procurement department, I was curious to understand the overall lead time in procuring medicines in our country as well as possible factors that might influence it. MSD being the government medicine procurement agency was the only choice to undertake my study.
4. The essence of this study is to provide required solutions for addressing some of the key issues affecting the procurement lead time of medicines. This way, the study will contribute to an inventory of solutions aimed at eradicating the challenges affecting the procurement lead time of medicines and, in this manner, facilitate in achieving the goal of higher-quality livelihood for all Tanzanians as documented in the Tanzania Development Vision 2025. Again, as focused and exhaustive studies on procurement lead time relative to the selected variables (purchase order Cycle time, payment processing time and supplier lead time) in relation to MSD are scanty, this study will, not only contribute to an in-depth understanding of the subject matter but also serve as a reference in other alike studies.
5. I look forward to receiving your approval.

Faith Edmin

JAMHURI YA MUUNGANO WA TANZANIA

**OFISI YA RAIS
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Unapojibu tafadhali taja:-

Kumb. Na. AB. 307/223/01

14/11/2022

Makatibu Tawala wa Mikoa,
Dar es Salaam, Singida, Mwanza na Geita

**YAH: UTAMBULISHO KWA WANAFUNZI WA SHAHADA YA UZAMILI KATIKA
UKUSANYAJI WA TAARIFA**

Tafadhali husika na somo tajwa hapo juu.

2. OR-TAMSEMI imepokea maombi ya ukusanyaji wa taarifa kutoka kwa wanafunzi wa shahada ya uzamili katika mnyororo wa ugavi wa bidhaa za Afya (*Masters of Health Supply Chain Management*) katika Chuo Kikuu cha Rwanda katika vituo vya kutolea huduma za Afya nchini.
3. Aidha, wanafunzi hao wameandaa "*Research Proposal*" mbalimbali na kuziwasilisha chuoni na kupewa kibali cha kuendelea na ukusanyaji wa taarifa nchini kwa ajili ya kukamilisha research zao. Wafuatao ni wanafunzi ambao wataenda katika maeneo mbalimbali nchini ikiwemo Mkoa wako kwa ajili ya zoezi la kukusanya taarifa.
4. Ninakuomba uwapokee na kuwapa ushirikiano kwakuwa tafiti hizi zitakuwa na michango mkubwa katika nchi hasa katika eneo la mnyororo wa bidhaa za Afya.
 - a) Ndugu Daniel G Pyuza – Mkoa wa Singida (Halmashauri zote)
 - b) Ndugu. Green Sadru - Mkoa wa Mwanza, Halmashauri zote
 - c) Bi. Faith Edmin - Mkoa wa Dar es Salaam (Halmashauri ya Temeke)
5. Ninawashukuru kwa ushirikiano wenu.

Dkt. N. A. Kapologwe
Kny: **KATIBU MKUU**



RECOMMENDATION LETTER FOR APPLICATION FOR ETHICAL APPROVAL AND
FOR DATA COLLECTION

Information on Dissertation Project

Student name	FAITH EDMIN	
Student ID	221028862	
Project title	FACTORS AFFECTING PROCUREMENT LEAD TIME OF MEDICINES IN TANZANIA: A CASE STUDY OF THE MEDICAL STORES DEPARTMENT	
Supervisors:	1. DR. FAUSTINE PETER PANGA 2. MR. MASALA	
Contact details of the Student	Phone +255745 189986	E-mail faith.shanghvi@gmail.com
Degree enrolled in	MASTER'S IN HEALTH SUPPLY CHAIN MANAGEMENT	
Project location	MEDICAL STORES DEPARTMENT, TANZANIA	

RECOMMENDATION

This is to certify that Ms. Faith EDMIN has developed her research proposal (see title above) and presented it to the EAC RCE-VIHSCM Scientific Panel for approval in June 2022. After scientific review and approval by the Research Unit of the EAC RCE-VIHSCM, she is now recommended to submit her research proposal to relevant ethical bodies for ethical approval and to the research site where data collection will be conducted to be able to finish her dissertation in partial fulfilment of the requirements for the award of the Degree of Master's in Health Supply Chain Management.

Any support and cooperation during this process will be highly appreciated.


Dr Stephen KARENGERA
Director
EAC RCE - VIHSCM

Appendix B: A questionnaire on the MSD staff in the procurement, finance and logistics and operations departments



UNIVERSITY OF RWANDA COLLEGE OF MEDICINE AND HEALTH SCIENCES THIRD IN-TAKE

A questionnaire administered on the MSD staff in partial fulfillment of a
MASTERS OF HEALTH SUPPLY CHAIN MANAGEMENT (MHSCM)

1. Name of respondent (optional): _____
2. Position of the respondent (optional): _____
3. Name of department: _____
4. Number of months _____ or years _____ in the department.
5. Previous department at MSD: _____
6. Number of months _____ or years _____ in the previous department.
7. Number of years at MSD _____

Please respond to the below categories of questions by selecting (✓) only one answer that best describes your experience with the MSD's procurement

process and outcomes. Kindly consider the following legend:

1= Strongly Disagree

2= Disagree

3= Neutral

4= Agree

5= Strongly Agree

A: Purchase order (PO) cycle time	1	2	3	4	5
1. MSD considers PO cycle time as a critical criterion in adhering to timely procurement of medicines.					
2. MSD measures its PO cycle time.					
3. MSD measures its PO cycle time consistently.					
4. Reduction of a PO cycle time contributes substantially to customer satisfaction.					
5. Contracts are vetted timely by the Attorney General					
6. External factors affect MSD's ability to implement its PO cycle time punctually.					
7. Staff are experienced in implementing the PO cycle time punctually.					
8. MSD has a policy in place of recognizing employees who perform well in procurement activities.					
9. MSD's procurement processes are predominantly manual.					
10. Manual procurement processes are a significant contributing factor to procurement inefficiencies as evidenced in such things as errors, bias and delays.					
11. MSD conducts a periodic internal evaluation of its medicine purchasing performance.					
12. MSD is periodically assessed by external bodies in terms of its performance with the procurement of medicines.					

B: Payment processing time	1	2	3	4	5
1. MSD strives to establish long term relationship with its manufacturers.					
2. MSD processes payments in time which helps manufacturers improve their lead time compliance.					
3. MSD considers payment processing time as a key factor in meeting customer satisfaction.					
4. External factors affect MSD's ability to implement its payment processing time punctually.					
5. Manufacturers usually complain about delayed payments from MSD.					
6. Manufacturers deliver medicines even when their required payments are not made by MSD.					
7. Delayed payment processing time can cause long procurement lead times.					
8. The government disburses funds timely					
9. Staff are technically able to always process payments in time.					
10. MSD undertakes a periodical internal assessment of its performance in payment processing time.					

C: Supplier lead time	1	2	3	4	5
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1. Supplier long lead time is a constant challenge at MSD.					
2. Supplier long lead time is associated with stock outs at MSD.					
3. Suppliers often fail to abide by agreed delivery schedules.					
4. MSD relies on few dependable suppliers.					
5. MSD has measures in place to make suppliers accountable for failure to comply to the agreed delivery schedules.					
6. MSD actually implements measures to make suppliers accountable for failure to abide by agreed delivery schedules.					
7. GPSA clears consignments timely under CIF, CFR and FOB					
8. MSD has a policy in place of recognizing suppliers who adhere to the stated delivery schedules.					
9. Supplier long lead time is due to many other reasons additional to supplier payment processing time and long purchase order cycle.					
10. MSD faces the challenge of weak supplier management (e.g., poor supplier evaluation and monitoring) that often affects its procurement.					

Please submit the completed questionnaire to Faith Edmin by Friday 10 January 2023.

Thank you very much for your responses and timely submission!

For enquiries, please contact:			
-Ms. Faith Edmin	Student	faith.shaghvi@gmail.com	0745189986
-Dr. Faustine Peter Panga	Supervisor	faustine.panga@gmail.com	0755891062
- Mr. Marco Masala	Supervisor	marcomasala28@gmail.com	0768546323

Appendix C: A questionnaire administered on Manufacturers



**UNIVERSITY OF RWANDA
COLLEGE OF MEDICINE AND HEALTH SCIENCES
THIRD IN-TAKE**

A questionnaire administered on Manufacturers in partial fulfillment of a
MASTERS OF HEALTH SUPPLY CHAIN MANAGEMENT (MHSCM)

1. Name of respondent (optional): _____
2. Name of the company: _____
3. Position of the respondent (optional): _____
4. Number of years in the company _____

Please respond to the below categories of questions by selecting (✓) only one answer that best describes your experience with the MSD's procurement process and outcomes. Kindly consider the following legend:

1= Strongly Disagree

2= Disagree

3= Neutral

4= Agree

5= Strongly Agree

Supplier's experience with MSD	1	2	3	4	5
11. MSD opens the letter of credit on time					
12. MSD pays suppliers on time					
13. Tendering procedures are conducted openly and fairly by MSD					
14. Tendering procedures are conducted timely at MSD					
15. MSD has measures in place to make suppliers accountable for failure to comply to the agreed delivery schedules.					
16. MSD actually implements measures to make suppliers accountable for failure to abide by agreed delivery schedules.					
17. Suppliers are affected by public procurement regulations					
18. MSD complies with all terms specified in the contract					
19. MSD's failure to comply with contractual conditions leads to a significant delay in delivering medicines by manufacturers					
20. Manufacturers deliver medicines even when their required payments are not made by MSD.					
21. MSD manages supplier relationships well, ensuring continuity of service					
22. Suppliers wish to clear goods by themselves under DDP incoterm					
23. GPSA clears consignments on time under FOB					
24. Suppliers are satisfied with MSD's treatment and procedures					

Please submit the completed questionnaire to Faith Edmin by Friday 30 December 2022.

Thank you very much for your responses and timely submission!

For enquiries, please contact:			
-Ms. Faith Edmin	Student	faith.shaghvi@gmail.com	0745189986
-Dr. FaustinePanga	Supervisor	faustine.panga@gmail.com	0755891062
- Mr. Marco Masala	Supervisor	marcomasala28@gmail.com	0768546323

Appendix D: A questionnaire administered on Health facilities



UNIVERSITY OF RWANDA COLLEGE OF MEDICINE AND HEALTH SCIENCES THIRD IN-TAKE

A questionnaire administered on Health Facilities in partial fulfillment of a
MASTERS OF HEALTH SUPPLY CHAIN MANAGEMENT (MHSCM)

8. Name of respondent (optional): _____
Jina la anayejibu (sio lazima)
9. Position of the respondent (optional): _____
Cheo (sio lazima)
10. Name and type of Health Facility: _____
Jina na aina ya kituo cha kutolea huduma
11. Number of years at the Health facility: _____
Miaka uliyo fanya kazi katika kituo hiki

Please respond to the below categories of questions by selecting (✓) only one answer that best describes your experience with the MSD's procurement process and outcomes. Kindly consider the following legend.

(Tafadhali jibu maswali yafuatayo kwa kuweka alama ya tick (✓) kulingana na uzoefu wako kwakutumia maelezo yaliyowekwa hapo chini):

1= Strongly Disagree – Sikubaliani kabisa

2= Disagree - sikubaliani

3= Neutral- sijui

4= Agree- Nakubali

5= Strongly Agree- Nakubaliana sana

Health facilities experience with MSD	1	2	3	4	5
25. MSD delivers requested orders on time MSD huleta mahitaji yaliyooombwa kwa wakati					
26. MSD fulfills orders as requested. MSD hutimiza kiasi cha mahitaji kama kilichooombwa					
27. MSD ensures that most medicines are available at all time MSD inahakikisha dawa nyingi zinapatikana muda wote					
28. Most medicines are always out of stock at MSD Muda mwingi dawa nyingi hazipatikani MSD					
29. MSD responds to customers timely MSD hujibu wateja kwa wakati					
30. Health facilities are satisfied with MSD's order fulfilment Vituo vingi vya afya vinaridhishwa na upatikanaji wa dawa MSD					
31. MSD considers lead time as a key factor in meeting customer (health facilities) satisfaction. MSD huzingatia kutimiza muda walioahidiana na wateja kupeleka dawa kama kigezo cha kumridhisha mteja					
32. The MSD staff I have encountered are friendly and welcoming. Wafanyakazi wa MSD hutoa huduma bora kwa wateja					
33. MSD manages customer relationships well, ensuring satisfaction to customers MSD huzingatia mahusiano na wateja wake na kuhakikisha wanaridhika					

Please submit the completed questionnaire by Friday 30 December 2022.
Tafadhali wasilisha dodoso lililojazwa kwa ukamilifu kufikia Ijumaa 30 Disemba 2022.

Thank you very much for your responses and timely submission!

Asante kwa ushirikiano wako!

For enquiries, please contact:

Kwa mawasiliano Zaidi:

-Ms. Faith Edmin	Student/Mwanafunzi	faith.shaghvi@gmail.com	0745189986
-Dr. Faustine Panga	Supervisor/msimamizi	faustine.panga@gmail.com	0755891062

Appendix E

Figure 1: Data Cleaning Progress Results

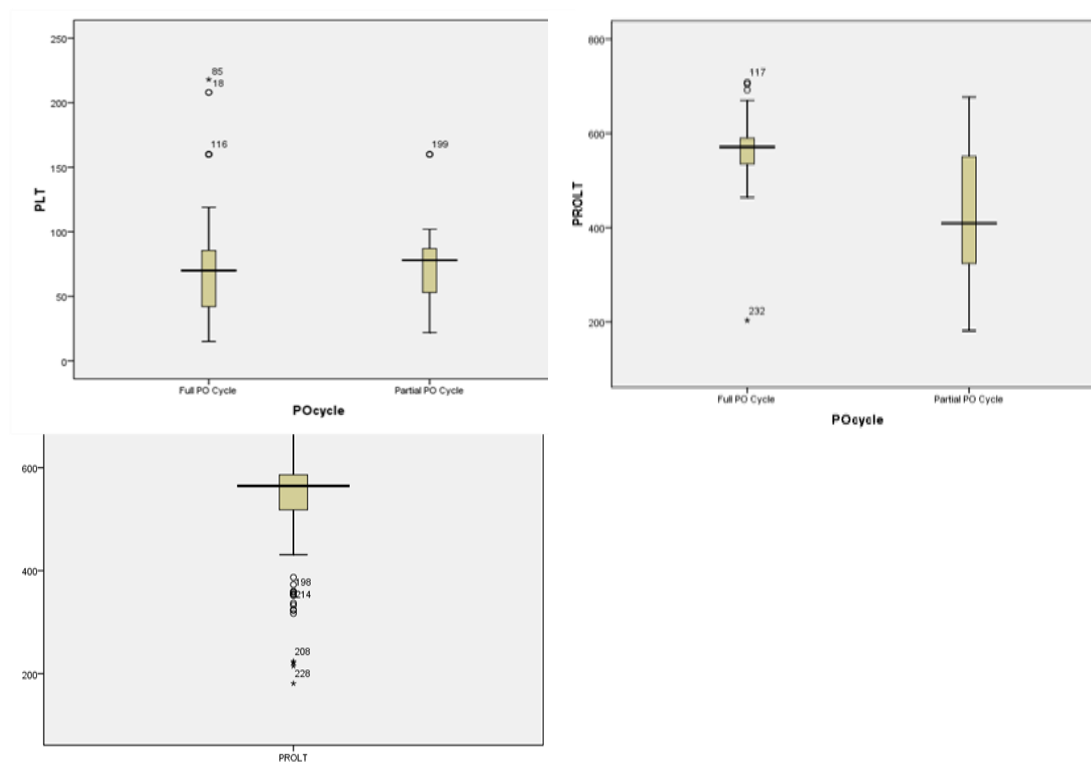


Figure 1: Outliers in study variables

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.766 ^a	.586	.585	.1145
2	.914 ^b	.835	.833	.0725
3	.984 ^c	.968	.967	.0322

a. Predictors: (Constant), LNPOCycle

b. Predictors: (Constant), LNPOCycle, LNSLT

c. Predictors: (Constant), LNPOCycle, LNSLT, LNPPT

d. Dependent Variable: LNPLT

Table 5: ANOVA^d

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.185	1	4.185	318.992	.000 ^a
	Residual	2.952	225	.013		
	Total	7.136	226			
2	Regression	5.958	2	2.979	566.338	.000 ^b
	Residual	1.178	224	.005		
	Total	7.136	226			
3	Regression	6.904	3	2.301	2.213E3	.000 ^c
	Residual	.232	223	.001		
	Total	7.136	226			

a. Predictors: (Constant), LNPOCycle

b. Predictors: (Constant), LNPOCycle, LNSLT

c. Predictors: (Constant), LNPOCycle, LNSLT, LNPPT

d. Dependent Variable: LNPLT

Regression output

Table 6: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	4.066	.110		36.816	.000	3.849	4.284		
	LNPOCycle	.381	.021	.766	17.860	.000	.339	.423	1.000	1.000
2	(Constant)	2.860	.096		29.813	.000	2.671	3.049		
	LNPOCycle	.330	.014	.664	23.943	.000	.303	.357	.960	1.042
	LNSLT	.296	.016	.509	18.361	.000	.264	.328	.960	1.042
3	(Constant)	1.139	.071		15.983	.000	.998	1.279		
	LNPOCycle	.400	.007	.805	61.051	.000	.387	.413	.839	1.192
	LNSLT	.340	.007	.585	46.514	.000	.326	.355	.921	1.086
	LNPPT	.257	.009	.403	30.169	.000	.240	.274	.815	1.226

a. Dependent Variable: LNPLT

Table 7: Familiarity with data

Factors related to PO cycle time	Factors related to Payment processing time	Factors related to Supplier lead time	MSD vs Health facilities	MSD vs Supplier
Staff have good experience in procurement	Pay in time to create good relationship with suppliers	Supplier lead time is a constant challenge	MSD delivers requested orders on time	MSD opens the letter of credit on time
Staff are recognized when perform well	Payments in time to improve supplier lead time compliance	Supplier long lead time	MSD fulfills orders as requested	MSD pays suppliers on time
MSD system of predominantly manual approach	Staff technically able to process payment	Supplier failure to abide by delivery schedule	MSD ensures that most medicines are available at all time	Tendering procedures are conducted openly and fairly by MSD
Manual procurement processes..errors, bias and delays	Periodic internal assessment in payment processing	Delayed payments to supplier	Most medicines are always out of stock at MSD	Tendering procedures are conducted timely at MSD
Periodic assessments for PO cycle performance	Payment processing affected externally	MSD relies on few dependable suppliers	MSD responds to customers timely	MSD has measures in place to make suppliers accountable for failure to comply to the agreed delivery schedules
External bodies assessments on PO cycle performance		Measures in place to make supplier accountable	The MSD staff I have encountered are friendly and welcoming	MSD actually implements measures to make suppliers accountable for failure to abide by agreed delivery schedules

MSD measures PO cycle time		Measures taken against supplier in compliance	Health facilities are satisfied with MSD's order fulfillment	Suppliers are affected by public procurement regulations
MSD measures PO cycle time consistently		MSD targets at customer satisfaction	MSD considers lead time as a key factor in meeting customer (health facilities) satisfaction	MSD complies with all terms specified in the contract
		Policy in place to recognize compliant suppliers	MSD manages customer relationships well, ensuring satisfaction to customers	MSD's failure to comply with contractual conditions leads to a significant delay in delivering medicines by manufacturers
		Weak supplier management (poor supplier evaluation and monitoring)		MSD manages supplier relationships well, ensuring continuity of service
				Suppliers are satisfied with MSD's treatment and procedures
				Suppliers wish to clear goods by themselves under DDP incoterm
				Suppliers are happy with GPSA clearing their goods

Table 8: Transformed and organized codes

Factors related to PO cycle time	Factors related to Payment processing time	Factors related to Supplier lead time	MSD vs Health facilities	MSD vs Supplier
Lack of well experienced staff in procurement	Delayed payment create bad relationship with suppliers	Supplier lead time is a constant challenge	MSD fails to deliver requested orders on time	MSD delays to opens the letter of credit
Inadequate staff recognition for performance	Delayed payments discourage supplier lead time compliance	Supplier long lead time	MSD seldom fulfills orders as requested	MSD pays suppliers lately
Rare periodic assessments for PO cycle performance	Staff technically able to process payment	Supplier failure to abide by delivery schedule	MSD fails to ensure that most medicines are available at all time	Tendering procedures are conducted with limited transparency and lack fairness
Irregular external bodies assessments on PO cycle performance	Lack of periodic internal assessment in payment processing	Delayed payments to supplier	Most medicines are always out of stock at MSD	Tendering procedures are conducted out of time at MSD
MSD measures PO cycle time	Payment processing affected externally	MSD relies on few dependable suppliers	MSD delays to respond to customers	MSD has no effective measures in place to make suppliers accountable for failure to comply to the agreed delivery schedules
MSD measures PO cycle time consistently		Less effective measures in place to make supplier accountable	Some MSD staff are neither friendly nor welcoming to customers in health facilities	MSD seldom implements measures to make suppliers accountable for failure to abide by agreed delivery schedules
		Difficult for measures to be taken against	Health facilities are not satisfied	Suppliers are affected by public

		supplier incompliance	with MSD's order fulfillment	procurement regulations
		MSD fails to target for customer satisfaction	MSD fails to consider lead time as a key factor in meeting customer (health facilities) satisfaction	MSD may not comply with all terms specified in the contract
		No clear policy in place to recognize compliant suppliers	MSD manages customer relationships poorly, causing dissatisfaction to customers	MSD's failure to comply with contractual conditions leads to a significant delay in delivering medicines by manufacturers
		Occasional weak supplier management (poor supplier evaluation and monitoring)		MSD manages supplier relationships poorly, causing discontinuity of service
				Suppliers are not satisfied with MSD's treatment and procedures

Table 9: Themes and topics

THEME: Procurement Personnel	THEME: Delayed payments process	THEME; Supplier challenges	THEME: Poor inventory/stock management	THEME: Poor supplier management
Expertise and experience	Delayed payment create bad relationship with suppliers	Supplier lead time is a constant challenge	MSD fails to deliver requested orders on time	No clear policy in place to recognize compliant suppliers
Well experienced staff in procurement	Delayed payments discourage	Supplier long lead time	MSD seldom fulfills orders as requested	Occasional weak supplier management (poor supplier

	supplier lead time compliance			evaluation and monitoring
Staff technically able to process payment	MSD pays suppliers lately	Supplier failure to abide by delivery schedule	MSD fails to ensure that most medicines are available at all time	
Inadequate staff recognition for performance	Delayed payments to supplier		Most medicines are always out of stock at MSD	
	MSD delays to opens the letter of credit			
	Delays in PO cycle activities			
	Tendering procedures are conducted out of time at MSD			
THEME: Limited performance assessments at MSD	THEME: External factors	THEME: Supplier monopoly	THEME: Supplier accountability	THEME: Poor MSD vs Health facilities relationships
Rare internal periodic assessments for PO cycle performance	Payment processing affected externally	MSD relies on few dependable suppliers	MSD has no effective measures in place to make suppliers accountable for failure to comply to the agreed delivery schedules	MSD manages customer relationships poorly, causing dissatisfaction to customers
Irregular external bodies assessments on PO cycle performance		Less effective measures in place to make supplier accountable	MSD seldom implements measures to make suppliers accountable for failure to abide by agreed delivery schedules	MSD delays to respond to customers

MSD measures PO cycle time		Difficult for measures to be taken against supplier in compliance		Some MSD staff are neither friendly nor welcoming to customers in health facilities
MSD measures PO cycle time consistently		MSD fails to target for customer satisfaction		Health facilities are not satisfied with MSD's order fulfillment
Lack of periodic internal assessment in payment processing				MSD fails to consider lead time as a key factor in meeting customer (health facilities) satisfaction
THEME: Tendering procedures	THEME: Poor MSD supplier relationships			
Tendering procedures are conducted with limited transparency and lack fairness	MSD manages supplier relationships poorly, causing discontinuity of service			
Suppliers are affected by public procurement regulations	Suppliers are not satisfied with MSD's treatment and procedures			
	MSD may not comply with all terms specified in the contract			
	MSD's failure to comply with contractual conditions leads to a significant delay in delivering medicines by manufacturers			

Table 20: Themes and Subthemes Review

THEME: Procurement Personnel	THEME: MSD based delays	THEME: Supplier based delays	THEME: Poor inventory/stock management	THEME: Legal and policy framework
Subtheme: expertise and experience	Subtheme: Delayed payments process	Subtheme: Supplier non compliance		Subtheme: Tendering procedures
Well experienced staff in procurement	Delayed payment create bad relationship with suppliers	Supplier lead time is a constant challenge	MSD fails to deliver requested orders on time	Tendering procedures are conducted with limited transparency and lack fairness
Staff technically able to process payment	Delayed payments discourage supplier lead time compliance	Supplier long lead time	MSD seldom fulfills orders as requested	Suppliers are affected by public procurement regulations
Subtheme: Inadequate staff recognition for performance	MSD pays suppliers lately	Supplier failure to abide by delivery schedule	MSD fails to ensure that most medicines are available at all time	Subtheme: Supplier motivation policy
	Delayed payments to supplier		Most medicines are always out of stock at MSD	No clear policy in place to recognize compliant suppliers
	MSD delays to opens the letter of credit			Subtheme: inadequate supplier accountability
	Subtheme: Delays in PO cycle activities			MSD has no effective measures in place to make suppliers accountable for failure to comply to the agreed delivery schedules

	Tendering procedures are conducted out of time at MSD			MSD seldom implements measures to make suppliers accountable for failure to abide by agreed delivery schedules
				Less effective measures in place to make supplier accountable
				Difficult for measures to be taken against supplier non-compliance
THEME: Limited performance assessments at MSD	THEME: Poor MSD supplier relationships	THEME: Poor supplier management	THEME: Poor MSD vs Health facilities relationships	THEME: External factors
Rare internal periodic assessments for PO cycle performance	MSD manages supplier relationships poorly, causing discontinuity of service	Subtheme: negligent supplier evaluation	Subtheme: Lack of customer care	Payment processing affected externally
Irregular external bodies assessments on PO cycle performance		Occasional weak supplier management (poor supplier evaluation and monitoring)	MSD delays to respond to customers	
	Suppliers are not satisfied with MSD's treatment and procedures	Subtheme: Supplier monopoly	Some MSD staff are neither friendly nor welcoming to customers in health facilities	
MSD measures PO cycle time	MSD may not comply with all terms specified in the contract	MSD relies on few dependable suppliers	Subtheme: failure to meet order in full	

			Health facilities are not satisfied with MSD's order fulfillment	
MSD measures PO cycle time consistently	MSD's failure to comply with contractual conditions leads to a significant delay in delivering medicines by manufacturers		Subtheme: delays in supply MSD fails to consider lead time as a key factor in meeting customer (health facilities) satisfaction	
Lack of periodic internal assessment in payment processing			Subtheme: Dissatisfaction	
			MSD fails to target for customer satisfaction	
			MSD manages customer relationships poorly, causing dissatisfaction to customers	

