

ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE



The Assessment of Factors Affecting Pharmaceutical Inventory Management practice: The Case of Pharmaceuticals Fund and Supply Agency (PFSA) in Ethiopia

A Thesis Submitted to Addis Ababa University, School of Commerce, Department of Logistics and Supply Chain Management in Partial Fulfillment of the Requirement for the Award of Master of Arts Degree in Logistics and Supply Chain Management.

By

Welelaw Necho Mulatu

June, 2017
Addis Ababa, Ethiopia

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Ethiopia**

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Advisor: Teklegiorgis Assefa (Ass. Prof)

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Declaration

I, the undersigned, declare that this study is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the study have been dully acknowledged.

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Letter of Certification

This research project has been submitted to Addis Ababa University, School of Commerce, Department of Logistics and Supply Chain Management for examination with my approval as a University Advisor

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List of Acronyms and Abbreviations

AST	Adaptive Structuration Theory
CMS	Central Medical Store
EOQ	Economic Order Quantity
FEFO	First Expired First Out
FMOH	Federal Ministry of Health
IPLS	Integrated Pharmaceuticals Logistics System
IM	Inventory Management
JIT	Just In Time
LMIS	Logistics Management Information System
MRP	Material Requirement Planning
PFSA	Pharmaceuticals Fund and Supply Agency
PSTP	Pharmaceuticals Supply Transformation Plan
RDF	Revolving Drug Fund
SCM	Supply Chain Management
SOP	Standard Operating Procedure
TCE	Transaction Cost Economics
VMI	Vendor Managed Inventory

Table of Contents

Page

Acknowledgment	V
List of Acronyms and Abbreviations	VI
List of Tables	IX
List of Figures	IX
Abstract	X
CHAPTER ONE: INTRODUCTION	1
1.1. Background of the Study	1
1.2. Statement of the Problem	4
1.3. Research Question.....	5
1.4. Research Objectives	5
1.5. Significance of the Study	6
1.6. Scope of the Study	6
1.7. Limitation of the Study	6
1.8. Definition of Terms	6
1.9. Organization of the Study	7
CHAPTER TWO: RELATED LITERATURE REVIEW	8
2.1. Theoretical review	8
2.2. Empirical Literature Review	10
2.2.2. Conceptual Framework	12
CHAPTER THREE: METHODOLOGY	14
3.1. Description of the Study Area	14
3.2. Research Approach	14
3.3. Research Design.....	14
3.4. Population and Sample	14
3.5. Data Collection Procedures	15
3.6. Ethical Consideration	16
3.7. Data Analysis	16
CHAPTER FOUR: RESULTS, DISCUSSION and INTERPRETATION	18
4.1. Validity of the Questionnaire	18
4.2. Demographic Characteristics of Respondents	19
4.3. Effect of Policy and Procedures on the Inventory Management practice	20
4.4. Effect of Management Support on the Inventory Management practice of PFSA	22
4.5. Effect of Staff Competency on PFSA Inventory Management Practice	25
4.6. Effect of IT on the PFSA Inventory Management practice	28
4.7. Inventory Management Practice at PFSA.....	29
4.8 Results of Key Informant Interview	30

4.9. Inferential Statistics	33
CHAPTER FIVE: SUMMARY, CONCLUSION and RECOMMENDATION	36
5.1. Summary of Findings	36
5.2. Conclusion.....	38
5.3. Recommendations	38
REFERENCE	40
Annex 1: Questionnaire.....	43
Annex 2: In-depth interview guiding questions	47
Annex 3: Effect of management support on the PFSA IM practice	48
Annex 4:Effect of IT on the PFSA inventory management practice	49
Annex 5: Logistics regression Output.....	49

List of Tables

Table 1: Reliability of variables based on Cronbach’s alpha level.....	18
Table 2: Background information of respondents, March 2017.....	19
Table 3: Regulatory policies and procedures are suitable for IM practice of PFSA.....	21
Table 4: PFSA has long procurement procedures that affects IM practice.....	22
Table 5: lack of management support inhibited the implementation of IM.....	23
Table 6: Management devised a mechanisms to create integration with key stakeholders.....	24
Table 7: Staffs knowledge and skill affects inventory management practice.....	26
Table 8: IT improved the current inventory management practice of PFSA.....	28
Table 9: Effect of IT on the PFSA inventory management practice.....	29
Table 10: Inventory management practice at PFSA.....	29
Table 11: Hosmer and Lemeshow Test.....	33
Table 12: Model Summary.....	34
Table 13: Logistics regression output.....	35

List of Figures

Figure 1: Conceptual Framework (adopted from Ondari, 2016.....	12
Figure 2: The IM system at PFSA is in line with government policies and procedures.....	20
Figure 3: PPP has a negative influence on implementation of IM system at PFSA.....	21
Figure 4: Management facilitate deployment of inventory management techniques.....	23
Figure 5: Management supports enforcement of SOPs.....	24
Figure 6: Fund management system affects positively the IM practice.....	25
Figure 7: PFSA staffs are well trained to execute inventory management practice.....	26
Figure 8: PFSA deploys the right type and mix of professional.....	27
Figure 9: PFSA uses data strictly for decision making.....	28

Abstract

The objective of this study was to assess factors affecting inventory management practice at the Pharmaceutical Fund and Supply Agency in Ethiopia. The study design is explanatory and both quantitative and qualitative methods were used to assess the inventory management practice. As the target population was small in number, census sampling technique was deployed. A pretested self-administered questionnaire was used for data collection. An in-depth interview was used to collect qualitative data. Binary logistic regression was used to show the relationship between the dependent and independent variables.

This study revealed that more than half of respondents (52.5%) showed their disagreement that PFSA Managements have facilitated successful deployment of inventory management. More than two third of respondents (67.2%) were in agreement with the fact that staffs knowledge and skills affects the performance of the inventory management system. The Logistics regression has showed that management support and staff competency have strong association with inventory management practice at 1% level of significance. Furthermore, the study revealed inadequate staff competency, low level of management support and poor inventory management practice at PFSA. The study also showed that majority of respondents are in agreement with the importance of information technology for the improvement of inventory management performance. Based on this, PFSA management needs to support the inventory management practice through enhancing the capacity of staffs, strengthening the information management system and deployment of modern inventory management techniques. Finally, further research is recommended to explore more factors that affects the inventory management practice at PFSA.

Key Words: Inventory management, Efficiency, Staff competency, Information Technology, Management support, Inventory Turnover

CHAPTER ONE: INTRODUCTION

This chapter gives a brief background of the study, problem statement, and significance of the study, scope of the study, objectives and limitation of the study. The background deals with the overview of inventory management practices with respect to health care supply chain.

1.1. Background of the Study

Inventory management plays a decisive role in the enhancement of efficiency and competitiveness of business enterprises. Effective inventory management entails holding an appropriate amount of inventory. Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. On the other hand, too little inventory often disrupts business operations, and increases the likelihood of poor customer service (Anisa & Susan, 2014).

As Rajeev (2008) argues, there is increased need for business enterprises to embrace effective inventory management practices as a strategy to improve their competitiveness. As cited by Godana (2014), Kotler describes inventory management as activities involved in developing and managing the inventory levels of raw materials, semi-finished materials (work-in-progress) and finished good so that adequate supplies are available and the costs of over or under stocks are low. Inventories are essential for keeping the production wheels moving, keep the market going and the distribution system intact (Nyakeri & Ochiri, 2014).

Dobler (2000) argues that well and efficiently controlled inventories can contribute to the effective operation of the firm and hence the firm's overall profit. Proper management of inventory plays a big role in enabling other operations such as production, purchases, sales, marketing and financial management to be carried out smoothly. Basic challenge however is to determine the inventory level that works most effectively with the operating system or system existing within the organization.

Furthermore, efficient inventory control can be done through introduction of different measures so as to prevent the company from incurring unnecessary losses made by different departments. Measures which can be put in place for example stock-taking which is the accounting of stock at every end of the month, so as to record the lost and available stock, etc. The company should set

up strict rules to procurement officers and store managers which they should follow during purchasing and storing of material so as to avoid loss. It is therefore important for an organization to have a sound, effective and well-coordinated inventory management system because the business environment is rapidly changing, highly competitive and it drastically affects the performance of the organization

Empirical evidence suggests that institutions throughout the world have adopted inventory management systems into their operations and changes in the organizational policy would necessitate and result in changes of inventory management. In particular, institutions will seek for systems that will enable them manage their supply chains more effectively and efficiently. In the current century, the inventory management practices have changed significantly. Developments in IT have made most of the institutional processes within organizations more efficient (Anisa and Susan W, 2014). It is for this reason that system developers and technological experts have linked up with inventory managers to develop systems that will enhance the efficiency of the inventory management process (Cachon & Fisher, 2000). Inventory control and management not only looks at the physical balance of materials but also at aspects of minimizing the inventory cost.

Key issues in the inventory management are service level and safety stock. The service level is the measurement of services from a supplier or from warehouse with the goal of never having stock outs. The principal determinant is safety stock – the higher the level of safety stock, the higher the service level. However exercise safety stock causes excessive inventory holding cost. The basic method for setting safety stock is multiplying lead time by consumption with some adjustments due to variability in consumption and lead time (MSH, 2012).

The health care supply chain in developed countries have a highly efficient systems with high turnover rates and automated systems whereas in developing countries the inventory management practice is inefficient that resulted in significant tied up in inventory and with low turnover rates (Dowling P., 2011).

Most governments in low-income countries, especially in sub-Saharan Africa, choose a distribution model where the government procures pharmaceuticals and distributes them to health facilities using a publicly run Central Medical Store (CMS) and a government-owned transport

fleet (Yadav, 2015). The annual pharmaceutical market in Ethiopia is estimated to be worth US\$ 400 to US\$ 500 million and growing at an impressive rate of 25% per annum. The pharmaceutical industry of Ethiopia contributes only 15% of the total market share while 85% of pharmaceutical and medical supplies products are imported. About 20 pharmaceutical and medical supplies manufacturing industries existed in the country most of which being confined in the capital, Addis Ababa (FDRE Embassy, 2015). The public sector imports 70% of the pharmaceuticals through PFSA. In Ethiopia, Pharmaceuticals Fund and Supply Agency (PFSA) was established in 2007 by Proclamation No. 553/2007 (Negrete Gazeta, 2007) based on the Pharmaceuticals Logistics Master Plan (PLMP) (FMOH, 2006). The Agency is mandated to avail affordable and quality pharmaceuticals sustainably to all public health facilities and ensure their rational use (Gazeta, 2007). The PFSA model is similar to the CMS model but takes country contexts in to considerations.

Since its establishment in 2007, Pharmaceutical Fund and Supply Agency (PFSA), the lead organization managing the health care supply chain of the country, has been working to ensure the availability, accessibility, and affordability of essential medicines with appropriate quality, safety, and efficacy. To achieve these goals, PFSA has designed and implemented various innovative programs. The Integrated Pharmaceutical Logistics System (IPLS), is one of the major interventions to create a strong, unified, healthcare supply chain, to connect all levels of the supply chain, and to provide accurate and timely data for decision-making (Abiy S.,2014). Within IPLS, the minimum-maximum inventory control system is intended to ensure that facilities always have enough stock to serve their clients and to avoid placing emergency orders. An assessment conducted at the facility level in Ethiopia indicated a poor inventory and warehousing practice at the lower level of the supply chain (Abiy S., 2014).

Inventory constitutes the most significant part of current assets in the Pharmaceutical Fund and Supply Agency. The value of pharmaceuticals procured in 2008 budget year was more than ETB 8 billion and pharmaceuticals worth more than 18 billion ETB has been distributed in the same budget year. Inventory turnover rate of PFSA is 1.68 % and the wastage rate is about 3.5% (PFSA 2015). Therefore, because of the huge inventories maintained by the PFSA, a considerable sum of an organization's fund is being committed to them. It thus becomes absolutely imperative to

manage inventories effectively so as to avoid unnecessary cost and ensure high level of customer service.

1.2. Statement of the Problem

Lack of appropriate inventory management leads to stock out which ultimately compromises customer service. Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. On the other hand, too little inventory often disrupts business operations, and increases the likelihood of poor customer service (Anisa and Susan, 2014). Maintaining appropriate inventory level at the various levels of the supply chain is crucial to ensure sustainable supply.

The value of pharmaceuticals procured and distributed by PFSA has shown significant increment over the past years which necessitates effective inventory management. Though, the inventory management across the pharmaceutical supply chain has showed significant improvement in the last five years in terms of establishing inventory control system and implementing the integrated pharmaceutical system, there are challenges which still remain to be addressed to create well established inventory management system at all levels (PFSA, 2015). According to Koumanakos (2008) inventory management practices have come to be recognized as a vital problem area needing top priority.

According to PFSA (2014) the combined inventory turnover rate of Revolving Drug Fund (RDF) and Program Pharmaceuticals is about 1.68 which is much lower than many industries. Hence, There are concerns on the inventory management practice at PFSA level that leads to wastage and stock out of essential pharmaceuticals which necessitates efficient inventory management practice.

There are no researches in Ethiopia which identifies factors affecting inventory management practice with respect to health logistics. This study therefore intends to fill this research gap by assessing the inventory management practice of PFSA.

1.3. Research Question

This research addressed the following questions:

- What is the effect of policy and procedures on the inventory management practice of PFSA?
- What is the effect of management support on the inventory management practice of PFSA?
- What is the effect of information technology on the inventory management practice of PFSA?
- What is the effect of staff competency on the inventory management practice of PFSA?
- What are the inventory management practices of PFSA?

1.4. Research Objectives

1.4.1. General Objective

The general objective of the study is to assess factors affecting pharmaceutical inventory management practice, the case Pharmaceuticals Fund and Supply Agency (PFSA).

1.4.2. Specific Objectives

The Specific objectives of the study are:

- To examine the effect of policy and procedures on the inventory management practice at PFSA
- To assess the effect of management support on the inventory management practice at PFSA;
- To examine the effect of IT on the inventory management practice at PFSA;
- To describe effect of staff competency on the inventory management practice at PFSA;
- To assess the inventory management practice at PFSA;

1.5. Significance of the Study

This study examined factors affecting the inventory management practice at PFSA and suggested strategies to improve the inventory management practice as well. The study offered more meaningful and acceptable outcomes to help PFSA in considering real factors affecting the success of inventory management performance and encourage the Agency in implementing strategies to enhance inventory management. The study also contributed on the limited knowledge in the area of inventory management of pharmaceuticals in Ethiopia. The research findings provided insight for researchers who have interest on doing research on pharmaceutical inventory management.

1.6. Scope of the Study

The scope of the study is to assess effects of policy, management support, IT, and staff competency on the inventory management practice of PFSA. The study did not consider end to end pharmaceutical supply chain due to time and budgetary constraints.

1.7. Limitation of the Study

- As data was collected based on self-reported information, there will be possibility of reporting errors and recall biases.
- In addition, the opinion of non-responders will also affect the interpretation of the research

1.8. Definition of Terms

Inventory management: is the management of materials in motion and at rest. Inventory management involves developing and managing the inventory levels of raw materials, semi-finished materials (work-in-progress) and finished good so that adequate supplies are available and the costs of over or under stocks are low.

Maximum inventory level: The maximum stock level is the largest amount of stock that each supply chain level holds at any one time.

Inventory Control: Inventory control can be defined as verification of the quantity, the value and the balance of the entire range of materials held in stock, so that it would be easy and possible to give the exact quantities of materials in the store at any given time (Eni, 2001).

Emergency order point: The emergency order point is the level where the risk of stocking out is likely, and an emergency order should be placed immediately

Inventory turnover: total value of inventory consumed divided by the average value of the inventory managed over a given time period.

Inventory record accuracy: is how well the inventory records, specifically the quantities on hand from a manual or computer record match the actual quantities in the warehouse.

Efficiency: is the ability to minimize wastage and improve inventory turnover in the process of availing pharmaceuticals to the end user.

1.9. Organization of the Study

The study organized in such a way that it encompasses introductory part, literature reviews, methodology, findings, conclusion and recommendation of the study. Background of the study, statement of the problem, research questions, objectives of the study, significance of the study, scope of the study and limitation of the study are addressed under introductory part. Then comes the literature review that covers the theoretical and empirical aspects of the inventory management. Description of the study area, research approach, research design, population and sample, data source and types and ethical issues are depicted under the methodology section. The fourth chapter addresses the data presentation, analysis and interpretations of the findings. Finally, the summary of findings, conclusion and recommendation of the research are pinpointed under the last chapter.

CHAPTER TWO: RELATED LITERATURE REVIEW

This chapter gives an extensive review of the available theoretical and empirical literature to the problem being investigated, critique of the existing literature relevant to the study, summary of the literature review and finally the research gaps. The aim of the literature review is to provide a context for the entire research study. Reviewing existing literature, on the aspect in question, allows the researcher to identify the “gap” that exists. The available literatures has been reviewed in order to gain an understanding the inventory management practice in the health care supply chain. The influence of various factors on the effectiveness of inventory management has been studied by researchers even though most of them are not specific to the pharmaceutical inventory management. The chapter begins by a theoretical review followed by Empirical literature and conceptual framework.

2.1. Theoretical review

As good research is grounded in theory and in order for a discipline to progress beyond the pre-paradigmatic stage and be considered a mature discipline it must use and develop theory. As the inventory management is under the influence of external environment, it is recommended that researches would be located within the content of inventory control theories (Defee, et al., 2010).

This section explores the theories that have been identified as modeling behavior for the problem being tackled by the study and indicating where the study originates. In their study of inventory of theory in logistics and supply chain management, Defee, et al., (2010) found that theory was explicitly used in approximately 53 percent of the sampled articles and suggests that there is a need for continuous theory-based research in the discipline. Seuring, et al., (2005) recommended researchers in the field of supply chain management have to account for conceptual and theoretical developments. Hence, this study uses stock diffusion theory, Transaction Cost Economics (TCE) and Adaptive Structuration Theory (AST) which are more relevant with the problems identified in this study.

2.1.1. Stock Diffusion Theory

A stock diffusion theory was pioneered by Braglia, Gabbrielli and Zammori (2013) with an intention to derive the probability distribution of the stock consumption and that of the reorder time. These authors further explained that the importance of stock diffusion theory is to assess and evaluate the required inventory levels in theory and practice. There are three considerations of the stock diffusion theory: (1) storage space required; (2) how quickly inventory is sold or used; and (3) how to avoid inventory from becoming outdated before it is used. These considerations can prevent shortages and wasteful spending. In addition, the stock diffusion theory has been confirmed to lower inventory level and has a direct impact on cost savings emanating from storage costs including stock insurance premiums (Unegbu and Mohammed, 2011: 304).

2.1.2. Adaptive Structuration Theory (AST)

Based on structuration theory, the study intends to determine the effects of information technology on effective stores management. Structuration theory was first proposed by Anthony Giddens in his constitution of society in 1984, which was an attempt to reconcile social systems and the micro/macro perspectives of organizational structure. De Sanctis and Poole (1994) borrowed from Giddens in order to propose AST and the rise of group decision support systems. AST provides the model whereby the interaction between advancing information technologies, social structures, and human interaction is described, and which focuses on the social structures, rules, and resources provided by information technologies as the basis for human activity. AST is a viable approach in studying how information technology affects inventory management practice in an organization because it examines the change from distinct perspectives.

2.1.3. Transaction Cost Economics (TCE)

The study of inventory management calls for an organization to ensure all costs are kept at a minimum hence the need to apply the theory of transactional Economics (TCE). According to (Halldorson, et al., 2007), TCE is a theory that ensures that costs across the supply chain are kept at a minimal. In the early 1970s, the mathematical economist, Williamson, incorporated TCE into the general equilibrium model in the new theory of a firm. Organizations can reduce their transaction costs by vertical integration and increasing the level of trust at the same time. This kind of integration can reduce the costs of inventory management while increasing the service level of

both internal and external customers and releasing capital to be used in other areas of the organization. Organizational supply chain can however reduce transaction not only through vertical integration and increasing the level of trust among supply chain participants, but also through horizontal integration and economy of scale gained from the aggregation of supply and/or demand (Williamson 2008).

One might expect the seemingly infinite stream of inventory theory related research to be a key resource for managers seeking to gain a competitive advantage through inventory control. However, some have suggested that managers who turn to inventory theory research may find it to be of little significance or that it has little to offer in terms of enhancing inventory practices according to Krautter, as cited by Ng'ang'a, 2013. This has led many to suggest a gap exists between inventory theories and practice (Lenard & Roy, 2005; Silver, 2001; Wagner, 2002). While the varied solutions offered to bridge this gap represent valuable research, input from practitioners is noticeably absent (Patton & Steele, 2010). Therefore, an empirically derived agenda founded on practitioner-identified issues, is needed. There is no study that have been comprehensively been done on factors influencing inventory management practice in Ethiopia and hence the study intended to fill this gaps.

2.2. Empirical Literature Review

2.2.1. Inventory Management

Inventory management is the management of materials in motion and at rest (Coyle et al., 2003). The following activities all fall within the scope of inventory management (Wikipedia, 2014) the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods, and demand forecasting. Balancing these competing requirements leads to optimal inventory levels, which is an ongoing process as the business needs shift and react to the wider environment.

Inventory management basically serves two main goals (Reid & Sanders, 2007). First of all good inventory management is responsible for the availability of goods. It is important for running operations that the required materials are present in the right quantities, quality and at the right time in order to deliver a specific level of service. The second goal is to achieve this service level against optimal costs. Poor inventory management system can negatively affect the service level of an organization. In most cases where inventory management decisions have been effective, inventory planning models have been developed and implemented focusing especially on the twin problems of inventory size and timing (Thummalapalli, 2010). To perform in competitive environment, companies have to design and maintain effective inventory management system. Inventory management systems enable an organization to determine and maintain an optimum level of investment in inventory in order to achieve required operational performance (Rossetti, 2008).

Scholars have come up with various techniques used in managing inventory {(Ross, 2003), (Baily, 2003), (Monczka, 2005), (Lyson, 2006)}. ABC analysis, Just in Time (JIT), Material Requirement Planning (MRP), Vendor Managed Inventory (VMI), and Economic order quantity (EOQ) are the most familiar techniques which are used to manage inventory. Researchers argue that inventory control practice has paramount importance for the effective inventory management. They proceed with their argument that it tells how much to order, how many have been used, what is remaining and when to place the next order so that the enterprises would not lack materials to work with at any point in time. They further argue that inventory control would ensure adequate supply of products to customers and avoid shortages and ensure timely action for replenishment (Sharma, 2004, Kumar & Suresh, 2008).

According to Wilson (2015), utilization of information technology improves the performance of inventory management there by improving the firm's competitiveness. The use of IT in supply chain and logistics management has attracted increasing attention of the business and academic world. Lee & Wang (2011) as cited by Wilson (2013) addressed the possibilities of reducing the bullwhip effect in supply chains through internet based collaboration. Technology application in supply chain context may provide benefits in the following areas: improve supply chain agility, reduce cycle time, achieve higher efficiency, and deliver products to customers in a timely manner (Lee & Wang, 2011). Furthermore, IT may further reduce existing wastes and inefficiencies along

the supply chain through increasing real-time movement of shipment and operational control of logistics activities.

Qualified staff that is competent and skilled will help the organization to achieve its goals and objectives by being efficient and effective when carrying out their various functions. For an organization to succeed, qualification is therefore a pre-requisite and must be matched with job requirement, hence the need to hire and develop ambitious personnel (Carr & Hesketh, 2000). If staff involved in stock control is not qualified and competent, and then there will be ineffectiveness in inventory control (Ng'ang'a, 2013). Bailey and Farmer (1982) indicated that for stock control function to achieve a superior performance, it's necessary to recruit, train and develop personnel with the capacity and motivation to do better job as incompetent employees can render stock control virtually ineffective.

2.2.2. Conceptual Framework

Bradley (2008) defines conceptual framework as a visual or written product that explain either graphically or in a narrative, the key factors and the presumed relationship among them. It is therefore a model used in research to outline possible courses of action or to present a preferred approach to an idea or thought. A conceptual framework is very important in any research study being undertaken. It shows the relationship between the dependent variables and the independent variable. The independent variables will be government policy, top management support, information technology, and top management support. The dependent variable is effective implementation of inventory management system.

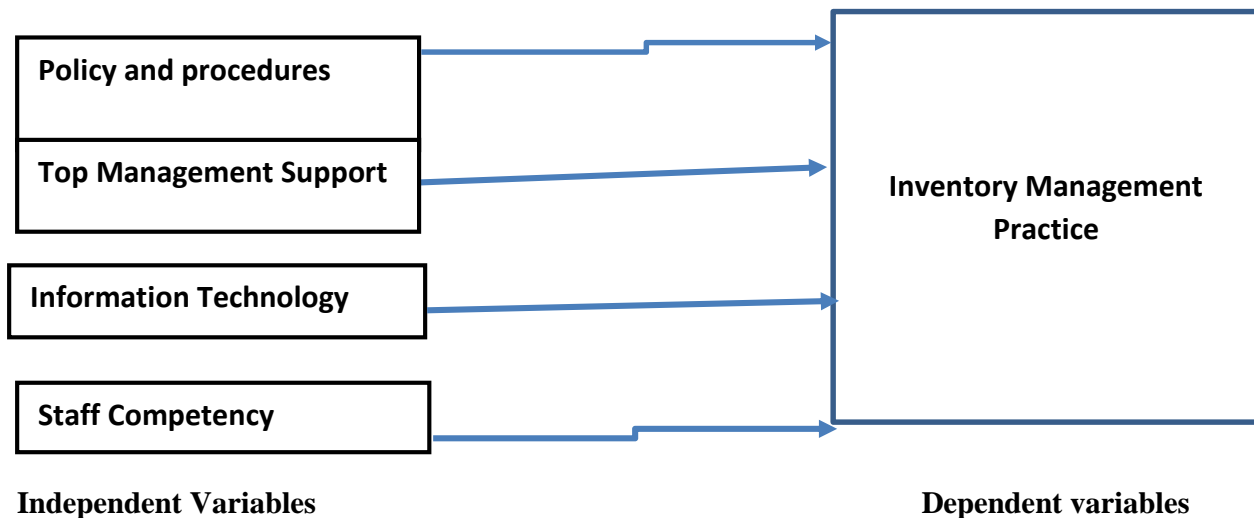


Figure 1: Conceptual Framework (adopted from Ondari, 2016)

The effect of applying information technology and using competent staffs in the efficiency of operations has been well researched. But there is limited research work of this nature in the area of pharmaceutical inventory management. Hence, an analysis of the factors affecting inventory management practice in the public sector has paramount importance. In addition, it is believed that key goals of the good governance agenda like increased efficiency, improved resource management, and increased accountability will be engendered by the application of inventory management systems (Anisa & Susan, 2014).

CHAPTER THREE: METHODOLOGY

3.1. Description of the Study Area

The Pharmaceutical Fund and Supply Agency is making itself more accessible to health facilities through establishing new warehouses at strategic locations throughout the country. The number of modern warehouses has now increased to more than 17. The agency has its head quarter and one of its branches at Addis Ababa. The rest of the branches are located out of Addis Ababa based on geographic proximity to the health facilities.

3.2. Research Approach

This study is primarily quantitative and cross-sectional in nature and aimed at assessing the effect of policy, management support, IT, and staff competency on the inventory management practice of PFSA. Qualitative approach was also used to support the findings of the quantitative findings.

3.3. Research Design

The study adopted an explanatory survey design. Explanatory research goes on to identify reasons and causes for something that occur which is suitable to this research that aims to identify factors affecting the inventory management practice of PFSA.

3.4. Population and Sample

The target population for this study constituted all employees who work at Forecasting, Stock and Distribution, Procurement and finance directorates of the Pharmaceutical Fund and Supply Agency. The aforementioned directorates are highly relevant in the management of the overall pharmaceutical inventories at PFSA. For the purpose of this study the target population was stratified to forecasting and inventory management officers, storage and distribution officers, warehouse managers, procurement officer and fund management officers. There are about 69 officers in these directorates. Due to the small target population, it was decided to employ a census technique to gain insight into the effect of factors on the inventory management practice of PFSA.

A criterion sampling technique was applied for the qualitative part. Supply chain experts who were supposed to be knowledgeable about the study topic were selected as key informant. The in depth interview was continued until the point of saturation whereby no new information becomes available with further interview. Based on this, a total of 7 in-depth interviews were conducted with key informants.

3.5. Data Collection Procedures

In this study, primary data was collected using a questionnaire (Ondari, 2016) and interviewing key informants while secondary data were obtained from annual reports of the organization and technical reports on the inventory management practices.

The study mainly relied on primary quantitative data collected through structured questionnaires. Main data collection was via a questionnaire as this is an efficient and convenient way of gathering the data within the resources and time constraints. The research instrument was pre-tested before final administration of questionnaires to the respondents. Participants for the pilot study were excluded from the final list of respondents. According to Dawson (2009), a pilot study is a small scale preliminary study conducted to evaluate feasibility, time, cost, and predict an appropriate sample size and improve the study design prior to performance of a full research scale research study.

For the qualitative part, a semi-structured interview guide containing questions to explore more informations on the factors associated with inventory management practice, challenges and possible interventions for the existing inventory management practice has been addressed (Annex 2). In-depth interviews were conducted with study subjects who have a better understanding of the inventory management practice at PFSA.

3.6. Ethical Consideration

The relevant ethical issues has been given special attention through all phases of the research process. Respondents informed clearly about the purpose of the study, the right to participate voluntarily, the right to ask questions including personal address of the researcher, the right to get the copy of the study, and the right to have their privacy respected; the right not to respond to question that they didn't want to respond. The information provided by participants will not be disclosed in any way. In addition, the researcher acknowledged all materials and sources of data used in this research. The researcher has received support letter from AAU. Before data collection, the research has received consents of participants. Names, phone numbers, addresses and other details are not included in the questionnaire to ensure confidentiality.

3.7. Data Analysis

The collected data were coded, entered, cleaned and analyzed using SPSS version 20.0 software package by the principal investigator. Descriptive statistics was computed for all the variables and data was presented in the form of frequency distribution tables and figures to summarize responses for further analysis and facilitate comparison. The quantitative reports were presented as tabulations, percentages, and measure of central tendency.

To assess factors associated with inventory management practice, likert scale was constructed by presenting respondents with a series of different statements that reflect different aspects of each respective variables. The statements have five possible answers. The responses were labeled "favorable" or "unfavorable" as follows; for positive statements, responses including "strongly agree" or 'agree' were labeled as "favorable and 'neutral', 'disagree' or strongly disagree' were labeled as "unfavorable". For negative statements, responses including "strongly agree", 'agree' or "undecided "were labeled as "unfavorable and "disagree" or "strongly disagree" were labeled as "favorable". One point was given for favorable responses and zero point for unfavorable responses and then the mean score was calculated. Those respondents with scores of greater or equal to the mean score were rated to have positive attitude and with scores less than the mean score were considered to have negative attitude.

Generally, inferential statistics was used to determine the association between the dependent and independent variable. Logistics regression was used to assess the effect of each explanatory variable on the outcome variable.

For the qualitative part, findings from both quantitative and qualitative surveys were investigated at the same time to help in interpretation. Thematic content analysis was used to analyze the qualitative data. Themes were identified based on the research questions and responses of key informants were summarized with respect to the themes identified.

CHAPTER FOUR: RESULTS, DISCUSSION and INTERPRETATION

This chapter presents the data analysis, results, and interpretation of the findings. The findings are based on data collected by the use of questionnaire and key informant interview so as to assess factors influencing the inventory management practice at PFSA. The analysis is performed around the objectives for this study; however, other relevant details are added for better presentation of findings.

4.1. Validity of the Questionnaire

Validity implies the degree to which a question measures what it was intended to measure. To assure the validity of the study, questionnaires were developed on the bases of previous studies and review of related literature. The questionnaire was subjected to a validity test. Pre testing was done to see the applicability of the tools and how the questionnaire was acceptable to the respondents. Pre testing was done on selected respondents which were not part of the final research. After the pretest, alterations were made to the tool.

Table 1: Reliability of variables based on Cronbach's alpha level

Variable	Cronbach's Alpha	No. of Items
Management support	0.77	9
Staff competency	0.81	6
Information Technology	0.85	6
Policy and procedure	0.70	5

Source, Own Survey, 2017

Reliability analysis was subsequently done using Cronbach's Alpha which measures the internal consistency by establishing if certain item within a scale measures the same construct. Cronbach's alpha was calculated by application of SPSS for reliability analysis. The value of the alpha coefficient ranges from 0-1 and may be used to describe the reliability of factors. A higher value shows a more reliable generated scale. Nunnally (1978) established the Alpha value threshold at 0.7 which the study benchmarked against. Cronbach Alpha was established for every objective in order to determine if each scale (objective) would produce consistent results should the research be done later on. Consequently the number of remaining items in each variable and their

corresponding reliability score are as shown in table 1. For each variable, the number of items retained for further analysis is shown in the last column.

4.2. Demographic Characteristics of Respondents

A total of 69 experts were participated in the study. However, 8 participants did not return and appropriately fill the questionnaire thus excluded from the analysis making the response rate 61(88.4%).The findings of demographic characteristics include: sex, academic qualification, service year, and directorate of the respondents. Table 2 below shows the details of background information of the respondents.

Table 2: Background information of respondents, March 2017.

Demographic Variable		Number	Percent
Sex	Male	50	82.0
	Female	11	18.0
Qualification	College certificate	1	1.6
	Diploma	1	1.6
	Bachelor degree	46	75.4
	Master's degree	13	21.3
Service Year	Less than a year	12	19.7
	1- 2 years	13	21.3
	3-5 years	15	24.6
	More than 5 years	21	34.4
Directorate	Procurement	13	21.3
	Forecasting and Capacity Building	18	29.5
	Storage and Distribution	19	31.1
	Fund Management	11	18.0

Source: Own survey, 2017

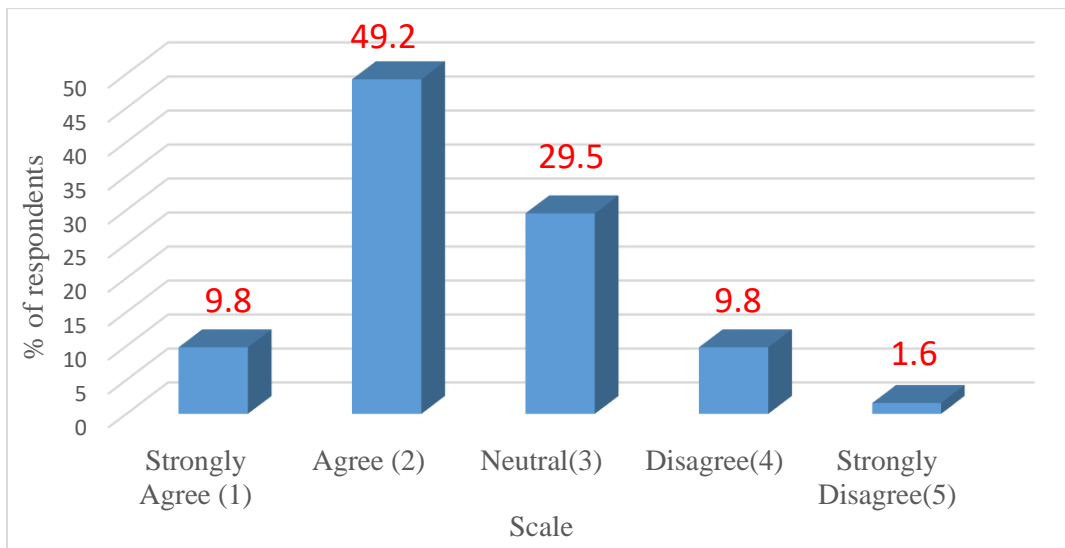
As noted in table 2 above, the majority of the respondents (78%) were male and the remaining 18 % were female. This shows that males dominantly handle inventory management activities in the organization. With respect to the education, the majority of the respondents of PFSA were bachelor (first degree) holders, accounting 75.4% of the staffs. On the other hand 21.3% were second degree holders while the rest had diploma and college certificate. This implied that majority of PFSA staffs working on the technical areas are degree or second degree holders that may in turn has a positive effect on Inventory Management practice if they are properly trained and motivated. The study also investigated that 34.4% of respondents had experience of more than 5years, and the majority had the experience of 1-5 years of service in the area of inventory management at the

agency, the rest 19.7 % of the respondent had the experience of less than one year. The study further investigated that about two third (65.6%) of the respondents have less than five years of experience. This may have implications on the inventory management practice as less experienced staffs have limited knowledge and skill on the inventory management principles and operations.

4.3. Effect of Policy and Procedures on the Inventory Management practice

Respondents were asked to state the extent to which they agreed or disagreed with the questionnaire items developed to assess the effect of policy and procedures on the inventory management practice of PFSA. Based on this, majority of participants (59%) agreed or strongly agreed that the inventory management system at PFSA is in line with government policies and procedures as depicted in figure 2 below. To the contrary, findings of the qualitative study acknowledged that waste management practice of PFSA and storage conditions at PFSA are not in line with regulations.

Figure 2: The IM system at PFSA is in line with government policies and procedures, 2017.



Source: Own Survey, 2017

The respondents was also asked on the suitability of the regulatory policy for inventory management practice. As depicted on the table 3 about half of the respondents believed that existing pharmaceutical regulatory policies, guidelines and procedures are suitable for warehouse

and inventory management practice of PFSA with mean 2.75 and standard deviation 1.011. The rest half of the respondents are in disagreement or neutral to this idea.

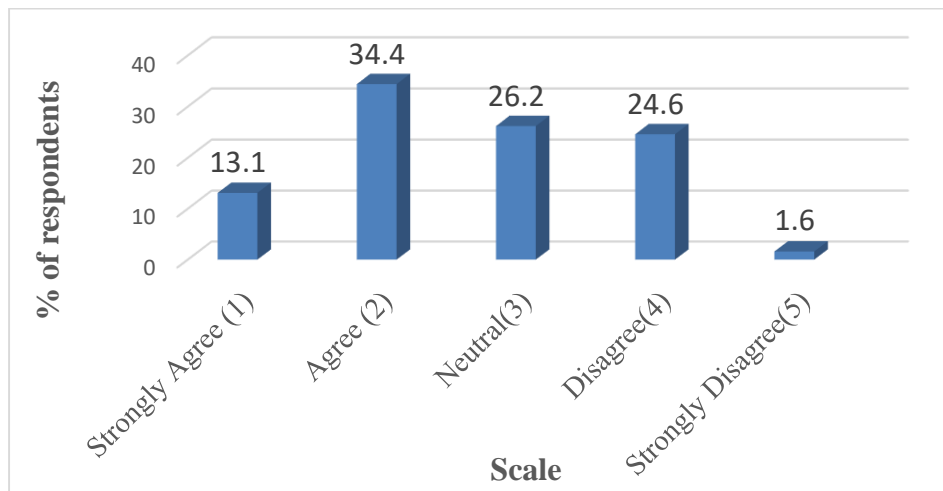
Table 3: Regulatory policies and procedures are suitable for IM practice of PFSA, 2017

Likert scale	Percentage of respondents
Strongly Agree (1)	6.6
Agree (2)	42.6
Neutral(3)	23
Disagree(4)	24.6
Strongly Disagree(5)	3.3

Source: Own Survey, 2017

The respondents were asked if they had considered public procurement policy exerted a negative influence on the PFSA inventory management practice. As indicted on figure 3 below, close to half of the respondents (50%) agreed or strongly agreed that public procurement policy negatively affects PFSA inventory management as shown by mean of 2.67 and standard deviation of 1.044. The other 26.2% were in disagreement that the public procurement affects the inventory management practice.

Figure 3: PPP has a negative influence on implementation of IM system at PFSA



Source, Own survey, 2017

Based on table 4 about 60.7% of respondents has expressed their agreement that the long procurement lead time at PFSA affects the inventory management with mean 2.43 and standard deviation of 0.991. The finding agrees with the Osborne et al. (2007) finding who indicated that

bureaucratic organization has long procurement lead time which has significant effect on the overall inventory management. The findings of qualitative study further strengthened the idea that decision making processes and complex intra-departmental communication and planning were some of the causes of long bureaucratic procurement delays that in turn affects the effectiveness of inventory management. Some of the key informants considered absence of long term procurement agreement and occurrence of repetitive tendering as major procurement problem that affects inventory management.

Table 4: PFSA has long procurement procedures that affects inventory management practice

Scale	Percentage of respondents
Strongly Agree (1)	16.4
Agree (2)	44.3
Neutral(3)	19.7
Disagree(4)	19.7
Strongly Disagree(5)	0
Mean	2.43
Standard deviation	0.991

Source: Own Survey, 2017

4.4. Effect of Management Support on the Inventory Management practice of PFSA

The study sought to determine the extent to which respondents agreed with the statements related with the influence of management support on implementation of inventory management system. Annex 3 can be referred for detail findings on the management support. As indicated in figure 4, this study revealed that more than half of respondents (52.5%) showed their disagreement that PFSA top managements have facilitated successful deployment of inventory management techniques as shown by mean of 3.28 and standard deviation 1.035. This is also in conformity with findings from qualitative study which shows limitation of management support in implementing new inventory techniques such as just in time, vendor managed inventory, and others.

Figure 4: Management facilitate deployment of inventory management techniques

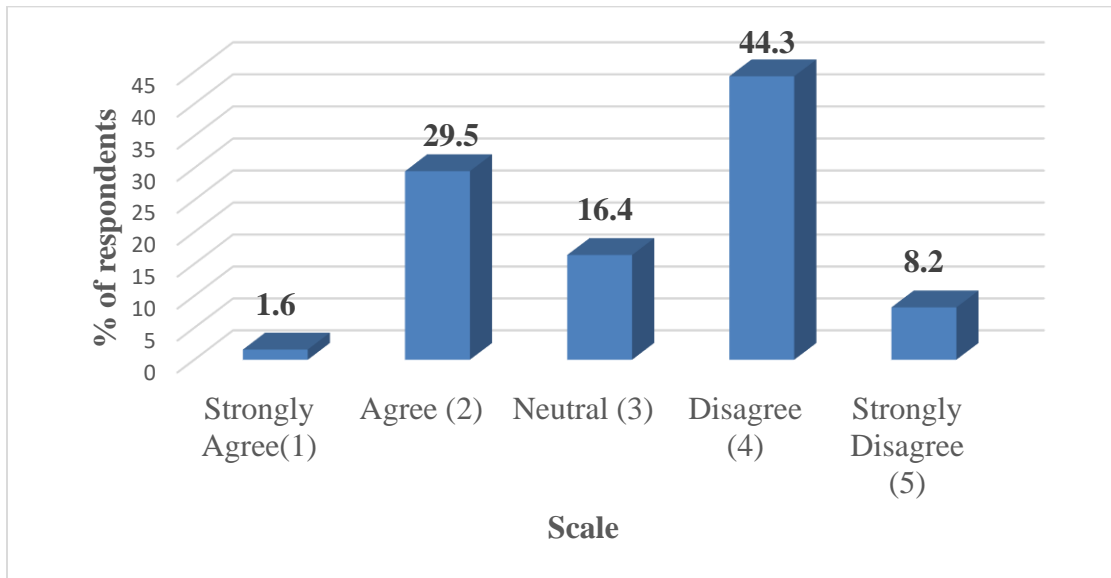


Table 5 below showed that majority of the respondents were in agreement that lack of top management support has inhibited the implementation of inventory management systems as shown by mean of 2.28 and standard deviation of 0.915. A study by Anisa S.L. and Susan W. (2014) reported similar findings where respondent disagreed that managers have facilitated successful deployment of inventory management systems. The findings from the qualitative study also stated that the existing PFSA warehouse structure is not adequate to practice modern inventory management techniques and state of the art IT to improve inventory management.

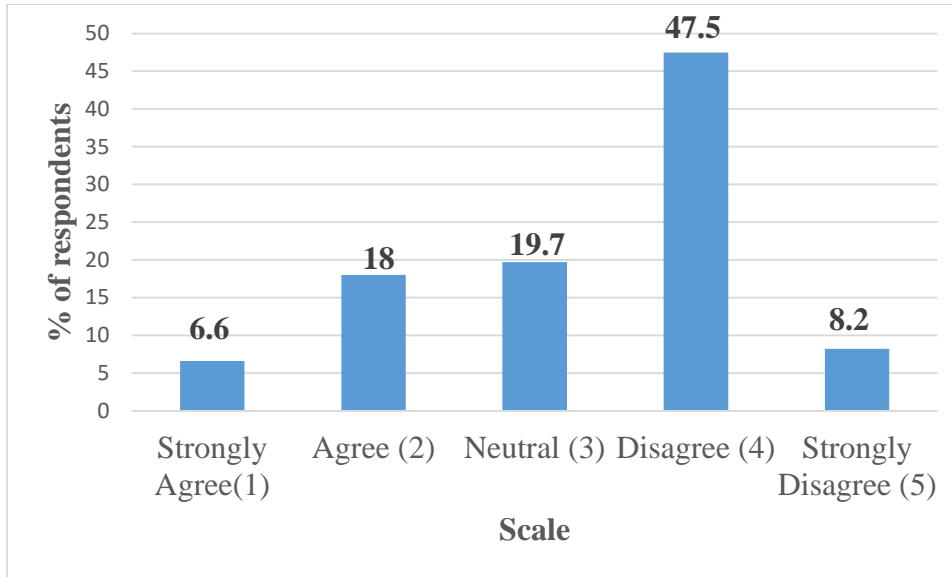
Table 5: lack of management support inhibited the implementation of inventory management

Likert scale	Percentage
Strongly Agree (1)	21.3
Agree (2)	39.3
Neutral(3)	29.5
Disagree(4)	9.8
Strongly Disagree(5)	0
Mean	2.28
Standard deviation	0.905

Source: Own Survey, 2017

As depicted on figure 5 below, it is disconcerting that more than half (55.7%) of the respondents either strongly disagreed or disagreed that PFSA management supports enforcement of SOPs for effective implementation of inventory management with mean 3.33 and standard deviation of 1.076. This showed that inventory management operations are not supported by SOPs in a regular manner that affects in turn the inventory management practice.

Figure 5: Management supports enforcement of SOPs



Only one third of the respondents showed their agreement, 31.1% their disagreement and 37.7 in neutral state that PFSA management devised a mechanisms to create integration with key stakeholders such as Banks, Ethiopian Customs Authority and Food, Medicine and Health care Administration and Control Authority that affects the inventory management system as showed on table 6 below. Integration with key stakeholders supposed to minimize lead time and improves inventory management practice.

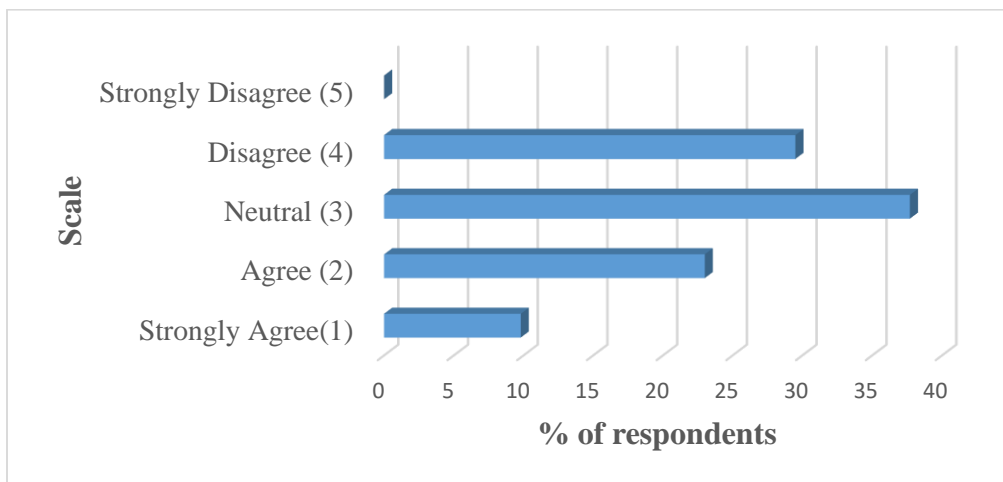
Table 6: Management devised a mechanisms to create integration with key stakeholders

Likert Scale	Strongly Agree(1)	Agree (2)	Neutral (3)	Disagree (4)	Strongly Disagree (5)	Mean	SD
Percentage of respondents	9.8	21.3	37.7	26.2	4.9	2.95	1.040

Source: Own Survey, 2017

Figure 6 below indicated more than two thirds (67.2%) of respondents chose “neutral, strongly disagree or disagree on the positive effect of the existing fund management system on the inventory management practice of PFSA with mean 2.87 and standard deviation 0.957. This is consistent with the findings of Ng’ang’a, KJ (2013) that indicated poor fund management has an effect in inventory control in that it may cause failure to achieve the set targets/ goals, under stocking of goods leading to poor customer service; poor staff morale and poor utilization of both human and physical resources. The rest of the respondents (32.8%) have in agreement with the positive effect of the existing fund management on the inventory management practice of PFSA.

Figure 6: Fund management system affects positively the inventory management practice



Source: Own Survey, 2017

4.5. Effect of Staff Competency on PFSA Inventory Management Practice

As depicted on the figure 7, only 26.3% of respondents were in agreement with a statement that PFSA employees are well trained to effectively execute the inventory management activities with mean 3.31 and standard deviation 1.119. This is in line with the findings of the in-depth interview that indicated a need for agency wide capacity building effort for the smooth implementation of inventory management activities. Findings from (Sporrong, et al., 2016) also recommended education and training as one of the interventions for developing and sustaining human resource in supply chain management and further agreed that team development and leadership competencies are vital for the effectiveness of inventory management. Caroline k. (2011) indicated that team development and leadership competencies reduced the company’s costs and losses

(Mean =4.26), furthermore the item that product management skills increase the company’s profits and reduce losses was agreed with, according to the results of the study (Mean =4.83).

Figure 7: PFSA staffs are well trained to execute inventory management practice

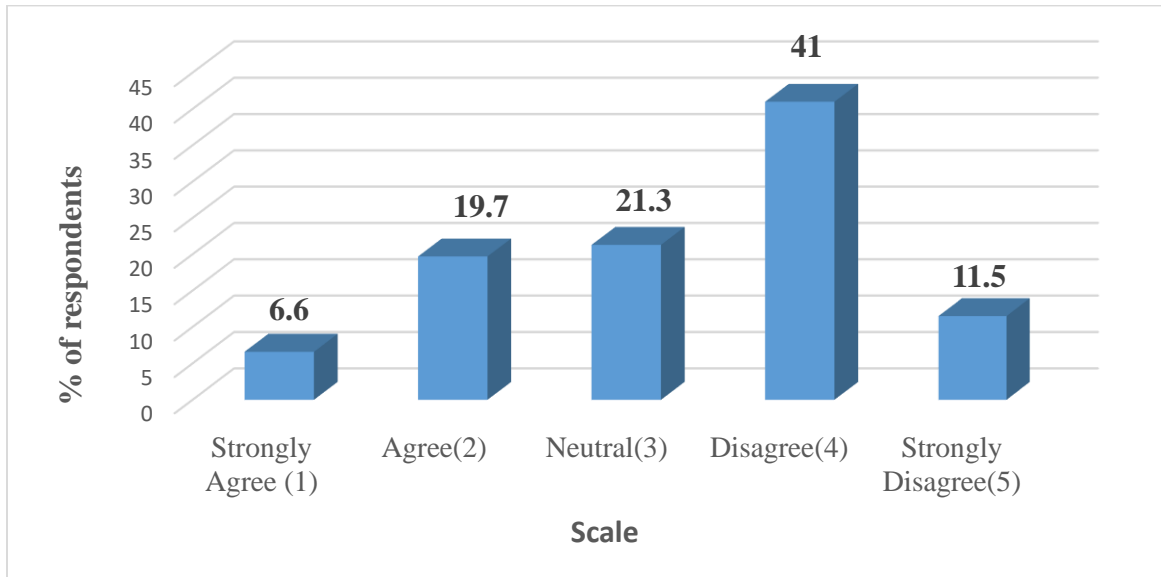


Table 7 showed that more than two third of the respondents (67.2%) were in agreement with the fact that Staffs knowledge and skills affects the performance of the inventory management system and the rest 32.8% were neutral and in disagreement with this idea with mean of 2.18 and standard deviation 1.148.

Table 7: Staffs knowledge and skill affects inventory management practice

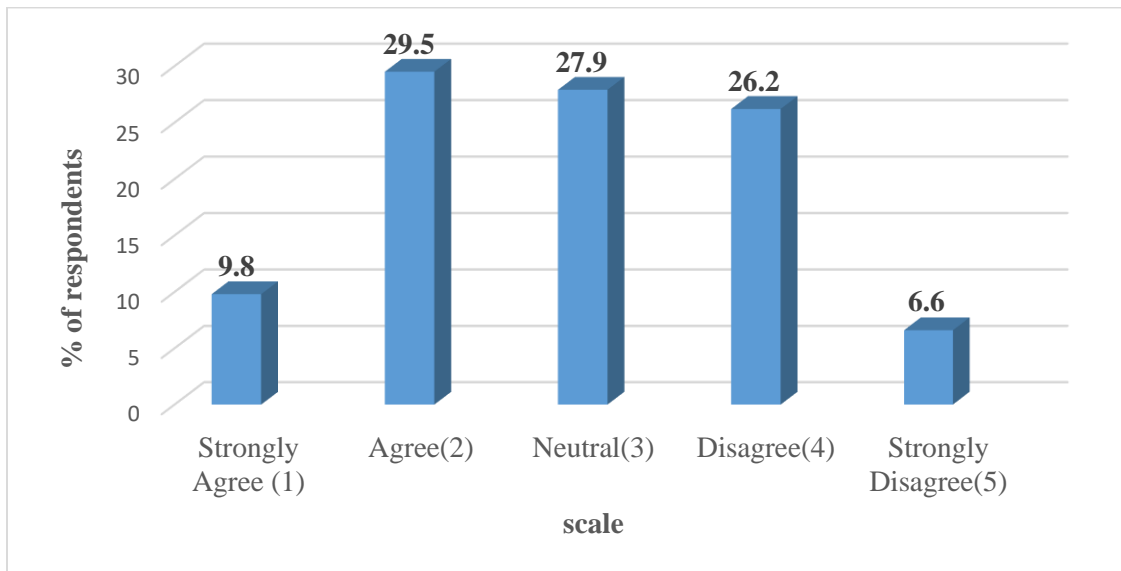
Likert scale	Percentage of respondents
Strongly Agree (1)	34.4
Agree (2)	32.8
Neutral(3)	16.4
Disagree(4)	13.1
Strongly Disagree(5)	3.3
Mean	2.18
Standard deviation	1.148

Source: Own survey, 2017

In connection with staff competency, for inventory management function to achieve a superior performance, it's necessary to recruit, train and develop personnel with the capacity and motivation to do better job. If staff involved in inventory management is not qualified and competent, then there will be ineffectiveness in management (Kanda & Iravo, 2015).

As depicted on the figure 8 below about 39.3% of respondents either strongly agreed or agreed that PFSA deploys the right type and mix of professional for the effective implementation of inventory management system while the rest 60.7% were neutral or in disagreement with this statement. Burt (2003) and Lyson (2006) agreed that there is a relationship between inventory management and staff competence; both agreed that if staff is qualified in techniques of inventory management there is a high possibility of effective inventory management. According to Bialy (2003), holding costs, stock out costs and acquisition costs are associated with inventory management. When the company's staff is incompetent the above costs will always be high resulting into the company's failure to achieve its major objective of profit maximization. This concurs with the qualitative findings of this study that unmotivated and incompetent staffs are the source of wastage and inefficiencies.

Figure 8: PFSA deploys the right type and mix of professional



Source: Own Survey, 2017

4.6. Effect of IT on the PFSA Inventory Management practice

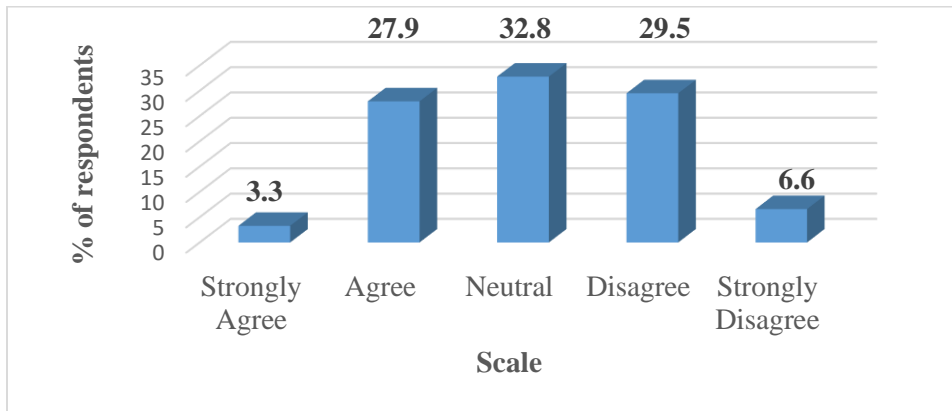
The study sought to determine the extent to which respondents agreed with the statements related with the influence of information technology on the inventory management practice. As depicted on table 8, majority of the respondents (62.3%) either strongly agreed or agreed that use of IT improved the current inventory management practice of PFSA as shown by mean of 2.14 and standard deviation of 1.189. It is also fact that LMIS is at the center of the logistics cycle and blood line for the overall inventory management.

Table 8: IT improved the current inventory management practice of PFSA

Scale	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
% of respondents	24.6	37.7	14.8	18	4.9	2.41	1.189

With regard to utilization of information technology, majority of respondents were neutral or in disagreement that PFSA uses the existing information technology strictly for decision making with mean of 3.08 and standard deviation of 0.988 as depicted on figure 9 below. The findings from the in depth interview supported this finding that there is no strict use of information for decision making at PFSA.

Figure 9: PFSA uses data strictly for decision making



Source: Own survey, 2017

As depicted on the table 9 below, the study further investigated that about 45.9% of respondents either agreed or strongly agreed that information technology has led to reduction in inventory costs and has improved employee productivity at PFSA. These finding concur with findings of Chaffy & Wood (2005), who found that effectiveness of an inventory management system depends on the quality of information it takes in and the capacity of the company's information technology (IT).

Table 9: Effect of Information Technology on the PFSA inventory management practice

Scale	Strongly Agree (1)	Agree(2)	Neutral(3)	Disagree (4)	Strongly Disagree (5)	Mean	SD
% of Respondents	11.5	34.4	24.6	23.0	0	2.79	1.127

Source: Own Survey, 2017

4.7. Inventory Management Practice at PFSA

The findings of this study investigated that only 31.1% of respondents either agreed or strongly agreed that there exists efficient and effective inventory management practice at PFSA that minimizes wastage and close to 69%% were in disagreement or neutral with this idea and the rest 19.7% did not decide. The key informants stressed that presence of scattered warehouses hampered efficiency of PFSA inventory management which leads to wastage.

Table 10: Inventory management practice at PFSA

Inventory management efficiency	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
There exists efficient inventory management practice at PFSA that minimizes wastage	3.3	27.8	19.7	45.9	3.3	3.18	.992
PFSA inventory management practice is in line with standard inventory management techniques	1.6	24.6	27.9	42.6	3.3	3.21	.915
There exists reasonable inventory turnover rate for both program and revolving drug fund items at PFSA	1.6	34.4	37.7	21.3	4.9	2.93	.910

Source: Own Survey, 2017

The study also revealed that about three fourth of (73.8%) of respondents did not agree that PFSA inventory management practice is in line with standard inventory management techniques. Moreover, about 59% of respondents were either in disagreement or neutral on the item that there exists reasonable inventory turnover rate for both program and revolving drug fund products at PFSA. Over all, the findings of the quantitative study indicated concern of inventory management efficiency at PFSA.

4.8 Results of Key Informant Interview

Major challenges for the inventory management practice

The in-depth interview aimed on getting opinions of key informants regarding the problems and possible suggestions on the inventory management practice of PFSA. Based on this, a number of insights reflected by the key informants during the in-depth interviews are summarized below. The results generated in this study are organized in line with the research objectives.

From the Perspective of Management Support: Participants of the in-depth interview reflected that PFSA management did not invest enough to enhance the inventory management practice. They noticed serious gaps in standardizing and enforcing procedures for better management of inventory at PFSA. Lack of practicing cyclic inventory counts, lack of strict application of FEFO principles and inconsistencies in batch tracking were considered as major problems that hampered the efficiency of existing inventory management practice. Participants of the in depth interview emphasized lack of strong support by senior management towards modernizing the overall inventory management system at all levels of the supply chain. Respondents stressed also that standard inventory practices such as vendor managed inventory, Lean and JIT are not properly practiced at PFSA. Key informants also added that there is limited support and follow-up from the higher level in a regular manner. Some of the participants stated presence of scattered nonstandard warehouses as major limitation that hindered efficiency of the inventory management practice.

From the Perspective of Information Technology: Participants of the in-depth interview criticized that the existing information system do not get the full support of senior management. Lack of strict use of system, inadequate use of the existing data for supply chain decision making, absence of standardized directory service and lack of ownership were some of the points raised by

key informants as major challenges for the existing information technology at PFSA which in turn affects the inventory management efficiency. Key informants added also that the existing inventory management system at PFSA lacks more robust information management system supported by the application of technologies such as RFID, barcoding and security systems.

From the Perspective of Staff Competency: Key informants were asked about the major problems on the existing inventory management practice in terms of human resource capacity. Based on this, they indicated that there was no clear roles and responsibilities given for each employee to build commitment and accountability at PFSA. They also witnessed even though there are huge efforts at PFSA to build the capacity of the staffs, the outcomes from the training in terms of building the skills of the staffs are limited. Key informants added that there is lack of capacity at PFSA in terms of efficient management of inventories. Some of the participants explained that incompetent and demotivated staffs are source of wastage and inefficiencies.

From the Perspective of External Policies and Procedures: The need for aligning and harmonizing inventory management practices along with government policies and procedures is evident from the responses provided by informants. Participants acknowledged that PFSA waste management system is not in line with waste management directive developed by FMHACA. The key informants witnessed that Bureaucratic custom clearance processes, delay in quality inspection, and delay in foreign exchange approval affects the inventory management practice of PFSA.

Suggested Solutions to Improve the Inventory Management at PFSA

Participants of the in depth interviews were asked to provide possible solutions to improve inventory management practice across the pharmaceutical supply chain. Based on this, a number of suggestions forwarded are summarized as follows:

Enough investment on the inventory management: Participants stressed deployment of standard inventory management techniques such as vendor managed inventory, application of ABC, cross docking, cyclic count, and strict enforcement of FEFO principles as important milestone for the efficient management of inventory management which needs strong management support and investment as well. Establishing modern warehouse infrastructure in a warehouse in a box style is recommended as a milestone to improve the transportation, distribution and inventory management practice. “Currently, PFSA is under business process reengineering, hence proper implementation of the newly redesigned processes should be a priority agenda for the management”, said a key informant from PFSA.

Enhance data quality for inventory management: Key informants stressed standardizing the pharmaceutical master list, strict use of the existing information technology, real time data sharing and use of data for decision making and improving ownership as important steps to improve inventory management practice. Key informants pinpointed that use of quality and real time data for decision making are instrumental for minimizing wastage and reducing the inventory holding costs.

Enhancing Staff Competency: Skill based capacity building for the inventory management workforce, development of clear job specification and job description for all staffs, aligning staffs quality with job requirement, devising strong monitoring and evaluation mechanisms, instituting rewarding and incentive mechanisms were suggested by key informants as milestones to improve staff competency at PFSA.

Strengthening Coordination and Collaboration: Integrating activities with key stakeholders and aligning procedures with government policies were acknowledged as important interventions for the smooth implementation of inventory management. Key informants suggested considering delay in custom clearance, foreign exchange approval, and reliability of suppliers, customer

demand and pharmaceutical regulatory procedures during redesigning the inventory management system.

Strengthening M&E system: Devising a mechanisms to routinely monitor and evaluate the overall inventory management practice through developing key inventory performance indicators was acknowledged by key informants.

4.9. Inferential Statistics

The study also intended to show association between the independent variables and the dependent variable using the logistics regression analysis. A p - value of <0.01 was used as a cutoff point to declare statistical significance.

Goodness of Fit Test

Hosmer and Lemeshow test was used to conduct the goodness of test for the logistics regression. The null hypothesis H_0 : shows the model is fit whereas the alternative hypothesis H_1 shows that the model does not fit at significance level of $\alpha = 0.05$. The Hosmer and Lemeshow test table below indicated a significance value of $\alpha = 0.81$ which is greater than a value of 0.05. Hence based on this, the null hypothesis is accepted and hence the model has a good fitness to the data.

Table 11: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	2.990	6	.810

Source: Own Survey, 2017

Predictive power

The coefficient of determination is a measure of how well a statistical model is likely to predict future outcomes. The coefficient of determination, R^2 is the square of the sample correlation coefficient between outcomes and predicted values. As such it explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable, inventory management practice that is explained by all the four independent variables (management support, policy and procedures, information technology and staff competency).

Table 12: Model Summary

-2 Log likelihood	Nagelkerke R Square
44.434	.564

Source: Own Survey, 2017

In standard regression, the co-efficient of determination (R^2) value gives an indication of how much variation in y is explained by the model. This cannot be calculated for logistic regression but the 'Model Summary' table gives the values for pseudo R^2 values which try to measure something similar. From the model summary table below, it can be inferred that the four independent variables that were studied, explained 56.4% of the inventory management practice of PFSA as represented by the R^2 . This means the four independent variables contribute about 56.4 % to the inventory management practice of PFSA whereas other factors which are not studied in this research contributed 43.6% to inventory management practice.

Logistics Regression Analysis

From the findings in table below, the established regression equation was $Y = -11.5 + 2.3 X_1 + 3.143 X_2 + 0.69 X_3 + 0.45 X_4$ where $Y = \ln(p/1-P)$. From the regression model, for every one unit increase in staff competency, it is expected a 3.1 increase in log odds of inventory management practice improvement holding all other independent variables constant. According to the findings of Godana, B. E. & Ngugi, K. (2014), taking all other independent variables constant, a unit increase in staff competency will lead to a 0.299 increase in log odds of inventory management practice improvement.

Table 13: Logistics regression output

	B	S.E.	Wald	df	Sig.	Exp(B)
Management Support	2.319	.768	9.114	1	.003	10.163
Staff Competency	3.143	1.168	7.242	1	.007	23.170
Policy and Procedures	.692	.763	.825	1	.364	1.999
Information Technology	.453	.770	.347	1	.556	1.574
Constant	- 11.508	3.343	11.851	1	.001	.000

Variable(s) entered: Management Support, Staff Competency, Policy and Procedures, IT
Source: Own Survey, 2017

Furthermore, for a unit increase in managements support, it is expected a 2.3 increase in log odds of inventory management practice improvement, keeping other factors constant. As shown in the table above, management support and staff competency have strong association with inventory management practice whereas as policy and IT did not show association as shown on table 13 above. The implication is competent staffs and management support are instrumental for the improvement of inventory management practice.

CHAPTER FIVE: SUMMARY, CONCLUSION and RECOMMENDATION

This chapter presents a summary of key findings and conclusions based on the objectives of the study.

5.1. Summary of Findings

5.1.1. Policy and Procedures

This study investigated that majority of respondents (59%) agreed or strongly agreed that the inventory management system at PFSA is in line with policies and procedures. About half of the respondents believed that existing pharmaceutical regulatory policies, guidelines and procedures are suitable for warehouse and inventory management practice of PFSA. The study also further investigated that close to half of the respondents (50%) agreed or strongly agreed that public procurement policy negatively affects PFSA inventory management. This indicated that there is a need to align PFSA inventory management practice with the available policies and procedures. This is also supported by the findings of the key informant interview that integrating activities with key stakeholders, aligning procedures with government policies during redesigning of inventory management were acknowledged as important interventions for the smooth implementation of inventory management.

5.1.2. Management Support

This study revealed that more than half of respondents (52.5%) showed their disagreement to the statement “PFSA managements have facilitated successful deployment of inventory management” which is in conformity with findings from qualitative study which showed limitation of management support in implementing new inventory techniques. Majority of the respondents also agreed that lack of management support has inhibited the implementation of inventory management systems and this concurs with findings of other studies which acknowledged managers have facilitated successful deployment of inventory management systems. The findings of the study indicated a need for concerted effort by PFSA management to support the inventory management practice. Participants of key informant interview suggested deployment of standard

inventory management techniques such as vendor managed inventory, application of ABC, cross docking, cyclic count, and strict enforcement of FEFO principles as important milestone for the efficient management of inventory management which needs strong management support and investment as well

5.1.3. Staff Competency

The study revealed that only 26.3% of respondents were in agreement with a statement “PFSA employees are well trained to effectively execute the inventory management activities” which implied that there is lack of knowledge and skill to implement the inventory management practice efficiently. In connection with this, more than two third of respondents (67.2%) were in agreement with the fact that Staffs knowledge and skills affects the performance of the inventory management system. This is in line with the findings of the qualitative study that indicated a need for agency wide capacity building effort for the smooth implementation of inventory management activities. Findings from literatures also supported that education and training as one of the interventions for developing and sustaining human resource in supply chain management.

5.1.4. Information Technology

This study investigated that majority of the respondents (62.3) either strongly agreed or agreed that use of information technology improved the current inventory management practice of PFSA and they also witnessed information technology improved traceability of inventory and data visibility. To the contrary, majority of respondents were neutral or in disagreement that PFSA uses the existing information technology strictly for decision. These finding concur with findings of Chaffy & Wood (2005), who found that effectiveness of an inventory management practice depends on the quality of information it takes in and the capacity of the company's information technology (IT).

5.1.4. Inferential analysis

The Hosmer and Lemeshow Test indicated that the model has a good fitness to the data. From the model summary, it can be inferred that the four independent variables that were studied, explain 56.4% of the inventory management practice of PFSA as represented by the R². This means the four independent variables contribute about 56.4 % to the inventory management practice of PFSA whereas other factors which are not studied in this research contributed 43.6% to inventory management practice. The Logistics Regression has showed that management support and staff

competency have strong association with inventory management practice at 1% level of significance.

5.2. Conclusion

The study revealed inadequate staff competency, management support and in adequate level of inventory management practice at PFSA. The study further investigated staff competency and management support are the major factors that affects the inventory management practice at PFSA. The study also showed that majority of respondents are in agreement with the importance of information technology for the improvement of inventory management practice.

5.3. Recommendations

Based on the findings of this study, the following recommendations are forwarded:

- PFSA needs to improve the competency of its staffs through appropriate capacity building efforts, coaching, mentoring, and supervision
- PFSA management needs to support the inventory management practice by deploying standard inventory techniques, strengthening the existing pharmaceutical management information system, enforcing the development and implementation of SOPS, enhancing warehouse operations efficiency, enhancing the capacity of inventory management workforce, and allocating appropriate budget for inventory related activities.
- It is recommended also that improving inventory management calls for a high degree of collaboration and visibility across all parties as well as utilizing sophisticated technologies such as barcode scanners/RFID and GPS.
- Developing clear job descriptions and regular performance monitoring using selected key inventory performance indicators has been also suggested as important milestone for improving the inventory management practice of PFSA.

5.4. Suggestions for Further Study

As indicated by predictive power of the model, there are factors which have not been properly accounted by this study due to its scope. It is therefore suggested that further research should be done to further explore other factors which can influence inventory management such as the recording practice, warehouse operation, and others. It is imperative also to study the inventory management practice at all levels of healthcare supply chain.

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Annex 1: Questionnaire

Instructions: This is a research designed to assess factors influencing the pharmaceutical inventory management practice: The case of the Pharmaceutical Fund and Supply Agency. You are kindly requested to fill in your response properly in the blank space provided or tick single responses as relevant. This research is intended to get information which will be used and treated confidentiality and solely for academic purposes. The survey will take no more than 20 minutes to complete. Thank you in advance for agreeing to participate in this assessment and for your valuable inputs.

PART I: Background Information

Q.N	Questions	Alternatives
101	Sex	<ol style="list-style-type: none"> 1. Male 2. Female
102	Highest level of education attained?	<ol style="list-style-type: none"> 1. College certificate 2. Diploma 3. Bachelor degree 4. Master's degree 88. Others: Specify Specify_____
103	Total years of service at PFSA?	<ol style="list-style-type: none"> 1. Less than a year 2. 1- 2 years 3. 3-5 years 4. More than 5 years
104	Please indicate your current directorate?	<ol style="list-style-type: none"> 1. Procurement 2. Forecasting and Capacity Building 3. Storage and Distribution 4. Fund Management

Part II: Current Inventory Management Practice of PFSA

Choose only one level of agreement for each statement related to the current inventory management practice of PFSA. Key =1-Strongly Agree (SA), 2- Agree (A), 3-Neutral (N), 4- Disagree (D), 5- Strongly Disagree (SD)

S. N	Inventory Management Practice	SA [1]	A [2]	N [3]	D [4]	SD [5]
1.	There exists efficient and effective inventory management practice at PFSA that minimizes wastage					
2.	PFSA inventory management practice is in line with standard inventory management techniques such as ABC analysis, Just in time, Vendor managed inventory and cross docking.					
3.	There exists reasonable inventory turnover rate for both program and revolving drug fund items at PFSA					

Part III: Factors affecting inventory Management Practice: Policy and Procedures, Management Support, Information Technology and Staff Competency

Based on the current practice you know, choose only one level of agreement for each statement related to factors affecting pharmaceuticals inventory management practices at PFSA. Key =1-Strongly Agree (SA), 2- Agree (A), 3-Neutral (N), 4-Disagree (D), 5- Strongly Disagree (SD)

A. Policies and procedures: Statements related to the influence of policies and procedures of relevant government organizations on the Inventory Management practice of PFSA.

S. N	Policy and Procedures	SA [1]	A [2]	N [3]	D [4]	SD [5]
1.	The inventory management system at PFSA is in line with government policies and procedures					
2.	The existing Pharmaceutical regulatory policies, guidelines and procedures are suitable for warehouse and inventory management practice of PFSA					
3.	Public procurement policy has a negative influence on implementation of inventory management system at PFSA					
4.	PFSA has Long procurement procedures which has a negative impact on the effectiveness of inventory management					
5.	PFSA Inventory management systems have achieved efficiencies and reduced costs while enhancing transparency of procedures					

B. Top management Support: Statements relating to the influence of top management on implementing Inventory Management Systems. This is support and follow-up from the top management in devising the appropriate infrastructure, procedures, personnel and performance management for the efficient inventory management practice.

S. N	Top Management Support	SA [1]	A [2]	N [3]	D [4]	SD [5]
1.	PFSA Top Managements have facilitated successful deployment of inventory management systems					
2.	PFSA management supports enforcement of SOPs for effective implementation of inventory management.					
3.	TOP management devises a mechanism to create integration with key stakeholders such as Banks, Ethiopian Customs Authority and Food, Medicine and Health care Administration and Control Authority that affects the procurement and inventory management					
4.	Lack of Top management support has inhibited the implementation of inventory management systems					
5.	The existing fund management system affects positively the inventory management practice					
6.	Management supports implementation of effective procurement system that in turn influences the inventory management.					
7.	Top management officials have a positive direct effect on inventory management system usage.					
8.	PFSA management has invested enough in information technology to streamline the inventory management					
9.	Top management supports inventory data visibility/data sharing mechanisms with relevant stakeholders to enhance data usage for decision making					

C. Information Technology: This part includes the application of technologies that supports the efficient management of inventory management

S. N	Information Technology	SA [1]	A [2]	N [3]	D [4]	SD [5]
1.	Use of information technology has improved the current inventory management practice of PFSA					
2.	Traceability of inventory and data visibility has been improved at PFSA because of deployment of electronic inventory management system					
3.	PFSA uses the existing information technology strictly for decision making					
4.	Information Technology has led to reduction in inventory costs at PFSA					
5.	Use of technology has boosted customer satisfaction levels at PFSA					
6.	Use of information technology has improved employee productivity at PFSA					

D. Staff Competency: Staff competency is technical and behavioral capabilities of staffs to accomplish tasks effectively.

S. N	Staff competency	SA [1]	A [2]	N [3]	D [4]	SD [5]
1.	PFSA employees are well trained to effectively execute the inventory management activities					
2.	PFSA Staff qualification matches with Job requirement which enhance the inventory management practice.					
3.	Staffs knowledge and skills affects the performance of the inventory management system					
4.	Team development and leadership competencies are vital for the effectiveness of inventory management					
5.	Staffs follow organization processes, instructions, rules, and parameters for warehouse and inventory management and related activities					
6.	PFSA deploys the right type and mix of professional for the effective implementation of inventory management system					

Thank you for your best cooperation!

Annex 2: In-depth interview guiding questions

1. How do you describe the current inventory management practice of PFSA as compared to standard inventory practices
2. What are the current challenges of inventory management at PFSA in terms of:
 - Organizational structure
 - Management support
 - Staff competency
 - Coordination
 - Information technology and
 - Government policies and procedures
3. What do you think are the possible interventions to resolve the current problems in terms of :
 - Management support
 - Staff competency
 - Information technology and
 - Government policies and procedures
4. What other additional factors affect the inventory management practice of PFSA?

Annex 3: Effect of management support on the PFSA IM practice

Management support	SA [1]	A [2]	N [3]	D [4]	SD [5]	Mean	SD
PFSA Top Managements have facilitated successful deployment of inventory management systems	1.6	29.5	16.4	44.3	8.2	3.28	1.035
PFSA management supports enforcement of SOPs for effective implementation of inventory management.	6.6	18.0	19.7	47.5	8.2	3.33	1.076
TOP management devises a mechanism to create integration with key stakeholders	9.8	21.3	37.7	26.2	4.9	2.95	1.040
Lack of Top management support has inhibited the implementation of inventory management systems	21.3	39.3	29.5	9.8	0	2.28	.915
The existing fund management system affects positively the inventory management practice	9.8	23.0	37.7	29.5	0	2.87	.957
Management supports implementation of effective procurement system that in turn influences the inventory management.	9.8	39.3	23.0	21.3	6.6	2.75	1.105
Top management officials have a positive direct effect on inventory management system usage.	11.5	34.4	23.0	26.2	4.9	2.79	1.112
PFSA management has invested enough in information technology	6.6	31.1	24.6	32.8	4.9	3.15	1.093
Top management supports inventory data visibility/data sharing mechanisms	4.9	27.9	24.6	32.8	9.8	2.98	1.057

Source: Own Survey, 2017

Annex 4: Effect of IT on the PFSA inventory management practice

Information Technology	SA [1]	A [2]	N [3]	D [4]	SD [5]	Mean	SD
Use of information technology has improved the current inventory management practice of PFSA	24.6	37.7	14.8	18.0	4.9	2.41	1.189
Traceability of inventory and data visibility has been improved at PFSA because of deployment of electronic inventory management system	14.8	37.7	29.5	14.8	3.3	2.54	1.026
PFSA uses the existing information technology strictly for decision making	3.3	27.9	32.8	29.5	6.6	3.08	.988
Information Technology has led to reduction in inventory costs at PFSA	11.5	34.4	24.6	23.0	0	2.79	1.127
Use of technology has boosted customer satisfaction levels at PFSA	9.8	19.7	45.9	21.3	3.3	2.89	.968
Use of information technology has improved employee productivity at PFSA	8.2	37.7	23.0	23.0	8.2	2.85	1.123

Source: Own Survey, 2017

Annex 5: Logistics regression Output

Case Processing Summary

Unweighted Cases ^a	N	Percent
Included in Selected Cases Analysis	61	100.0
Missing Cases	0	.0
Total	61	100.0
Unselected Cases	0	.0
Total	61	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
.00	0
1.00	1

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	-.793	.276	8.231	1	.004	.452

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
Step	31.240	4	.000
Step 1 Block	31.240	4	.000
Model	31.240	4	.000

Model Summary

	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	44.434	.401	.564

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Management Support	2.319	.768	9.114	1	.003	10.163
Staff Competency	3.143	1.168	7.242	1	.007	23.170
Policy Support	.692	.763	.825	1	.364	1.999
IT	.453	.770	.347	1	.556	1.574
Constant	-11.508	3.343	11.851	1	.001	.000