

***Assessment of Integrated Pharmaceutical Logistics System in
Selected Health Facilities under Jimma Branch Pharmaceutical
Fund and Supply Agency***

*A Thesis Submitted to the School of Graduate Studies of Jimma University in
Partial Fulfilment of the Requirements for the Award of the Degree of
Masters of Business Administration (MBA)*

BY:

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Jimma University

College of Business and Economics

MBA Program

JUNE, 2016

JIMMA, ETHIOPIA

***Assessment of Integrated Pharmaceutical Logistics System in
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BY:

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Under The Guidance of:

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CERTIFICATE

This is to certify that the thesis entitled “Assessment of Integrated Pharmaceutical Logistics System in Selected Health Facilities under Jimma Branch Pharmaceutical Fund and Supply Agency”, submitted to Jimma University for the award of the Degree of Masters of Business Administration (MBA) and is a record of bonafide research work carried out by Mr. Kezaf Mohammed Ibrahim, under our guidance and supervision.

Therefore, we declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree or diploma.

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DECLARATION

I hereby declare that this thesis entitled “Assessment of Integrated Pharmaceutical Logistics System in Selected Health Facilities under Jimma Branch Pharmaceutical Fund and Supply Agency”, has been carried out by me under the guidance and supervision of Mr. Emnet Negash and Mr Wubshet Mengesha.

The thesis is original and has not been submitted for the award of any degree or diploma to any university or institution.

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JIMMAUNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
MBA PROGRAM

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JUNE, 2016
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ABSTRACT

As part of a major intervention to improve the health supply chain situation in the country, PFSA, began implementing the Integrated Pharmaceuticals Logistics System (IPLS) in 2011 at all of its branches. The general objective of the study is to assess the IPLS in Selected Health Facilities under Jimma Branch Pharmaceutical Fund and Supply Agency (PFSA). A cross sectional qualitative and quantitative methods of research was used and data was collected from 25 health facilities of Jimma and Ilubabora zones included in phase I IPLS implementation (2011) by interview questions, document review and questionnaires. Descriptive statistics like percent, mean and standard deviation and statistical tools such as; Chi-square test, independent sample t-test, Mann Whitney U test were used for data analysis. It was found that, the level of implementation of IPLS is good in terms of availability of formats, training and capacity building. System performance in terms of LMIS formats usage, LMIS data quality, stock out rate, lead time, reliability and responsiveness of the supply chain is not as desired. Customer satisfaction on pre transaction and post transaction supply chain services is good. But, it is weak with transaction supply chain services. It is concluded that, though the progresses seen so far are encouraging, IPLS implementation didn't yet bring about the desired level of achievements in a number of SC parameters used to evaluate the supply chain practices and performance. It is recommended that similar studies be made at other PFSA branches to get the whole picture. It is also recommended to invest and work more in streamlining the SC system integration with supply chain partners through objective alignment, collaboration, data visibility, streamlining processes through removing unnecessary steps, and increasing responsiveness and resilience.

Key Words: *IPLS, Supply Chain Management, PFSA, Storage, Bin Card, Order Fill Rate, Stock out, Customer Satisfaction, Hospitals, Health centers.*

Acknowledgements

I would like to express my deep gratitude to Mr. Emnet Negash and Mr Wubishet Mengesha, my advisors, for their guidance, enthusiastic encouragement, and useful critiques of this paper. They have also helped and assisted me in keeping my progress on schedule.

I would also like to acknowledge the cooperation and assistance provided by technical and managerial staffs of Jimma branch Pharmaceutical Fund and Supply Agency (PFSA). My special appreciation goes to Melese Tekle, Branch Manager, Tekalign Admasu and Fedila Sherefa, Forecasting and capacity building officers and Mr Tadesse Dessie, Stock and distribution coordinator. I am also grateful to Nuria Oumer, Ilubabora zone logistics officer, and Abdu Mohammed, MBA student and a real friend, both of whom contributed the majority in coordinating the data collection and enabled this study to be a reality. Additionally, am very thankful to Jemal Hussien, a dear friend, who provided his unreserved technical expertise in the utilization of SPSS. Moreover, I thank all those who contributed and supported me for this work.

Last but not least, I would like to offer my special thanks to my dear wife Safia Nuro and my sweet daughters Hamdia and Aisha for their patience, continuous support, and encouragement throughout my study.

My Final Word is “Alhamdu lilahi Rabi Elalamin”!!!

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ABBREVIATIONS/ACRONYMS

ART	Antiretroviral Therapy
CHAI	Clinton Health Access Initiative
FCB	Forecasting and Capacity Building
FEFO	First Expire First Out
FIFO	First In First Out
FMOH	Federal Ministry of Health
HC	Health Center
HF	Health Facilities
HPMRR	Health Post Monthly Reporting and Requesting Form
ICT	Information Communication Technology
IFRR	Internal Facility Reporting and Requesting Form
IPLS	Integrated Pharmaceutical Logistics System
KPI	Key Performance Indicator
LIAT	Logistics Indicator Assessment Tool
LMIS	Logistics Management Information System
LSAT	Logistics System Assessment Tool
MSH	Management science for Health
PFSA	Pharmaceutical Fund and Supply Agency
PLMP	Pharmaceutical Logistics Master Plan
RDF	Revolving drug fund
RHB	Regional Health Bureau
RRF	Reporting and Requesting Form
SC	Supply Chain
SD	Stock and Distribution

SCM	Supply Chain Management
SCMS	Supply Chain Management System
SCOR model	Supply Chain Operations Reference model
SDP	Service Delivery Points
SOH	Stock on Hand
SOP	Standard Operating Procedure
STV	Stock Transfer Voucher
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Organizations are facing different kinds of challenges in their effort of competing in today's dynamic global markets. The new paradigm in modern business management is that, competition is no longer among individual business organizations, but rather among inter-networks in the supply chain (Drucker, 1998).

The Global Supply Chain Forum describes Supply Chain Management as the integration of key business processes and resources from end user through original suppliers that provide products, services, and information that add value for customer and other stakeholders (Lambert, Cooper, & Pagh, 1998). It encompasses the planning and management of all activities involved in sourcing and procurement and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies (USAID | DELIVER PROJECT, Task Order 1, 2011). In other words, logistics activities could be considered as the operational component of supply chain management, including quantification, procurement, inventory management, transportation and fleet management, and data collection and reporting. Supply chain management includes the logistics activities plus the coordination and collaboration of staff, levels, and functions (USAID | DELIVER PROJECT, Task Order 1, 2011). The main goals of having Supply Chain Management are to offer good service to the final customer, while keeping costs and lead times low (Trkman, Stemberger, Faklic, & Groznic, 2006). Performance and efficiency improvement initiatives through Supply Chain Management are now becoming important factor in maintaining competitive advantage over competitors (Dannese & Romano, 2011).

Health sector supply management play pivotal role to ensure accessibility of health care for all segments of the population. In Ethiopia, the government is the primary health care

provider and supplier of pharmaceuticals for the public sector through Pharmaceutical Fund and Supply Agency (PFSA).

The Federal Ministry of Health (FMOH) of Ethiopia has been working to ensure an efficient and high performing health care supply chain that ensures an equitable access to affordable medicines for all Ethiopia. Significant progress has been made although various challenges including wastage, stock outs, and poor health outcomes remain. Consequent investment in “program” commodity specific or vertical SC systems even though improved availability led to fragmentation and duplication (inefficiency), which is sub optimal use of limited resource. To address these challenges, the FMOH initiated a comprehensive public health Supply Chain planning process emphasizing on the integration of all public health products into one Supply Chain System (PLMP, 2006). Following this Pharmaceutical Fund and Supply Agency (**PFSA**), an autonomous FMOH agency mandated to manage all aspects of public health Supply Chain Management activities, was established by proclamation in 2007.

PFSA was designed to focus its operations on ensuring that vital and essential medicines are available in public sector health facilities. The agency is mandated to coordinate and lead facility-specific, consumption-based demand planning or forecasting for key products. PFSA’s distribution design emphasizes logistics efficiency by utilizing a network of 17 hub warehouses whose locations are based on population density, logistics efficiency; balances warehousing and transport costs, and concentrates logistics capacity in a relatively small number of hub warehouses. Regular orders from total of more than 3000 hospitals and health centers are packaged and delivered by the hubs to the respective hospitals and health centers. Jimma PFSA, one of the long serving branches, currently is serving nearly 300 public health facilities (hospitals and Health centers) that are found in Jimma and Illubabora zones of Oromia region, Kefa, Sheka and bench Maji zones and Yem and Konta special woredas of SNNPR and Gambella region.

In addition, Integrated Pharmaceutical Logistics System (IPLS), standard in country inventory Management, warehousing, distribution, and logistics information management system to ensure and maintain availability of essential medicines including and minimize their wastage in public hospitals and health centers was implemented. Specific objectives

of IPLS include; streamlining and standardizing the public health logistics management system (information, inventory, and warehouse management system) and optimizing commodity resupply and distribution. So, the purpose of the study is to describe and evaluate the impact of the system (IPLS) on the supply chain management practices and performance of the public health supply chain system using process and output related indicators from SCOR model, Logistics Indicator Assessment Tool (LIAT), and M & E indicators for logistics performance for Public Health Supply Chain System of essential pharmaceuticals at health facilities served by the Jimma hub PFSA.

1.2. Statement of the Problem

In public health care service, supply chain of health commodities is the most costly activity requiring significant attention, effective strategy, and management. The public health organizations need to have clear supply chain strategy and direction that support firms' business strategy. In addition, the supply chain management including; the procurement planning, inventory control, distribution, and logistics processes should be well integrated and coordinated to reduce costs and increase availability and hence improve the intended health outcome.

Prior to the development of PLMP in 2007 followed by the establishment of PFSA, the SCM of public health commodities in Ethiopia used to lack clear supply chain strategy and direction. There used to be many tiers and different routes which didn't consider cost effectiveness. Moreover, SC problems such as stock out, expiry, poor quality, shortage, etc were used to be common. Following the establishment of PFSA, the federal MOH of Ethiopia decided to streamline the flow of all public health commodities through PFSA. As per the mandate given to it, PFSA established 17 branches all over the country that were believed would form strong SC network to address the public health commodity needs of the nation.

PFSA introduced and implemented Integrated Pharmaceutical Logistics System (IPLS), standard in country inventory Management, warehousing, distribution, and logistics information management system to ensure and maintain availability of essential medicines and minimize their wastage in public hospitals and health Centers. The IPLS was introduced by PFSA to streamline and standardize the public health logistics

management system (information, inventory, and warehouse management system) and optimizing commodity resupply and distribution. Millions of Birr had been invested by PFSA and partners for the implementation of the system. However, the implementation of IPLS does not necessarily guarantee efficiency and good outcome as product characteristics of different health commodities influence the supply chain practices and performances. This added with high service expansion have highly exacerbated effectiveness and efficiency related challenges which are manifested as stock outs, wastages due to expiries, mal-distribution, and hence poor health outcomes.

Routine monitoring reports show that IPLS is improving information recording and reporting, storage and distribution systems, as well as the availability of essential commodities at SDPs served by jimma hub. However, the IPLS has not had an official, evaluation to assess the progress made to this point. Therefore, this study was conducted to measure system performance at public-sector health facilities—hospitals and health centers. The findings from the survey helped in providing information on the level of the IPLS implementation on the hub’s catchment area; it also helped determine future priorities and direction.

1.3. Basic Research Questions

The study tried to find answers to the following basic research questions:

- Ñ What does the public health supply chain practice of Jimma branch PFSA within its catchment area look like?
- Ñ What is the level of availability and usage of recording and reporting formats at the facilities where IPLS was implemented?
- Ñ Did IPLS implementation bring about good storage condition at the HFs?
- Ñ To what extent did IPLS implementation minimize stock out of products at the selected health facilities?
- Ñ What is the supply chain performance of the IPLS as per SCOR KPIs at the selected facilities?

- Ñ What is the level of satisfaction of customers at public health hospitals and health centers on the supply chain performance of IPLS and is the level of satisfaction the same at different zones?
- Ñ Is the implemented system consistent in its performance between different zones (Jimma and Ilubabora)?

1.4. Objectives of the Study

1.4.1 General Objective

To assess the implemented IPLS in selected health facilities (hospitals and health centers) under Jimma Branch Pharmaceutical Fund and Supply Agency (PFSA).

1.4.2 Specific Objectives

- Ñ To describe the public health supply chain practice of Jimma branch PFSA within its catchment area.
- Ñ To assess is the level of availability and usage of recording and reporting formats at the facilities where IPLS was implemented.
- Ñ To assess whether IPLS implementation brought about good storage condition at the assessed health facilities.
- Ñ To measure the extent to which IPLS implementation minimized stock out of products at the selected health facilities.
- Ñ To evaluate the supply chain performance of the IPLS as per SCOR KPIs at the selected facilities.
- Ñ To assess the level of satisfaction of customers at public health hospitals and health center staffs on the supply chain performance of IPLS and compare whether the satisfaction level is the same between two zones (Jimma and Ilubabora).
- Ñ To assess whether the implemented system is consistent in its performance between different zones (Jimma and Ilubabora).

1.5. Significance of the Study

Supply chain is key strategic area requiring significant attention and effective management especially in the health system of any country. It is one of the most expensive activity and improving or optimizing the supply chain will have significant impact on performance in terms of improving access to essential medicines and

improving health outcomes. Because, effective supply chain will help a lot in delivering the right product/service, in the right quantity, to the right place, at the right time, with the right quality, and in the right cost. Therefore, the findings and recommendations from this study will be an interest for policy and decision makers in the health sector in general and public health supply chain in particular. Specifically, the finding will be significant in the following aspects:

1. It will provide baseline evidence based information on the effect of implemented IPLS by Jimma branch PFSA on the health supply chain practices and management of the catchment public health facilities.
2. It will help in identifying weak links in the public health supply chain to prioritize interventions accordingly and hence finally improve the health of the public.
3. It will help in diagnosing and evaluating customer focused (output) and internally focused (operation) performance attributes of the supply chain for further improvement.
4. It will also be used as an input by PFSA in general and Jimma branch in particular to further improve and optimize supply chain strategy that will significantly improve the performance in terms of medicine access and health outcome.
5. It will contribute on the limited knowledge in the area of public health SCM in Ethiopia to the researcher himself, the scholars and the public and is expected to encourage further studies in the area.

1.6. Scope of the Study

The scope of the study was assessment and evaluation of the implemented IPLS in the selected public health facilities on the supply chain practices and performances of essential medicines from Jimma PFSA branch warehouse to hospitals and Health Centers, particularly those found in Jimma and Ilubabora zones. The study did not include local and international suppliers at the upper tier and health posts down the tier due to time and budgetary constraints. In addition, the assessment was done at ART sites that are included in phase I (i.e., in 2011) IPLS implementation facilities.

1.7. Definition of Terms

- **Supply Chain Management:** is the integration of key business processes from end user through original suppliers that provide products, services, and information that add value for customer and other stakeholders (Lambert, Cooper, & Pagh, 1998).
- **Supply Chain Management Practices:** are set of activities undertaken in an organization to promote effective management of its supply chain (Beamon, 1998).
- **Supply Chain Performance:** is the performance of the supply chain system in terms of reliability, responsiveness, asset management efficiency, and customer satisfaction (SCC, 2010).
- **Asset Management Efficiency:** is an internally-focused SC performance attribute describing the ability to efficiently utilize assets (SCC, 2010).
- **Customer satisfaction:** The degree to which customers are satisfied with the product and/or service received (Bemon, 1998).
- **Reliability:** customer focused attribute describing system's ability to deliver the right quantity and quality on the right time. The SCOR® KPI is perfect order fulfillment (SCC, 2010).
- **Responsiveness:** customer focused attribute describing the speed at which tasks are performed and mostly expressed by cycle-time metrics. The SCOR® KPI is order fulfillment cycle time (SCC, 2010)
- **Order Fill Rate:** is the percentage of difference between amount ordered in the last order period (or other defined period of time) and the amount received for that period (USAID | DELIVER PROJECT, Task Order 1, 2006).
- **Delivery Lead Time:** is the time interval between when new stock is ordered and when it is received and available for use (USAID | DELIVER PROJECT, Task Order 1, 2011).
- **Inventory Turnover:** is an indicator that measures the number of times the inventory turns over in a given time period (USAID | DELIVER PROJECT, Task Order 1, 2006).
- **Inventory Accuracy Rate:** is the accuracy of stock balances recorded in bin cards and electronic system over a range of items as a percentage of stock balances reviewed for accuracy (USAID | DELIVER PROJECT, Task Order 1, 2006).

1.8. Structure of the Thesis

This research paper have the following organization: The introductory chapter dealt with the background, statement of the problem, research questions, objectives of the study, definition of terms and significance of the study. Chapter two discussed the review of related theoretical and empirical literatures on basic concepts and principles of SC, SCM practices and performance, and health care SCM in Ethiopia. Chapter three described research design and methodology, sample and sampling methods; tools, procedures and sources of data collection and data analysis. Chapter four covered the findings of the study, interpretation and discussion of the findings by comparing with the existing literature and best practices. Chapter five summarized the findings, drawn conclusions and also presented the limitations and recommendations from the study.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Theoretical Framework

2.1.1. Supply Chain Management Theories and Concepts

Organizations are facing different kinds of challenges in their effort of competing in today's dynamic global markets. The new paradigm in modern business management is that, competition is no longer among individual business organizations, but rather among inter-networks in the supply chain (Lambert *et al*, 1998; Drucker, 1998). The supply chain is becoming more critical these days due to a number of factors like rising of manufacturing costs, resource constraint, shortened product life cycle, and globalization of market economies (Beamon, 1998).

Supply chain (SC) is a linked set of resources and processes that begins with the sourcing of raw materials and extends through to the delivery of end items to the final customer (Trkman, Stemberger, Faklic, & Groznic, 2006). That is, various business entities (suppliers, manufacturers, distributors, and retailers) are expected to work together to deliver the right product or service at the right time. It is a network that begins with the sourcing of raw materials and extends to the delivery of end items to the final customer. The supply chain constitutes all functions within and outside an industry, which enable the value chain to make products and provide services to customers. That is, SC involves and requires collaboration of value chains within and outside of industry to make products and provide services to customers (Beamon, 1998). Nowadays, supply chain is receiving significant attention because it is an integral part of a firm's strategy and supply chain costs as a percent of sales are often significant (Heizer, 2011).

Supply-chain management is management of activities in the supply chain including procurement of materials/services, transformation into intermediate goods and final products, and delivery through a distribution system. The major processes involved in the supply chain include: production planning, inventory control, distribution, and logistics

processes. These processes interact with one another to produce an integrated supply chain (Heizer, 2011).

According to the Global Supply Chain Forum,

“SCM is the integration of key business processes from end user through original suppliers that provide products, services, and information that add value for customer and other stakeholders” (Lambert *et al.*, 1998, pp 1)

SCM is also defined as a sourcing technique that involves proactive relationship between a buyer and supplier and the integration is across the whole SC, not just first-tier suppliers (Cox, 2004).

All in all, SCM encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, SCM integrates supply and demand management within and across companies” (Ballou, 2007).

As can be seen above, different authors defined the SCM differently. Some in operational terms involving the flow of products and information, some viewed it as a management philosophy, and some viewed it in terms of a management process. These different perspectives suggested a multi-dimensionality of SCM that covers set of activities and processes from upstream, firm’s internal operations to downstream of the supply chain.

Successful SCM requires integration of internal operational level activities along with external suppliers and customers to attain supply chain performance goals like reliability, responsiveness, agility, and cost effectiveness (Samarnayake, 2005). Performance and efficiency improvement initiatives through SC integration are now becoming important factor in maintaining competitive advantage over competitors. Specifically, SC integration programs do mostly focus on information flow and management, inventory planning, and/or partnership (Dannese & Romano, 2011).

There are six generic Supply Chain strategies used in sourcing products from suppliers to be adopted based on different organizational and environmental factors. These strategies involve negotiating with many suppliers, developing long term relationship with suppliers, vertical integration, joint venture, keiretsu and virtual companies (Heizer, 2011).

An effective supply chain strategy that is in line with company's business and product strategy is vital. Specifically, demand patterns and characteristics are major product related factors for having effective and efficient supply chain strategy. Physically efficient supply chain is the right SC strategy for stable low margin functional products intended to satisfy basic needs. Responsive supply chain will be the right supply chain strategy for innovative products characterized by high profit margin and volatile demand (Fisher, 1997).

Main objectives for implementing SCM include reducing cost of operations, improving inventory, lead time and customer satisfaction, increasing flexibility and cross functional communication, and remaining competitive (Tummala *et al*, 2006). The main goals of having efficient SC system are to offer good service to the final customer, while keeping costs and lead times low (Trkman *et al*, 2006). Enhancing competitiveness and profitability of the whole supply chain network are among the main objectives of SCM (Cooper, Lambert, & Pagh, 1997). According to Habib (2011); the major purposes, benefits, and reasons for SCM include operation efficiency, better outsourcing, profit maximization, enhancing customer satisfaction, improving product/service quality, tackling competitive pressures, increasing importance of E-commerce, and growing complexity of supply chains. It is now being seen as a means of generating innovations which can generate performance (Burgress & Sing, 2003). There are many factors and reasons in relation to suppliers and customers that have raised interest in the supply chain. Greater differentiation, competition, changing operating environment, product quality improvement, and shipping products in cost effective manner. Whereas consumer level includes customer's sensitivity to quality, safety, health, nutritional factors, place of

origin, means of production, and environmental sustainability. The four SCM strategic and operational success factors include building customer supplier relationship, implementation of ICT, re-engineering material flow, and creating corporate culture (Tummala *et al*, 2006).

SCM-related problems are mostly due to demand uncertainties and/or difficulty in coordinating several activities and processes in the supply chain. Bullwhip effect is incomplete information about the needs of others resulting in increase in inventory levels and fluctuation in its demand relative to others down the chain; local instead of global optimization as described by optimizing individual performance without considering others in the supply chain; and human factors described as subjective decisions based on non objective criteria like human resource performance system. So, seamless and efficient information flow and data visibility are among the major factors required for success of the supply chain system (Trkman *et al*, 2006; Heizer 2011).

2.1.2. Evolution of Supply Chain Management

2.1.2.1. The Past

Pre 1950 is dormant era in SCM and logistics. In this era, logistics is a term to describe procurement, maintenance, and transportation of military facilities, materials, and personnel. 1950-60 was an era where manufacturing firms started recognizing physical distribution management as a separate organizational function. The importance of total cost approach rather individual transportation cost was highlighted. But, inbound movement of goods and purchasing were not considered as such. The concept of physical distribution and logistics has emerged in 1960s. Here, business logistics is relatively broader concept encompassing physical distribution and inbound of goods in the manufacturing firm. In conclusion, even though physical distribution and logistics management activities were recognized to be critical for product flow in the supply chain, the coordination among the core functions (purchasing, production, and physical distribution) was minimal. And, the coordination by itself affects product flow a lot (Ballou, 2007).

2.1.2.2.The Present

The concept has emerged with new name and broader concept than logistics and physical distribution to include coordination and collaboration with channel members. These channel members are suppliers, intermediaries, third-party service providers, and customers (Trkman *et al*, 2007).

2.1.2.3.Future

According to Ballou (2007), the contemporary view is designing and operating the supply chain to enhance the revenues of the firm in such a way as to maximize contribution to profit. A revenue generation strategy for the supply chain or a new objective to capture revenue enhancement effects of the supply chain will emerge. And, it is called ROSCA.

$$\text{ROSCA} = \frac{\text{Revenue} - \text{Cost}}{\text{Asset}}$$

- Revenue.....SC's contribution to the sales of the firm
- Cost.....Expenses incurred in SC process
- Asset.....Investments made in facilities and equipments to support SC processes

2.1.3. Supply Chain Management Practices

SCM practices are defined as a set of activities undertaken in an organization to promote effective management of its supply chain. Supply Chain Management is now recognized as a critical business process for companies manufacturing or distributing products. This is because customers' demand for most products are ever more demanding in response time, in choice and in seeking more competitive prices and thanks to globalization, customers can choose from an increased number of suppliers (Lazarevic, Sohal, & Baihaqi, 2007).

The SCM practices of an organization could be described in terms of their supply strategy to source raw materials and as a set of interlinked activities under production planning,

inventory control, distribution, and logistics. The detail activities under these processes include: raw material scheduling and acquisition, manufacturing process design and scheduling (Process focus, repetitive focus, and product focus), material handling design and control, design and management of storage policies and procedures for raw materials/work in process/final product inventories, management of inventory retrieval, transportation, and final product delivery (Beamon, 1998)

Cox (2004) has described four sourcing options for buyers which guide the focus of relationship with suppliers and the level of work scope with suppliers and supply chain. Supplier selection and supply chain sourcing are reactive sourcing strategies whereby, suppliers from one or many tiers are chosen among many competing ones. The relationship management with these sourcing options is arm's length or non-collaborative. Supplier development and supply chain management are proactive sourcing strategies whereby, buyers and suppliers at the first or many tiers collaborate more on long term basis. The relationship management with these sourcing options is collaborative.

Relationship management as an organizational core process is comprised of strategic and operational components. The strategic process provides the structure for integrating the firm with suppliers. This is to identify key suppliers for organizational success and to decide on development and maintenance of the relationship. The operational process is to segment suppliers based on their value overtime and identify opportunities for longer term relationship. The operational teams will be responsible to develop the standard and tailored product and service agreement (PSA) to different supplier segments (Lambert, & Schwieterman, 2012).

Information sharing practice among companies, customers, and suppliers is an important component required to improve visibility of information to achieve seamless integration within the supply chain. The practice could be described in terms of type (quantity), quality, and level of participation. The type of information to be shared could vary depending on the level of relationship and vision alignment. It could be strategic,

operational, market, consumer, and/or logistics. Forecast, product related, satisfaction, and logistics related information is the most commonly shared information among the supply chain partners (Zailani & Rajagopal, 2005; Huang, Sheoran, & Wang, 2004).

Information and communication technology (ICT) being process and product communication enabler is very important strategic factor for SC integration. It will help a company a lot in streamlining communication and developing efficient- responsive system. The most important issue to consider while implementing ICT is extent of coordination with SC partners and compatibility with other relevant technologies used in the SC system. Major types of ICT used in interaction with suppliers and customers include e-mail/fax, bar-coding/scanning, EDI, WWW, e-commerce, intranet, ERP, and Baan (Tummala *et al*, 2006). ICT implementation should go along with the required process changes and re design activities executed through incremental processes (Power, 2005).

In addition, (Cooper *et al*, 1997) has developed framework encompassing three interrelated elements to describe SCM and the level of integration of a system. The combination of these three elements captures the essence of SCM. Supply chain network structure includes members of supply chain (primary and supporting), structural dimension of the network (horizontal structure, vertical structure, and horizontal position), and the links between members of the supply chain. In addition, it includes business processes links for activities producing a specific output of value to the customer (managed, monitored, not-managed, and non member). The seven key business processes to be integrated across the supply chain are customer relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, procurement, product development and commercialization, and return. The management components of SCM include the physical/technical and managerial/behavioral group. The former component is the most visible, tangible, and easy to change component. Whereas, the latter component is less tangible and visible and are therefore, often difficult to assess and alter.

Organization's internal operation and logistic system as described by production strategy, capacity utilization, inventory control practices, warehousing, and distribution are also very important variables used in describing supply chain management practices of an organization (Beamon, 1998).

Perishable products like food and pharmaceuticals require well functioning and effective inventory control system to avoid wastage due to expiry without compromising consistent availability. The following simple inventory management procedures implemented by experienced staffs will help a lot to achieve the above mentioned objective. That is:

1. Experienced and trained staffs to fully benefit from the learning curve effect and reducing the probability of making mistakes while ordering.
2. Understanding target stock level and order patterns to have successful inventory management.
3. Creating and maintaining transparency of inventories in order to calculate right order quantities.
4. Keeping inventory procedures simple which reduces making mistakes that would lead to unnecessary wastage
5. Keeping stock fresh and monitoring remaining shelf life to avoid unnecessary wastage.
6. Collaborating with other departments that are not directly involved in the inventory management process (Stanger, Wilding, Yates, & Cotton, 2012).

Decision variables or design aspects like Production/distribution scheduling, the amount and location of every raw material, sub-assembly, and final assembly storage, number of stages (echelons), distribution center (DC) - customer assignment, plant- product assignment, critical aspects of the buyer-supplier relationship, product differentiation step (specialization), and number and product types held in inventory to optimize the supply chain performance (Beamon, 1998).

In summary, SC practices of an organization could be described in terms of sourcing options and relationship management with suppliers, internal operations and logistics, information sharing practices, ICT implementation, and network structure.

2.1.4. Supply Chain Performance Measures

Establishment of appropriate performance measures is an important component and step in design and analysis of supply chain. It measures efficiency and/or effectiveness of an existing system and bench mark standard/good practices from alternative systems (Zailani & Rajagopal, 2005).

Supply chain performance measures could be either qualitative or quantitative. They could also be categorized as internally focused and customer focused performance attributes. The qualitative performance measures include customer satisfaction (pre transaction, transaction, and post-transaction), flexibility, information and material flow integration, risk management, and suppliers' performance in terms of delivering the right good in the right time. There are also quantitative measures based on cost and based on customer responsiveness. Measures based on cost include cost minimization, sales maximization, profit maximization, inventory investment minimization, and return on investment maximization. Measures based on customer responsiveness include fill rate maximization, product lateness minimization, customer response time minimization, and lead time minimization (Beamon, 1998).

The Supply Chain Operations Reference (SCOR®) model provides a common framework for supply chain processes and performance metrics along with bench marks and best practices. The metrics in SCOR provide a solid foundation for measuring performance and identifying priorities. SCOR has five core supply chain performance attributes broadly grouped under customer focused and internal focused. Reliability, responsiveness, and agility are customer focused attributes. Whereas, cost and asset management efficiency are internally focused performance attributes. The key performance indicators are order fulfillment rate, delivery lead time, flexibility, adaptability, cost of goods sold, supply chain management cost, capacity utilization, and inventory days of supply (SCC, 2010).

- Reliability is customer focused attribute describing system's ability to deliver the right quantity and quality on the right time. The SCOR KPI is Perfect Order Fulfillment.

- Responsiveness is customer focused attribute describing the speed at which tasks are performed and mostly expressed by cycle-time metrics. The SCOR KPI is Order Fulfillment Cycle Time.
- Agility is customer focused attribute describing the ability to respond and change according to external influences. The SCOR KPIs include Flexibility and Adaptability.
- Cost is internally focused attribute describing the cost of operating the process (labor, material, and transportation costs). The SCOR KPIs include Cost of Goods Sold and Supply Chain Management Cost.
- Asset Management Efficiency is an internally-focused attribute describing the ability to efficiently utilize assets. Asset management strategies in a supply chain include inventory reduction and in-sourcing vs. outsourcing. Metrics include: inventory days of supply and capacity utilization. The SCOR KPIs include: Cash-to-Cash Cycle Time and Return on Fixed Assets.

In summary, SC performance of an organization could be described in terms of customer satisfaction, suppliers’ performance, reliability, responsiveness, and asset management efficiency. The table below could be described as framework for assessing the supply chain performance of SCM.

2.1.5. Theoretical Framework of SCM of the Study

Data collection on SCM practices and performance measures was guided by SCM practices in Table 2.1 and SC performance measures in Table 2.2 below. These activities and measures were used to derive suitable questions for data collection.

Table 2.1. Theoretical SCM practices used in this study

SCM Operations	SCM Practices	Major References
Demand Planning/Forecasting	<ul style="list-style-type: none"> • Forecasting process • Data elements to be used (consumption, service utilization, program target,...) • Forecast validation and accuracy • Factors to be considered (centralized Vs decentralized, seasonality, geographic variability...) • Role and responsibility of stakeholders 	USAID DELIVER PROJECT, Task order 1, 2004

Procurement	<ul style="list-style-type: none"> • Procurement process (planning, shipment scheduling, pipeline monitoring, and quality assurance) • Procurement policy and procedure • Coordination mechanisms in place • Role and responsibility of stakeholders • Responsiveness to public health demands 	USAID DELIVER PROJECT, Task order 1, 2004
Warehousing and Inventory Management	<ul style="list-style-type: none"> • Setting up optimal and minimum inventory. • Design and management of storage policies and procedures for inventories. • Inventory management practices in place (ABC, record keeping system/accuracy, and cyclic counting) • FEFO and FIFO employment • Models for determining reorder frequency and quantity • Policy on inventory levels to be held (minimum stock reorder for each item and periodic stock evaluation) • Disposal guideline • Special storage policy, guideline, and infrastructure for perishable products 	Heizer, 2011, Ruteri and Xu, 2009, USAID DELIVER PROJECT, Task order 1, 2004, and Tewfik, S., Ensermu, M., 2014.
Transport and Distribution	<ul style="list-style-type: none"> • Retrieval and transportation from warehouse to health facilities. • Distribution scheduling • Number of echelons (stages) • Distribution center (DC) - customer assignment • Special policy, guideline, and infrastructure to transport and distribute perishable products • Distribution optimization • Performance and reliability of delivery vehicles • Fleet management 	Beamon, 1998 and Wong, 2005
Management Information System	<ul style="list-style-type: none"> • Type (strategic, operational, consumer, and logistics) • Quality (accuracy and validity) • Level of participation 	Huang et al, 2004, and Tewfik, S., Ensermu, M., 2014
ICT implementation	<ul style="list-style-type: none"> • Type (Fax/internet, bar-coding/scanning. Intranet, inventory and warehouse management...) • Extent of coordination among SC partners • System compatibility 	Tumala et al, 2006, and Tewfik, S., Ensermu, M., 2014

Organizational Support for Logistics	<ul style="list-style-type: none"> • Capacity building in terms of training, infrastructure, and mentoring • Monitoring and Evaluation 	LSAT, Tewfik, S., Ensermu, M., 2014
Organization and staffing	<ul style="list-style-type: none"> • Staffing and organizational structure at different level 	

Table 2.2. SC performance measures

SC performance attributes	Measures and KPIs	References
1. Qualitative performance measures		
Customer satisfaction	<ul style="list-style-type: none"> • Pre-transaction satisfaction (service elements prior to product delivery) • Transaction satisfaction (service elements during physical distribution of products) • Post transaction satisfaction (support provided for products while in use) 	Beamon, 1998
Suppliers performance	<ul style="list-style-type: none"> • Consistency of suppliers in delivering products on time and in good condition. 	Beamon, 1998
2. Quantitative performance measures		
Reliability	<ul style="list-style-type: none"> • Product Availability • Forecast Accuracy • Order fill rate by item and quantity 	SCC, 2010, Beamon, 1998, and USAID DELIVER PROJECT, Task order 1, 2008
Responsiveness	<ul style="list-style-type: none"> • Delivery lead time • Customer response time' • Supplier lead time variability 	SCC, 2010, Beamon, 1998, and USAID DELIVER PROJECT, Task order 1, 2004
Asset management efficiency	<ul style="list-style-type: none"> • Product Availability • Months of Stock on Hand • Order Fulfillment • Inventory turnover 	SCC, 2010, Beamon, 1998, and USAID DELIVER PROJECT, Task order 1, 2004

Concerning customer satisfaction, the following hypotheses were tested using Mann Whitney U test (a non-parametric test).

H₀1: There is no statistically significant difference in pre transaction customer satisfaction between Jimma and ilubabora zones health facilities.

H₀2: There is no statistically significant difference in transaction customer satisfaction between Jimma and ilubabora zones health facilities.

H₀3: There is no statistically significant difference in post transaction customer satisfaction between Jimma and ilubabora zones health facilities.

2.2. Empirical Reviews on SCM Practices and Performances

The forward vertical integration for distribution is used to be only explained by governance efficiency as described in Transaction Cost Theory (TCA). That is the ownership is to lower marginal transaction cost arising due to market imperfection and uncertainty. Range of internal and external factors could also explain the motive to integrate forward for distribution. External factors include customer demand and the potential benefits involving differentiation, increased information about customers, and supply chain efficiency improvement. Whereas, the most important internal factor driving the integration is company's Supply Chain positioning strategy. And, this affects company's functions, roles, required resources, added value, and competitiveness. All in all, the forward vertical integration for distribution creates potential for selling more products (Guan & Rheme, 2012).

Evangelista, Mogre, Perego, Rospagliesi, and Sweeney (2012) have used resource based perspective to describe and understand the relationship between IT adoption, logistics capabilities, and firm's performance. Accordingly,

- A positive correlation between data gathering technologies (EDI, bar code, radio frequency, and RFID) and performance related to efficiency (asset utilization improvement), effectiveness (operation improvement, customer service improvement, and flexibility improvement), and transactional capabilities (packing, labeling, and order management).
- A positive correlation between enterprise information technologies (LAN, WLAN, and ERP) and financial performance (turnover improvement, market expansion, and increased customer).

- Adoption of CRM and mobile phones is correlated to efficiency performance (asset utilization improvement)
- A positive correlation between transactional capabilities (packing, labeling, and order management) performance measures in relation to asset utilization efficiency.

Supply chain integration as described by integration of supplier, customer and internal operation do have positive influence on supply chain performance. These performances are described in terms of raw material purchasing cost, transport cost, distribution cost, asset turnover and inventory holding cost (Patrick, 2013).

According to Makwemba and Xu (2009), uncoordinated information flow in Tanzania's food industry sector has resulted in a lot of wastage and product recalls. Bullwhip effect due to unreliable data was the major reasons for all these wastages. In addition, food products have relatively shorter shelf lives which make product recovery more difficult and expensive. Inventory management strategies and practices as described by setting optimal reorder and stock level, FIFO/FEFO, and stock evaluation practices were poor in all except in multinational companies. This along with *produce-to-stock* production strategy has resulted in stock piling, spoiled product, increased distribution recall costs, increased inventory cost, and significant decrease in profit margin. Poor forecasting along with production planning/scheduling activities that are not systematic and strategic has resulted into overstocking when the demand becomes low and or shortages when the demand turns to be high. Other challenges like technical knowhow, research and development, capital, difficulty in securing primary and secondary (packing) raw materials, and managerial/physical infrastructures were identified as bottleneck for the sector.

Deres (2011), in his comparative study on the level of SCM practices and performance in five selected medium and large footwear firms has found out that, the level of SCM practice implementation and performance among case firms varies depending on the SC variables. Specifically, the difference in performance with regard to; strictness of major customers' delivery requirement, cooperativeness in relationship with customers and suppliers, joint product planning with customers, in the occurrence of meeting with suppliers, internal material flow management, and made to stock production and modular system application is statistically insignificant. Whereas, statistically significant

difference was observed among case organizations with regard to their compliance to customers' requirement, joint product planning with suppliers, accepting and implementing suppliers' improvement suggestion, participation in the sourcing decision of suppliers, new product development, flexibility of production process, innovation, continuous improvement adoption, employees' professional skill, management know-how regarding supply chain, the extent of made to order production and production process automation, their information sharing practices (forecast, product related, adequacy, formal and informal information sharing agreement), in implementation of up to date automated ordering system with major suppliers, implementation of electronic ordering system with major customers and its adequacy, and in implementing automated production system.

According to Balda (2011), Kaliti Food Factory's Supply Chain practices and performance were not satisfactory. Specifically, the degree of relationship across the supply chain as described by joint product planning decision making is low and characterized as transactional or the traditional one. Even though; the company has good automated quality control and moderate flexible production system, innovation and efficiency in utilizing the available resource is weak. Good information sharing practices were observed among the supply chain partners even though the quality of information shared is under question mark. But, sales forecast information sharing with suppliers and customers is weak. Implementation and usage of information technology/tools in the company was found to be weak. And finally, the level of customer satisfaction in the supply chain performance of the company was also found to be low.

2.3. Conceptual Framework of the Study

Figures 2.1 and 2.2 below conceptually summarize the relationship among major health supply chain management operations.

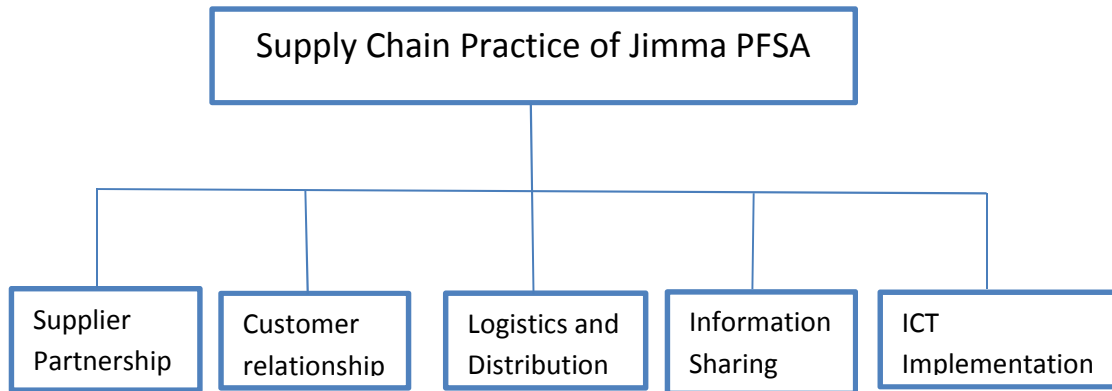


Fig 2.1: A conceptual framework of supply chain practice of Jimma PFSA

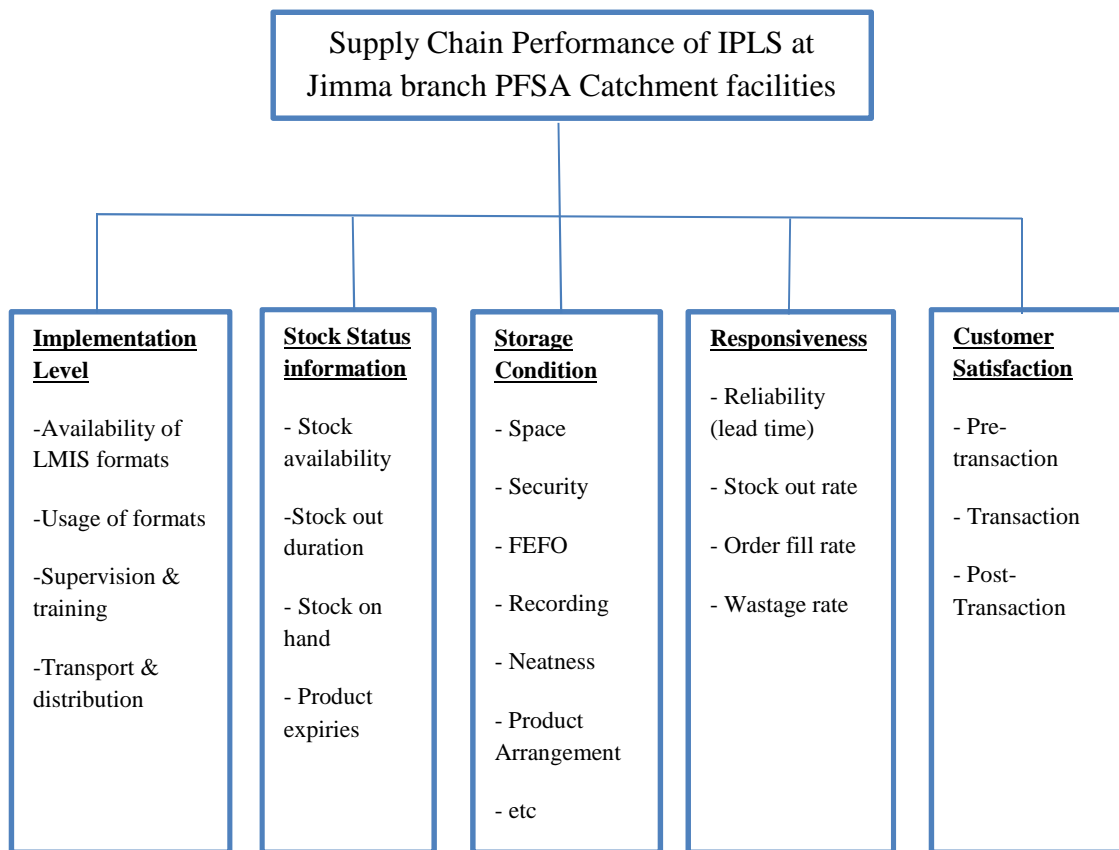


Fig 2.2: A conceptual framework of supply chain performance of IPLS

CHAPTER THREE

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Research Design

The study used both qualitative and quantitative approaches throughout. Specifically, qualitative approach was used to describe the supply chain management practices of public health supply chain management for essential pharmaceuticals after integration. And, quantitative approach was used to measure process and output related performance of public health supply chain management for essential pharmaceuticals after integration.

The study was cross sectional evaluative study as it was intended to describe the practice and performance of IPLS on health supply chain carried out in snap shot after implementation of IPLS.

3.2. Source and Type of Data

The sources of data for the study were health facility records and staffs of PFSA and health facilities working at different level in the Supply Chain tier. The primary data was collected by observation, physical inventory, and structured interviews with health facility relevant staffs at hospitals and health centers. Health facility records, previous assessments and surveys done to describe and evaluate the Ethiopian health supply chain were used as secondary data sources.

3.3. Population and Sampling Technique

The population in this study were all the 46 (forty six) hospitals and health centers being served by Jimma branch PFSA that were involved in phase one IPLS implementation (in year 2011). That is, the sampling frame was list of all hospitals and health centers (total of 46) served by Jimma PFSA involved in Phase one IPLS implementation (the list was obtained from Jimma PFSA). As the population size or the total number of hospitals and health centers included in phase one IPLS implementation was small, and are geographically dispersed, all facilities found in Jimma and Ilubabora zones (i.e, 26) were

included in the study by a census method. Therefore, the sampling units were service delivery points (SDPs) which means hospitals and health centers.

3.4 Data Collection Instruments

The *Logistics Indicators Assessment Tool (LIAT)*, a standardized quantitative tool developed by the USAID | DELIVER PROJECT, and applied in many countries around the world, was adopted to develop structured questionnaires to be used at field level survey. The *Logistics System Assessment Tool (LSAT)*, a standardized qualitative tool developed by the USAID | DELIVER PROJECT, and applied in many countries around the world, was adopted to develop standard open ended questionnaires for key informant interview. Performance attributes were organized as per SCOR model KPI indicators.

A combination of the following tools was used to collect the required data:

- Structured interview guides were used to conduct key informant interview with Jimma PFSA officials and staffs to describe the supply chain management practices including forecasting, procurement, warehousing, distribution, information system, and collaboration.
- Questionnaires and observation checklists were used at the hospitals and health centers in the study to evaluate the process and output related supply chain performance through field level survey including forecast accuracy, order fill rate, delivery lead time, acceptable storage condition, product availability, and data quality.
- Structured questionnaires designed in five levels Likert scale were used to assess customer satisfaction in hospitals and health centers on the pre-transaction, transaction, and post-transaction supply chain services.

In summary, the variables used to describe and evaluate the supply chain performance were customer satisfaction on the SC service, order fill rate, delivery lead time, stock availability, forecast accuracy, reporting rate, meeting good warehousing practice, wastage/losses, and data visibility and accuracy.

3.5 Procedures of data collection

Key informant interview method was used to obtain information from primary data sources on the supply chain management practices using standard open ended questionnaires with tailored questions for relevant staffs in the system. Key informants were ten (10) Jimma PFSA officials and staffs which includes; branch manager, forecasting and capacity building coordinator and officers, Stock and distribution coordinator and officers, Warehouse managers and fund manager. The interviewer recorded verbal answers to various questions which were transcribed latter. Relevant officials interviewed were communicated ahead of time for them to get prepared in advance. The interviewer asked and probed using open ended specific questions in the interview guide.

Trained enumerators were used for collecting field level data (hospital and health center) through schedules by making use of structured questionnaires. In addition, the enumerators observed and checked records, processes, and infrastructure to describe and evaluate the supply chain.

Collected data were checked in detail for consistency and completeness, cleaned and coded prior to data entry process. Statistical package for social sciences (SPSS) version 21.0 program was used for quantitative data entry and analysis respectively. All the data collected was checked for accuracy and completeness prior to entry in to the data base. After the data entry, the data base information was cross-checked with the data collection forms before commencement of analysis. Data from key informant interview was transcribed and translated while the data collection was in progress and analyzed progressively as they get collected in the field. The data were presented in the form of tables and graphs. Data entry was done by the researcher himself.

3.6. Data Analysis

3.6.1. Data Analysis for Qualitative Data

The public health supply chain management practice was described and analyzed qualitatively as per the discussion outputs from key informant interview. Narrative

descriptions of data collected through interviews and observations were used to describe forecasting, procurement, warehousing and inventory management, information management practices of the branch's catchment facilities.

3.6.2. Data Analysis for Quantitative Data

Descriptive statistics like mean, standard deviation and percentages were used to describe, analyze, and compare Reliability (Order fill rate) and Asset Management efficiency (inventory days of supply, inventory turnover,...) of public health supply chain management (Univariate analysis). That is, average with standard deviation was used to measure average performance for each indicator to be further compared with the set standard by the IPLS itself. Percentage was used to measure percentage facilities fulfilling the requirement against the bench mark.

Table 3.1 below shows formulas to calculate variables along with source document to obtain figures.

Table 3.1. Formulas to calculate SC KPIs along with secondary data sources

Variables	Formula	Source Document
Order Fill Rate	<ul style="list-style-type: none"> Quantity Supplied - Quantity Ordered / Quantity Ordered *100 Average and Standard Deviation % tage with fill rate of 100 % for at least 80 % of tracer items (bench mark) 	Report and Requisition Form, PFSA's Stock Transfer Voucher, and Good Receiving Voucher (Model 19).
Delivery Lead time	<ul style="list-style-type: none"> % tage facilities obtained their consignment within one month 	Report and Requisition Form, PFSA's Stock Transfer Voucher, and Good Receiving Voucher (Model 19).
Meeting acceptable warehousing and good storage practices	<ul style="list-style-type: none"> Average and Standard Deviation Percentage facilities meeting acceptable storage condition 	Observation
Months of Stock	<ul style="list-style-type: none"> Stock on Hand/Average Monthly Consumption * 100 	Bin Cards and Report and

	<ul style="list-style-type: none"> • Average and Standard Deviation • % tage facilities within acceptable stock level as per IPLS policy (2 – 4 MOS) 	Requisition Forms.
Wastage	Percentage losses due to expiry and other reasons	Bin Cards
Reporting Rate	Reporting Rate = Total number of facilities submitted report/Total number of facilities * 100	Report and Requisition Forms.

Chi-Square test and Independent sample t-test were conducted to compare performance of the IPLS between Jimma and Ilubabora zones in terms of certain variables such as bin card availability, order refill rate, number of emergency orders placed in the last three months. This is to see whether the implemented system is consistent in its performance at different geographical locations.

Pre transaction, transaction, and post transaction customer satisfaction levels were analyzed using Mann Whitney U test (Non parametric test).

The pre transaction, transaction and post transaction customer satisfaction of facilities under study on the supply chain performance were analyzed using descriptive statistics like mean, standard deviation, and percentage. Mean scale was calculated to come up with satisfaction figures for pre transaction, transaction, and post transaction SC services. Based on this average figure; between 4 and 5 shows very strong satisfaction, between 3 and 4 shows strong satisfaction, between 2 and 3 shows weak satisfaction, and between 1 and 2 shows very weak satisfaction. The pre transaction, transaction and post transaction customer satisfaction levels between facilities under jimma and ilubabora zones were compared using Mann Whitney U test (Non Parametric Test) based on exact P-value. This is because; the sample size is small and less than 61.

Jimma PFSA's IPLS supply chain performances as described by order fill rate and delivery lead time as perceived by the facilities was analyzed using descriptive statistics like mean, standard deviation, and percentages.

3.7. Ethical Considerations

Prior to launching the survey, PFSA was informed about the study. During data collection, interviewers or enumerators told the respondents the purpose, scope, and expected outcome of the study. Any respondent not interested in participating in the survey could decline; during the interview, if the respondent does not want to answer specific questions or discontinue the interview, they could. All data was anonymous; no individual or facility was identified in any reports or any publication based on this study.

3.8. Study Variables

The following were study variables; pre-transaction, transaction and post-transaction customer satisfaction on the SC service, order fill rate, delivery lead time, forecast accuracy, meeting good warehousing practice, wastage/losses, and data visibility and accuracy

CHAPTER FOUR

4. RESULTS and DISCUSSIONS

4.1. Results/Findings of the Study

4.1.1. Introduction

Primary data collected through interview and questionnaires were presented after summarizing and grouping them logically. In addition, relevant information obtained through reviewing relevant documents was presented after analysis, summary, and grouping. This information was used in assessing and evaluating SC practices of Jimma branch PFSA and the public health facilities served by the branch.

4.1.2. SCM Practices

a. Supply Chain Network Structure

The interview result with the Branch Manager and the Stock and Distribution Coordinator was used to describe the supply chain network structure of the PFSA branch:

The primary members of PFSA supply chain or members that perform operational and/or managerial activities in the business processes designed to produce specific output for particular customer or market include:

- Central PFSA which carries out the procurement and distribution of products to its branches such as Jimma based on the forecasting made by the branch.
- Customers (Hospitals and Health Centers) are primary members of the supply chain as they provide feedback and input in terms of reports that will be used for decision making at the branch in improving health product availability and service quality.
- Woreda health offices also serve as primary customers for facilities (Health centers) that are not reachable by the PFSA branch. They not only serve as pass through but also compile reports and send to the branch to help in making better logistics decisions.

Supporting companies in terms of providing resources, knowledge, utilities or assets are zonal health departments (ZHD), partner NGOs, insurance companies, banks, transportation and logistics companies.

As part of the vertical network structure, Jimma PFSA has only one supplier (central PFSA) but more than 300 customers (Hospitals, Health Centers and woreda health offices) at the first tier level of the supply chain system. Figure 4.1. shows the supply chain network of Jimma PFSA.

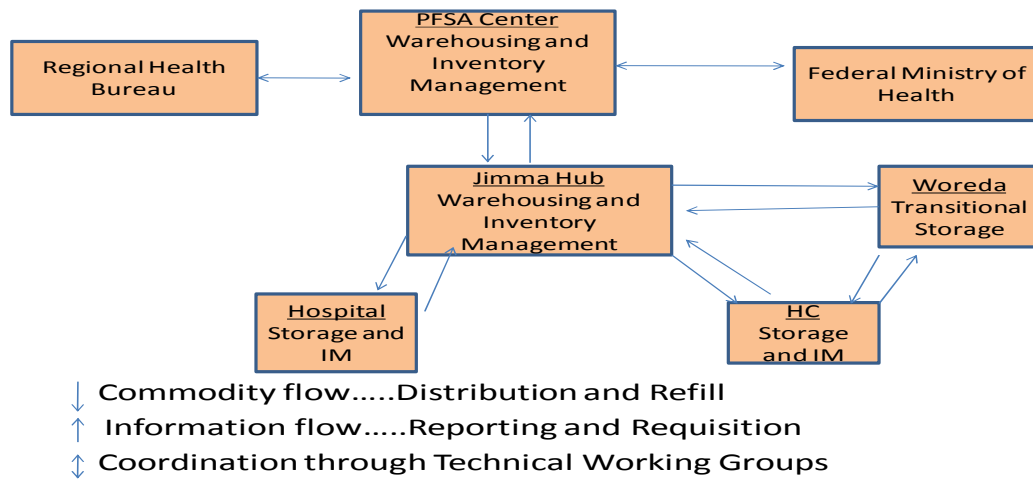


Figure 4.1. Supply Chain network of Jimma PFSA

b. Relationship Management

The interview result with the above mentioned officials of the agency was used to describe the relationship management of Jimma PFSA as follows:

“The main function of the branch can generally be described as inventory management as the forecasting and procurement is carried out and coordinated by the head office” said the branch manager. So Jimma branch PFSA keeps close relationship with its sole provider, central PFSA, to keep the smooth functioning of its operation.

From the customer side, as can be seen from the supply network diagram above, there are mainly the facilities and the woreda health offices. PFSA strives to keep smooth and effective relationship with these customers for the mutual benefit of the two parties. The

forecasting and capacity building coordinator said “*Jimma branch PFSA gives technical supports to its customers in a form of trainings, supportive supervision and material support*”. He added “*Concerning IPLS training, the branch trained relevant staffs of all health facilities (blanket coverage)*”. It also arranges capacity building trainings and experience sharing opportunities for its staffs. In this regard, the agency is heavily supported by the partner NGOs. Such as UNFPA, CHAI, USAID/DELIVER, MSH/SCMS, etc.

c. Logistics and Distribution

The interview result with the Stock and Distribution coordinator and the Warehouse Managers was used to describe the logistics and distribution system of Jimma PFSA as follows:

The key informants said “*the branch has two group of warehouses intended for storing RDF products and program products. Hundreds of different products are stored in these warehouses; ranging from medicines, laboratory diagnostic reagents and equipment, medical supplies, medical equipment, etc. It also has a cold room within one of the warehouses which is meant to store products that need to be refrigerated*”.

They also said “*Standard warehousing and inventory management practices like labeling, racking, categorization, and record keeping are well implemented in both warehouses. FEFO- First Expiry First Out, a policy that enforces issue by expiry is well practiced and product arrangement in the warehouse facilitates the implementation of the policy except when the warehouse is overfilled and aisles are blocked as a result which mostly happens in the RDF warehouse*”.

“*Major activities in warehousing operation of products include receiving, inspection, recording, assigning bin location, storing and issuing. Completing standard record, formats, and vouchers is also an important component in the standard operating procedure of material warehousing*” added the key informants.

While paying visit to the warehouse, it was observed that stock keeping and transaction records like Bin Card, Store Issue Voucher, and Good Receiving Note are used to track,

monitor, and document movement and storage of products in and out of the warehouses. In addition, reporting formats like Store Requisition forms and Product Return Note are used to transfer essential data needed for decision from one level to another. The branch has a computerized software system that carries out the above mentioned record and they also keep manual records. The records of the computerized system have reasonable level of accuracy because the ending balance matches the physical control for majority of products in the inventory. However, the manual records, especially bin cards, are way behind the actual physical counts.

The key informants said *“there is inventory management system in place to classify, categorize, and prioritize products in the warehouse. And, the agency implemented Integrated Pharmaceutical Logistics System (IPLS), a standard inventory control model in place that helps in deciding quantity and time of order at supplier and customer level, at national level”*.

d. Information sharing practices

The interview result with the Branch Manager, SDC, FCBC, Fund Manager and Warehouse Managers was used to describe information sharing practices in the branch as follows:

The type and extent of information sharing practices of Jimma PFSA with supplier, central PFSA, depends on the relationship management styles adopted. It is more advanced when the relationship management is more collaborative. That is:

- The type and extent of information sharing practices is limited operational and logistics related. Specifically; price, volume, delivery schedule, and other logistics related information is shared.
- The branch even has more advanced and rigorous information sharing practice with referral hospitals. The company shares strategic, technical, and logistics related information like long term demand, forecast, delivery schedule, and product related technical requirements mostly through meetings.

They said *“Information sharing among core businesses within the organization is improving a lot through time. The branch is in the process of automating the internal information sharing practices among core internal business processes. In addition, there is formal coordination mechanism in place between core processes to optimize resources and to continuously monitor performance towards objectives. This is materialized through monthly meetings between cross functional teams in the core processes”*.

The type of information shared with customers is mostly logistics related. Stock and transaction related information like available stock on hand, resupply quantity, type, and delivery schedule are among the most common logistics related information shared with customers.

e. ICT implementation

The interview result with the Branch Manager, IT manager, SDC and the Warehouse Managers was used to describe ICT implementation in Jimma PFSA as follows:

They said *“They are using e-mails and websites to communicate and do business with supplier and customers. The branch implemented an automated system called Health Commodity Management information system (HCMIS). The system is used by only two of the functional departments; SD and FCB. There is a server that connects all the users and each of the employees who are using the system has their own user name and password. The software is primarily designed to facilitate easy operation of the warehouses. Among the many features it has; it tells bin locations of products, prepares pick list as per client’s request, prints STV, shows understocked, overstocked, near expiry and expired products, generates different types of reports, shows bin cards and stock cards, shows sales, records consumption data, it process orders, etc. This software is primarily used for the inventory control system of the warehouse. Though the system has features that try to address financial records, the hub is currently not using it as they say it is found to be unreliable when compared with manually recorded financial transactions. Interview of the users of this software revealed that the system has many problems”*.

4.1.3. Supply Chain Performance

a. IPLS Level of implementation

I. Availability of LMIS formats

The bar chart in figure 4.2 below shows that all LMIS formats for recording and reporting logistics data are available at required level except for HPMRR which is 86 % available (less than the desired 100%).

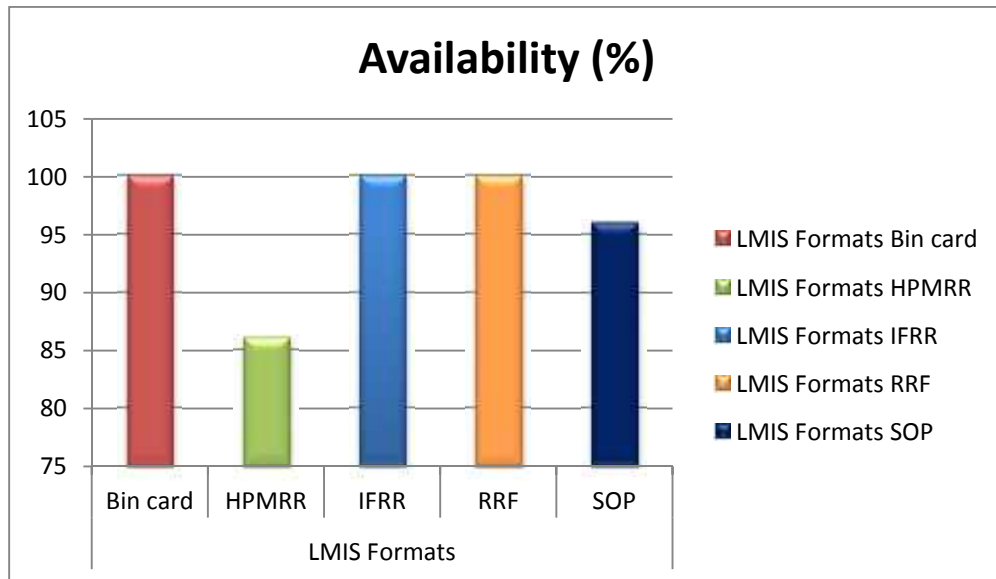


Figure 4.2. Availability of LMIS formats at the health facilities

II. Usage of LMIS formats

All health facilities reported that they use Bin card for product management and 8% of them reported that they additionally use stock cards. 100% of the respondents said that they use both RRF and IFRR forms for reporting purposes. However, 4% of them reported that they are not sending RRF report to higher level. All the facilities reported that they send RRF reports to Jimma PFSA but 36% of them additionally send reports to Woreda Health office, 32% of them to zonal health department and 12% of them to both woreda and zone. 88% of them said they send reports on bimonthly bases. However, the review of the last RRF sent during data collection revealed that only 60% of the reports are completed for all products.

The bar graph in figure 4.3 below shows usage rate of IFRR by major dispensing units of the assessed health facilities. Usage rate is lowest at TB clinic (74%) followed by ART clinic (78%) as compared to the other dispensing units which is 88%.

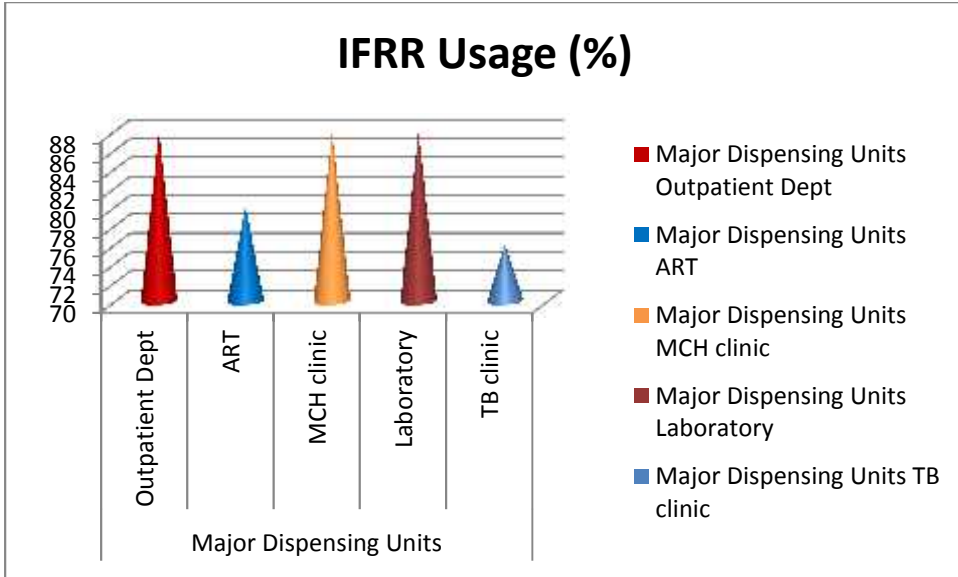


Figure 4.3: Bar graph showing usage rate of IFRR at major dispensing units of health facilities.

Out of 177 Health posts served by the facilities under study, only 108 of them are sending HPMRR forms for reporting which makes it only 61%.

III. Training and Supportive Supervision

The Pie-Chart in figure 4.4 below shows knowledge sources to complete LMIS formats. As can be seen from the figure, the formal IPLS training accounts for 92 % of the knowledge source for completing LMIS formats.

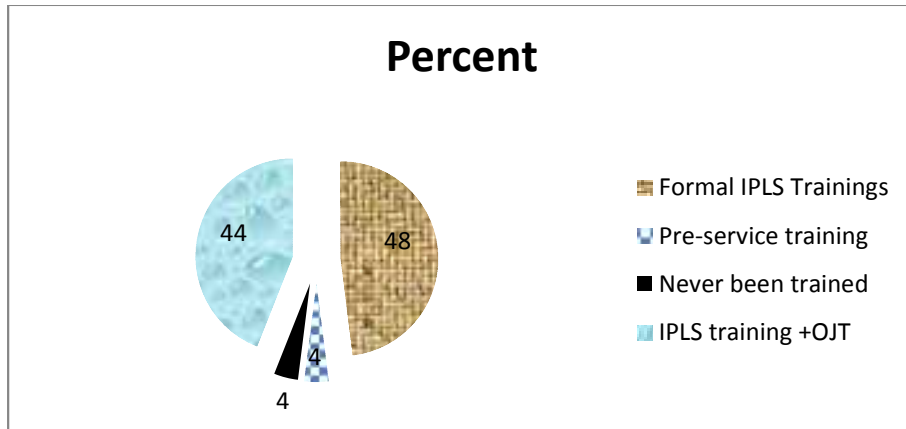


Figure 4.4. Pie Chart showing the knowledge sources for completing LMIS formats

40 % of the facilities reported that they received supportive supervision within the last month and another 44% reported that they received it within the last 1 to 3 months. Only 4% reported that they didn't receive. All the facilities that received supportive supervision reported that the supervision included drug (product) management and logistic. Table 4.1 below shows the summary of who conducted the last supportive supervision as reported by the facilities.

Table 4.1. Summary of organizations who conducted supportive supervision

	Frequency	Percent
PFSA	7	29.2
Woreda health office	1	4.2
RHB+WoHO	1	4.2
Partners	1	4.2
PFSA+ZHD	2	8.3
ZHD+WoHo	1	4.2
PFSA+RHB+ZHD	2	8.3
PFSA+Partner	3	12.5
PFSA+RHB	1	4.2
PFSA+ZHD+Partner	5	20.8
Total	24	100.0

As can be seen from the table, PFSA is involved in 83.3% of the cases in conducting the last supportive supervision to the facilities under the study.

IV. Distribution and Transportation

Concerning product refilling, 84% of the facilities reported that they are the ones who make the decision on the quantity to be refilled and the remaining 16% said that decisions are made at higher level.

Table 4.4 and figure 4.5 below summarize the response of facilities when asked the direct source of known program products.

Table 4.2. Percent Direct source of products

	Direct source of Product in Percent (%) for			
	HIV & OI	TB	Family Planning	Malaria
PFSA	92	60	28	8
WoHO		4	4	16
ZHD				36
RHB				4
PFSA+WoHO		20	16	20
PFSA+ZHD	4	16	44	16
PFSA+RHB	4		4	
PFSA+ZHD+WoHO			4	

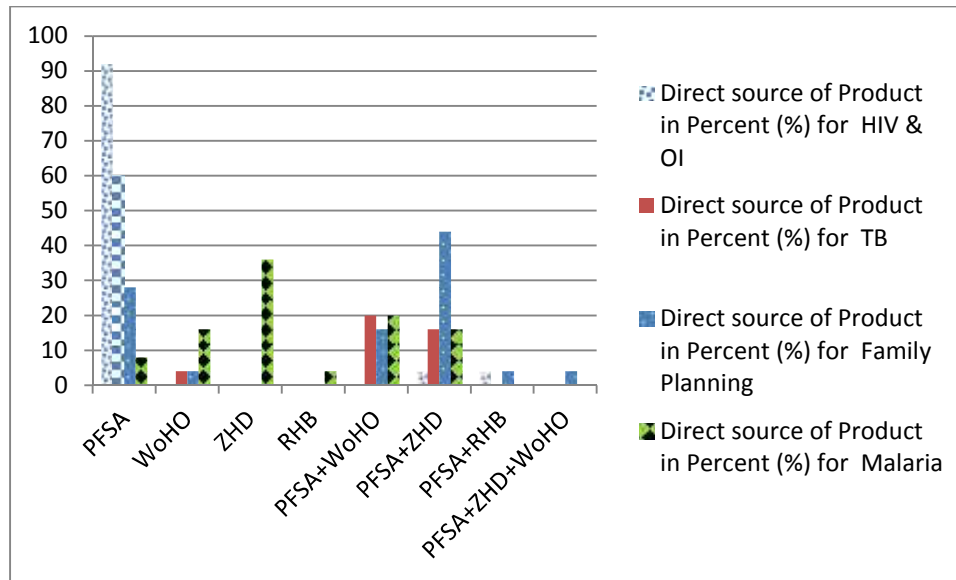


Figure 4.5. Bar graphs showing direct source of products for selected program drugs

The bar chart in figure 4.6 below shows the response in percentage of the facilities for the usual source of known program products. As can be seen from the figure, PFSA is the usual source of program drugs more than 80% of the cases.

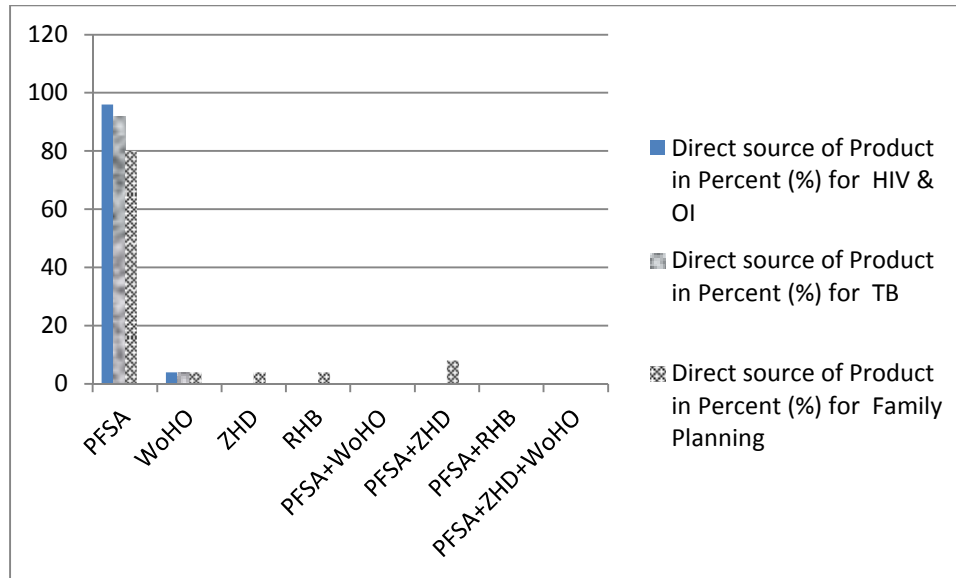


Figure 4.6. Bar chart showing the usual source of program drugs in percent

Additionally, 92% of the facilities reported that PFSA is direct source of RDF products while 96% of them said PFSA is also the usual source of RDF products.

The pie charts in figure 4.7 below show the mode of distribution being used for program and RDF products. As can be seen from the figure, program drugs are mostly delivered by Jimma PFSA to the facilities while only in one third of the cases.

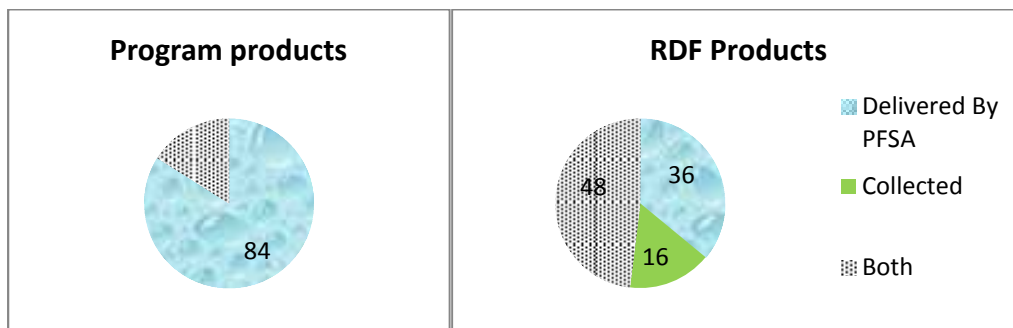


Figure 4.7. Jimma PFSA Mode of product distribution for Program and RDF products

b. Stock Status Information

Implementation of IPLS is expected to improve stock status information including stock availability, stock out duration, stock on hand, product expiries, and storage conditions at both facility and PFSA level. The table below gives a summary of the above mentioned variables for the selected drug group.

Table 4.3: Summary of Stock status information for selected drug group at HF's

Product	% Bin card available	% Bin card updated	Balance on bin card	% Stock out most recent	Total number of days stocked out (average)	Number of Months of data available	Physical inventory Store room	Availability of expired product (%)
Amoxicillin 500mg/250 mg Capsule	84	66.7	571	9.5	9	3.24	6299	8
TDF+3TC+EFV 300+300+600mg Tab of 30	80	60	6581	10	0.8	3.16	14029	8
Ceftriaxone 1g-m/500mg injection	80	65	1802	40	22.4	2.76	18171	4
Co-trimoxazole 480mg/960mg of	80	60	278	5	1.2	2.8	864	8
Co-trimoxazole 240mg/5ml suspension, 100ml	76	68.4	1869	15.8	2.1	2.8	5129	0
RHZE-150mg/75mg+400mg+2	72	83.3	218	5.5	0.01	2.64	331	24
Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection with 1 ml	72	77.8	3010	22.2	9.12	2.64	5560	36
Stat pack of 20 or KHB of 50	76	68.4	60	36	47.3	2.28	38	24
Oral Rehydration Salt (ORS)	56	64.3	1050	57.1	22.24	1.88	10,231	28
AZT+3TC+NVP 300+150+200mg of 60	88	68.2	8276	9	0.6	3.04	9469	8

From table 4.3, the bin card availability was taken to compare between Jimma and Ilubabora zones and table 4.4. shows the summary of bin card availability for the two group (zone).

Table 4.4. Summary of bin card availability for Jimma and Ilubabora zones

Crosstab					
		<u>Bin_card_available</u>		Total	
		no	yes		
zone	Jimma	Count	21	119	140
		% within zone	15.0%	85.0%	100.0%
	Ilubabore	Count	29	71	100
		% within zone	29.0%	71.0%	100.0%
Total		Count	50	190	240
		% within zone	20.8%	79.2%	100.0%

The two groups were compared based on Chi-Square test as shown on table 4.5 below.

Table 4.5. Chi-square test result for the two zones on bin card availability

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	19.327	1	.000		
Continuity Correction	18.112	1	.000		
Likelihood Ratio	19.277	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	19.242	1	.000		
N of Valid Cases	227				

Group comparison based on Chi-Square test showed that there was significant difference (P-value= 0.008) in bin card availability between Jimma and Ilubabora zones. Bin cards are more available in facilities of Jimma zone (119 out of 140) for the selected product group compared to that of Ilubabora zone (71 out of 100).

Storage Condition

Table 4.6 below summarizes the storage condition of pharmaceutical products at the stores of the assessed health facilities.

Table 4.6. Summary of storage condition of products at the assessed HFs

Sr No	Description of Standard Storage Conditions	% Responses	
		No	Yes
1	Pharmaceuticals are arranged & organized according to a logical categorization, e.g. zoning	16	84
2	Bin Cards are used & updated regularly?	48	52
3	Are unwanted items (damaged or expired drugs, non- pharmaceutical items, etc) in the store room separated from the usable stock?	16	84
4	Products are arranged so that ID labels, expiry dates, and/or manufacturing dates are visible.	12	88
5	Products are stored & organized in a manner which facilitates use of First-to-expire, first-out (FEFO).	8	92
6	Products are protected from direct sunlight and high heat at all times of the day/during all seasons.	0	100
7	The storeroom is maintained in good condition (clean, no trash, sturdy shelves, and boxes well-organized).	16	84
8	The current space and organization is sufficient for existing products and reasonable expansion	28	72
9	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel.	0	100
10	Storage area is visually free from harmful insects and rodents.	16.7	83.3
11	Cartons and products are in good condition, not crushed due to mishandling.	4	96

As can be seen from table 4.6, the storage conditions are excellent in terms of protecting products from extreme weather conditions and securing products from theft. The storage conditions showed less than 100% for 9 of the other standard parameters used to evaluate storage. The worst result is for using and updating bin cards which is only 52% followed by the storage space which was in 72% of the cases sufficient.

c. Logistics System Performance of IPLS

I. LMIS Data Quality

Table 4.7 below shows data quality of records for selected tracer pharmaceutical product group for the last refill period at the time of Data collection. The results are obtained from secondary sources (Bin cards and RRF reports).

Table 4.7: LMIS data quality of all selected product groups.

Sr No.	Product	Data Quality			
		% of Facilities with updated Bin Card	Total SOH On Bin Cards	Total SOH on RRF Reports	% Discrepancy (BC Vs RRF Report)
1	Amoxicillin 500mg/250mg capsule	40	154	217	40
2	TDF+3TC+EFV 300+300+600mg Tab of 30	48	21176	20965	1
3	Ceftriaxone-1gm/500mg injection	32	34,813	34,920	0.3
4	Co-trimoxazole 480mg/960mg of 1000 tab	40	727	725	0.2
5	Co-trimoxazole 240mg/5ml suspension, 100ml	36	3466	3530	1.8
6	RHZE-150mg/75mg+400mg+275mg-tablet	40	389	386	0.77
7	Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection	44	6444	5603	13
8	Stat pack of 20 or KHB of 50	36	55	42	23.6
9	Oral Rehydration Salt (ORS)	28	6550	6200	5.3
10	AZT+3TC+NVP 300+150+200mg of 60	52	37,090	31,552	14.9

As can be seen from the above table, the availability of updated bin cards for the selected products is below the average for most products. It is better for antiretroviral products (products 1 & 10) which are 48% and 52% respectively. The percentage discrepancy

between the two LMIS data sources (Bin card & RRF) ranges from as low as 0.2 for product 4 and to as high as 40 % for product 1. The two data sources showed discrepancy for all selected product group.

II. Reliability – Order Fill Rate

Table 4.8 below shows refills performance of selected tracer pharmaceutical product group of the last refill period at the time of Data collection. The results are obtained from secondary sources (RRF reports and model 19).

Table 4.8: Performance-Order Fill Rate of all selected product groups (March, 2016).

Sr No.	Product	Order fill rate in percentage		
		Total requested	Total refilled	Percentage (%)
1	Amoxicillin 500mg/250mg capsule	1085	590	54.4
2	TDF+3TC+EFV 300+300+600mg Tab of 30	10,199	11,052	108.4
3	Ceftriaxone-1gm/500mg injection	14,800	2960	20
4	Co-trimoxazole 480mg/960mg of 1000 tab	892	935	104.8
5	Co-trimoxazole 240mg/5ml suspension, 100ml	3710	3080	83
6	RHZE-150mg/75mg+400mg+275mg-tablet	588	253	43
7	Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection	22883	8814	38.5
8	Stat pack of 20 or KHB of 50	139	22	15.8
9	Oral Rehydration Salt (ORS)	7005	4266	60.9
10	AZT+3TC+NVP 300+150+200mg of 60	2083	2711	130
	Overall	63384	34683	54.71886

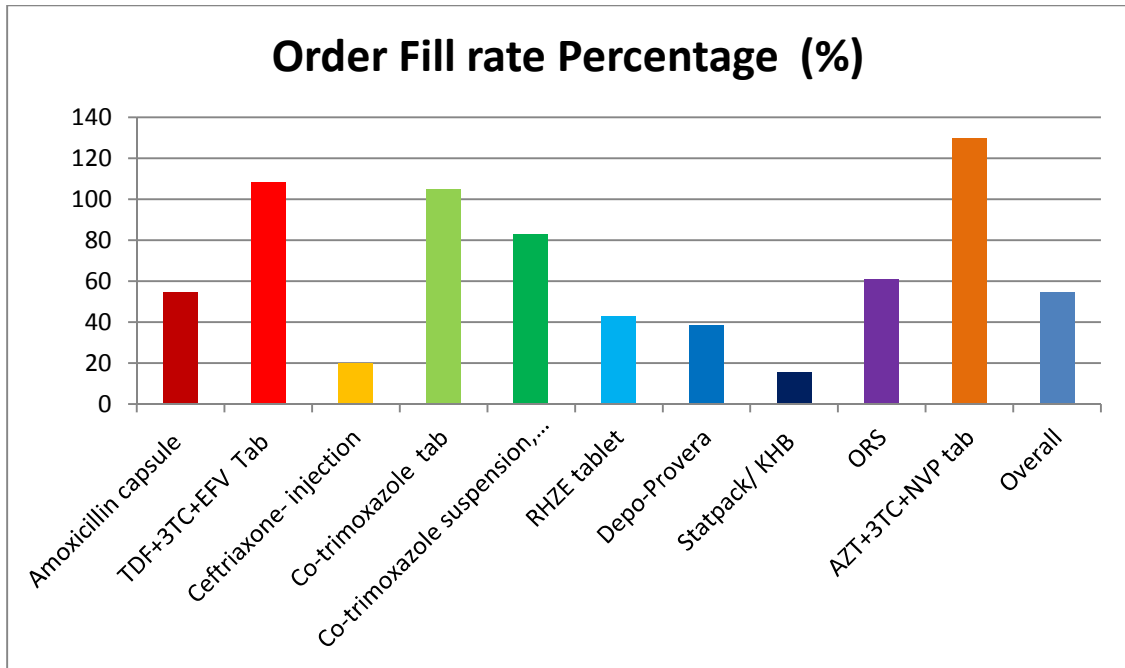


Figure 4.8: Order refill rate of one period for selected products.

As can be seen from figure 4.8 and table 4.8 above, the overall refill rate performance is 54.7 % with variations among product groups (130 for AZT+3TC+NVP Vs 15.8% for KHB). The performance for HIV related products such as TDF+3TC+EFV, AZT+3TC+NVP and Cotrimoxazole is relatively high. Moreover, when asked whether or not they receive the quantity of products they requested, 72% of them replied that they don't usually receive the quantity they requested.

The refill rate was further broken down into two (Jimma and Ilubabora zones) to see if there was difference and independent sample t-test was used to check whether the difference if any was significant or not. Table 4.9 below shows summary of refill rate for the two groups.

Table 4.9. Group statics showing mean refill rate for Jimma and Ilubabora zones

Group Statistics					
	Zone	N	Mean	Std. Deviation	Std. Error Mean
Refill _rate	Jimma	62	125.2858	174.23934	22.12842
	Ilubabore	46	59.3891	46.76383	6.89495

Table 4.10: Independent sample t-test result for order refill rate between the two zones

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	4.795	.031	2.496	106	.014	65.89666	26.39600	13.56403	118.22930
Equal variances not assumed			2.843	72.493	.006	65.89666	23.17773	19.69807	112.09526

Independent sample t-test as shown in table 4.10 showed that the mean refill rate between Jimma and Ilubabora zones was significantly different (p-value = 0.014). The refill rate was significantly higher for facilities of Jimma zone than that of Ilubabora zone.

Table 4.11 below shows percentage of facilities that placed emergency orders in the last three months with their respective number of emergency orders.

Table 4.11: Summary of percent emergency orders placed with their respective frequency

	Frequency	Percent
Valid	none	9 36.0
	once	8 32.0
	twice	6 24.0
	more than 3	2 8.0
Total	25	100.0

Cross-tabulation was done to further breakdown and compare the emergency orders placed between Jimma and Ilubabora zones as shown in table 4.12 below. Then the two groups were compared using a Chi-square test and the result was as shown in table 4.13 below.

Table 4.12: Summary of percent emergency orders placed by the two zones

zone * Number of emergency orders placed in the last 3 months Cross-tabulation							
		Number_of_emergency_orders_placed_in_the_last_3_months				Total	
		none	once	twice	more than 3		
zone	Jimma	Count	1	7	5	2	15
		% within zone	6.7%	46.7%	33.3%	13.3%	100.0%
	Ilubabore	Count	8	1	1	0	10
		% within zone	80.0%	10.0%	10.0%	0.0%	100.0%

Table 4.13: Chi-square test result for emergency orders placed by the two zones

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.178	3	.003
Likelihood Ratio	15.937	3	.001
Linear-by-Linear Association	8.240	1	.004
N of Valid Cases	25		

As can be seen from the above table, group comparison based on Chi-Square test showed that there was significant difference (p -value= 0.003) in number of emergency orders placed in the last three months between Jimma and Ilubabora zones. Emergency orders are more placed by facilities of Jimma zone compared to that of Ilubabora zone.

III. Stock Out Rate

The stock out status (rate) of the selected products at the main dispensary units of the facilities was collected at the time of the visit. The result was summarized as per the following table (Table 4.14).

As can be seen from the table, the stock out rate at the main dispensary units range from as low as 0% for product 4 (Cotrimoxazole suspension) to as high as 72% and 80% for products 3 and 9 (ceftriaxone inj and ORS) respectively. The result shows that the stock out rate for TB and family planning products is lower than the other products.

Table 4.14: Stock out rate of selected products at main dispensing units

Sr No	Product	Percentage of facilities reported stock out at time of visit at Dispensary units				
		OPD	ART	MCH	TB	IPD (3 hosp)
1	Amoxicillin 500mg/250mg capsule	0	28			0
2	TDF+3TC+EFV 300+300+600mg Tab of 30	20	4			
3	Ceftriaxoneg-1gm/500mg injection	28	44			33
4	Co-trimoxazole 480mg/960mg of 1000 tab	0	0			0
5	Co-trimoxazole 240mg/5ml suspension, 100ml	8	8			33
6	RHZE-50mg/75mg+400mg+275mg-tablet				0	
7	Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection with 1 ml syringe and needle			4		
8	Stat pack of 20 or KHB of 50			32		
9	Oral Rehydration Salt (ORS)	36	44			0
10	AZT+3TC+NVP 300+150+200mg of 60	12	0			

IV. Responsiveness – Delivery Lead Time

Figure 4.9 below shows percentage summary for delivery lead time as perceived by the health facilities.

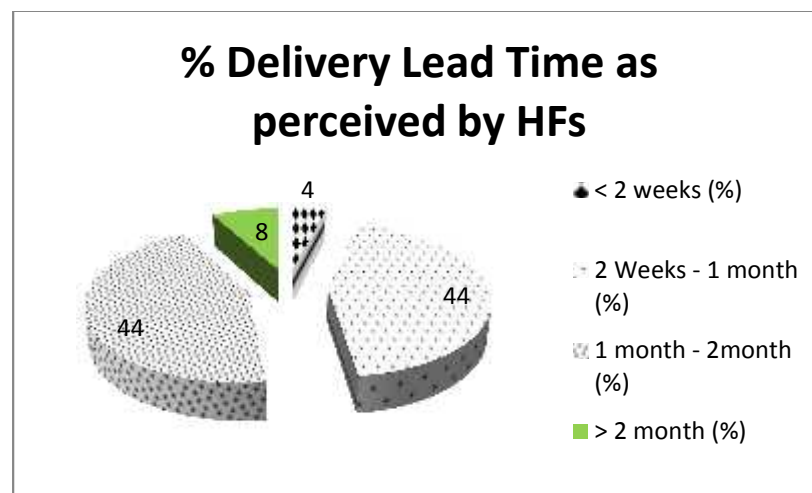


Figure 4.9: Summary for delivery lead time as perceived by the health facilities

As can be seen in figure 4.9, majority of the health facilities (88%) believed that, delivery lead time is between 2 weeks to 1 month and between 1 to 2 months each of which account for 44%.

d. Customer Satisfaction on Supply Chain Services

I. Pre-Transaction

Table 4.15 below shows summary of customer satisfaction on pre-transaction SC services of Jimma PFSA IPLS system.

Table 4.15: Summary of responses measuring pre-transaction customer satisfaction

Pre Transaction Customer Satisfaction	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
PFSA has written customer service policy	0.0	4	48	32	16	3.6	0.8165
continues support from PFSA on IPLS	0.0	40.0	4.0	24	32	3.48	1.327
LMIS formats available in required quantity	0.0	24.0	8	40.0	28	3.72	1.172
Updated LMIS formats availed timely	0	40	12	36	12	3.2	1.118
PFSA has clear organizational structure	0	8	40	44	8	3.52	0.773
PFSA system can address customer needs	12	28	16	40	4	2.96	1.172
The staff who handle orders is accessible	4	36	32	40	8	3.32	0.988

As can be seen from Table 4.15, overall pre transaction customer satisfaction is good according to the mean which are more or less between 3 and 4 except for flexibility of the system to address customer needs which is less than 3. Specifically, 68 % of respondents agreed that Jimma PFSA availed formats in the required quantity.

II. Transaction

Table 4.16 below shows summary of the level of customer satisfaction on transaction SC services of Jimma PFSA.

Table 4.16: Summary of responses measuring transaction customer satisfaction

Transaction Customer Satisfaction	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
Right Quality	12	16	48	24	0	3.84	0.94
Right time	4	36	36	20	4	2.84	0.94
Right Quantity	16	52	12	20	0	2.36	0.995
Right products	12	52	12	24	0	2.48	1.005
Easy to check order status	8	8	36	36	12	3.36	1.075

As can be seen from Table 4.16, overall transaction customer satisfaction is weak according to the means which are more or less between 2 and 3 or below average. Specifically, 68 % of respondents at least disagree and 12% neutral on the supply chain system's ability in delivering the right quantity. 62% disagree on the system's ability to deliver the right product. 40.0 % disagree and 36 % of respondents are neutral on the system's performance in delivering products in the right time. The majority of respondents agreed that the system is better in delivering products in the right quality.

III. Post-transaction

The table below shows summary for customer satisfaction on post-transaction SC services.

Table 4.17: Summary of responses measuring post-transaction customer satisfaction

Post-Transaction Customer Satisfaction	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
Customer complaints handled properly	4	16	32	44	4	3.28	0.936
Clear & accurate invoicing procedure	4	4	0	60	32	4.12	0.927
Good product tracing/warranty	8	20	36	24	12	3.12	1.129
Avails enough spares for medical equipment	20	40	28	8	4	2.36	1.036
Clear and good Returns policy	4	44	28	16	8	2.8	1.041

As can be seen from Table 4.9, overall post transaction customer satisfaction is good according to the mean which are more or less between 3 and 4. The level of customer satisfaction for invoicing procedure and complaints handling is strong (mean between 3 and 4). That is, only 92.0% and 48 % (with 32% neutral) of respondents for invoicing procedure and complaints handling respectively do agree on the systems being satisfactory. However, 60% and 48% of respondents disagree on the system’s ability in availing spare parts and in the clarity of its returns policy respectively.

Table 4.18 below shows summary for overall customer satisfaction on SC services rendered by Jimma PFSA based on the IPLS system.

Table 4.18: Summary of responses measuring overall customer satisfaction.

Overall Customer Satisfaction	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean	Std. Deviation
Overall Satisfaction	0	34	32	30	4	3.0	0.84

As can be seen from Table 4.18, overall customer satisfaction on the supply chain performance is average to the mean which is 3.0. That is, 34% at least agree and 34%

disagree with another 32% neutral group for being satisfied with the overall performance to deliver the right products, in the right quantity, in the right time, and quality.

e. Testing Hypothesis

The pre transaction, transaction, and post transaction customer satisfaction levels between Jimma and Ilubabora zones facilities were compared using Mann Whitney U test (Non Parametric Test) based on P-value.

Testing Hypothesis 1

H₀1: There is no statistically significant difference in pre transaction customer satisfaction between Jimma and ilubabora zones health facilities.

Table 4.19 below shows result of Mann-Whitney U test used to compare pre-transaction customer satisfaction of Jimma and ilubabora zones health facilities

Table 4.19: Mann-Whitney U test to compare pre-transaction customer satisfaction of Jimma and ilubabora zones health facilities.

Zones		PFSA has written customer service policy	continues support from PFSA on IPLS	LMIS formats available in required quantity	Updated LMIS formats availed timely	PFSA has clear organizational structure	PFSA system can address customer needs	The staff who handle orders is accessible
Jimma	N	15	15	15	15	15	15	15
	Mean	3.7333	3.9333	4.3333	3.6000	3.6000	3.0667	3.2000
	S.D	.96115	1.27988	.81650	1.12122	.91026	1.33452	1.08233
IluBabor	N	10	10	10	10	10	10	10
	Mean	3.4000	2.8000	2.8000	2.6000	3.4000	2.8000	3.5000
	S.D	.51640	1.13529	.91894	.84327	.51640	.91894	.84984
Asymp. Sig. (2-tailed)		.368	.037	.001	.029	.434	.504	.559

As per table 4.11, the 2-tailed Asymp significance values 0.037, 0.001 and 0.029 for the second, third and fourth parameters are less than the significance level 0.05 (95% confidence interval). So, the null hypothesis “There is no statistically significant difference in pre transaction customer satisfaction between Jimma and ilubabora zones health facilities” is rejected. Facilities under Jimma zone are more satisfied in the pre-transaction.

Testing Hypothesis 2

H₀2: There is no statistically significant difference in transaction customer satisfaction between Jimma and ilubabora zones health facilities.

Table 4.20 below shows result of Mann-Whitney U test used to compare transaction customer satisfaction of Jimma and ilubabora zones health facilities

Table 4.20: Mann-Whitney U test to compare transaction customer satisfaction of Jimma and ilubabora zones health facilities.

Zones		Right Quality	Right Time	Raight Quantity	Right Products	Easy to check order status information
Jimma	N	15	15	15	15	15
	Mean	3.9333	2.8000	2.3333	2.6000	3.4000
	S.D	.96115	1.14642	1.17514	1.12122	1.35225
IluBabore	N	10	10	10	10	10
	Mean	90	90	90	90	90
	S.D	3.7000	2.9000	2.4000	2.3000	3.3000
	Asymp. Sig. (2-tailed)	.458	.599	.630	.566	.449

As per table 4.12, the 2-tailed Asymp significance values 0.458, 0.599, 0.630, 0.566 and 0.449 are greater than the significance level 0.05. So, the null hypothesis “There is no statistically significant difference in transaction customer satisfaction between Jimma and ilubabora zones health facilities” is not rejected.

Testing Hypothesis 3

Ho3: There is no statistically significant difference in post transaction customer satisfaction between Jimma and ilubabora zones health facilities.

Table 4.21 below shows result of Mann-Whitney U test used to compare post-transaction customer satisfaction of Jimma and ilubabora zones health facilities

Table 4.21: Mann-Whitney U test to compare post transaction customer satisfaction of Jimma and ilubabora zones health facilities.

Zones		PFSA properly handles customer complaints	The invoicing procedure is clear and accurate	It has good product tracing warranty	PFSA avails spares for medical equipment	It has clear and good Returns policy
Jimma	N	15	15	15	15	15
	Mean	3.2667	4.1333	3.0667	2.4667	3.2667
	S.D	1.09978	1.18723	1.38701	1.24595	1.09978
IluBabore	N	10	10	10	10	10
	Mean	3.3000	4.1000	3.2000	2.2000	2.1000
	S.D	.67495	.31623	.63246	.63246	.31623
	Asymp. Sig. (2-tailed)	.859	.237	.752	.683	.003

As per table 4.13, the 2-tailed Asymp significance values for the four of the parameters are greater than the significance level 0.05. So, the null hypothesis “There is no statistically significant difference in post transaction customer satisfaction between Jimma and ilubabora zones health facilities” is not rejected. However, the last parameter (P-value = 0.003) shows that there is difference in satisfaction level of the two zones facilities in that specific parameter.

4.2. Discussion

4.2.1. SCM Practices

The SCM practices of an organization could be described in terms of their supply strategy to source raw materials and as a set of interlinked activities under production planning, inventory control, distribution, and logistics (Beamon, 1998).

a. Relationship Management

Cox (2004) has described four sourcing strategies for buyers which guides the focus of relationship with suppliers. Relationship management as an organizational core process is comprised of strategic and operational components. The strategic process is about identifying key suppliers and development/maintenance of relationship. Whereas, the operational process is to segment suppliers based on their value over time and identify opportunities for longer term relationship (Lambert & Schwieterman, 2012).

After the endorsement of pharmaceutical logistics master plan, PFSA has made major strategic supply chain decisions that have tremendously affected the horizontal and vertical supply chain network structure. These include; the company's decisions to make vertical SC structure shorter removing out unnecessary steps that used to lengthen the lead time and cause product wastage. And also, PFSA had intentionally narrowed down the number of tier one customers to free up resources and capability to manage the whole supply chain even beyond tier one customers. That is, it ceased serving private retailers and hence focused on addressing the needs of public health facilities. This has resulted in relatively wider and longer vertical network structure at the first tier level. But, considering second and third tier suppliers and customers, the supply chain is characterized by narrow and long network structure on the supplier side combined with short and wide structure on the customer side. All in all, PFSA is oriented closer to the customer side of the supply chain network.

The sourcing strategy to obtain products from central PFSA is supplier development since the relationship is more long term and highly collaborative. PFSA has provided and still providing continuous technical support to customers (health facilities). This is to maintain the quality standards of products and reputations of the system. The relationship

management style is supplier dominant collaborative relationship. Because, there is long term operational relationship between buyers and sellers, supplier (PFSA) sets price and quality trade off, and buyer is paying whatever is required to receive given quality standards.

b. Logistics and Distribution

Good and effective inventory control system is crucial for big operational firms like PFSA to strike a balance between inventory investment and customer service. That means there should be a system in place to avail the optimal stock levels of products to satisfy customer needs. And also, inventory is one of the big impact areas to consider for cost reduction. All in all, companies can never achieve low cost strategy without good inventory management system (Heizer, 2011).

Jimma PFSA holds reasonable level of product inventory to offset demand and supply related uncertainties. Specifically the key informants said:

- *“For most of the products, it holds maximum stock that it enables it to serve the facilities under it for four months and minimum stock that would enable it to serve those facilities for two months which can be considered as a safety stock or buffer stock meant to help it cope with uncertainties”.*
- *“For products of short shelf life such as vaccines and lab reagents, the above principle does not apply and hence are treated separately on case by case basis”.*

Standard warehousing and inventory management practices like labeling, racking, categorization, and record keeping are well implemented in both RDF and Program product warehouses. FEFO- First Expiry First Out, a policy that enforces issue by expiry is well practiced and product arrangement in the warehouse facilitates the implementation of the policy. The software system they are currently using is helping them in this regard. The policy is crucial for firms handling products with relatively short expiry dates like food products and pharmaceuticals. That is the policy highly minimizes wastage of products due to expiry. In addition, basic standard operating procedures and workflows needed to manage products in warehouse are well in place. The warehouse by itself is designed in such a way that, it facilitates smooth flow of products except for RDF

warehouse which is relatively congested. But, as the organization grows and started to manage more products, existing business processes are needed to be re designed to incorporate important processes like dispatch.

Stock keeping and transaction records used in the warehouse have important stock and transaction related information used in important Supply Chain Decisions (when and how much to order). This in turn helps a lot in maintaining optimal stock level to meet the demand and prevent wastage due to oversupply. The records in the system have reasonable level of accuracy because the ending balance matches the physical count for majority of products in the inventory but this is not the case for records that are kept in hard copy.

The key informants said *“Distribution center (DC) or PFSA branch establishment is primarily based on geographical location but it additionally considers customer load to certain extent. The system is direct delivery for program products or collection system for RDF products unless when there is special agreement to all health facilities. Program products are refilled every two month based on their RRF report and the stock on hand during resupply”*. All in all, the in-country supply chain includes 3-4 echelons depending on the type of products: Central PFSA, Branch PFSA and Health Facilities or Woredas and Health facilities. Well streamlined distribution system believed to have improved operation efficiency and customer satisfaction.

c. Information Sharing Practices

Information sharing practice among companies, customers, and suppliers is an important component required to improve visibility of information to achieve seamless integration within the supply chain (Zailani & Rajagopal, 2005).

The type and extent of information sharing practices or level of data visibility with most suppliers is only on the basic ones needed for decision making. Because, the level of collaboration and trust doesn't allow sharing information beyond basic logistics related information needed for short term transaction. The same is true for Jimma PFSA as a supplier. But, with Jimma university hospital the level of collaboration and the

government directive allowed high level of data visibility or important strategic and operational information are shared for mutual benefits.

Even though, Jimma PFSA's internal information sharing practice and visibility is good, data obtained from the HCMIS the organization is using is sometimes not reliable and hence make it difficult to be used for decision making. This is one of the area the branch PFSA needs to work on it.

Vertical integration through the IPLS has also created appreciable level of coordination and collaboration with the health facilities. Major areas for collaboration include developing joint demand planning / forecasting and technical support in a form of training supportive supervision on IPLS to strengthen the system. So, relevant demand related information will be used and shared when developing the joint demand.

d. ICT Implementation

Information and communication technology (ICT) being process and product communication enabler is very important strategic factor for SC integration. It will help a company a lot in streamlining communication and developing efficient- responsive system (Tummala *et al*, 2006). Core processes in PFSA are utilizing the available basic ICT solution. The automation initiative to automate some of the activities and sub processes is also encouraging. The automated system the organization is currently using is called HCMIS (Health Commodity Management Information System). As per Power (2005), process automation should follow process redesign and reengineering to avoid the risk of optimizing sub optimal process. Change management should also be equally considered to minimize human resistance to change.

e. Supply Chain Challenges

The interview result with all key informants has shown that, Supply chain related challenges of PFSA could be summarized under supply, internal, demand, and external factors.

I. Supply related challenges

Insufficient availability of products in the local market to provide majority of important products needed in the country. PFSA is currently importing 80% of the products it is distributing in the country. Though the branch office is not involved in procurement, the challenge in this regard being faced by the head office is affecting Jimma PFSA. Even the available ones lack the required technical and financial capacity to deliver the right quantity of supplies in the right time.

II. Internal Operations

Majority of problems in relation to company's internal operations revolves around financial, technical, managerial and infrastructure. Demand and supply uncertainty by itself affected organizational operation in terms of sales target and optimization. Insufficient storage space to handle the volume of products needed to fulfill customer's demand especially for RDF products is also another problem.

III. Demand

Demand uncertainty along with imperfect market structure did affect company's long term forecasting and planning activities. This in turn affects the optimization effort to allocate organizational resources efficiently. Reliability and responsiveness of customers at all level for longer term supply chain relationship is also under question mark because it has not reached that level of maturity.

IV. External Environment

System inefficiency in warehousing, transportation and other logistics related services. The mandate to enforce the system in order to get a reliable, complete and timely data and reports for better decision making is limited because PFSA is not the owner of the health facilities (Regional health bureaus are the owners).

4.2.2. Supply Chain Performance

a. IPLS Level of implementation

I. Availability of LMIS formats

Results on assessment of availability of LMIS formats showed that all LMIS formats for recording and reporting health logistics data are available at required level at the health facilities except for HPMRR which is 86 % available (less than the desired 100%). Though it should be

improved, this 86% availability for HPMRR should not be considered as bad because it is used at Health post level and is limited to very few products as compared to the others.

II. Usage of LMIS formats

As seen in the result, all health facilities reported that they use Bin card for product management, use both RRF and IFRR forms for reporting purposes and send RRF reports to Jimma PFSA bimonthly which are all in line with the desired level. But, there was inconsistency among facilities in sending reports to higher level other than PFSA. Some send to Woreda or zone health offices while others send to both level. Additionally, the review of the last RRF report sent during data collection revealed that only 60% of the reports are completed for all products which make its completeness (data completeness) questionable.

IFRR usage rate by major dispensing units of the assessed health facilities showed that it is lowest at TB clinic (74%) followed by ART clinic (78%) as compared to the other dispensing units which is 88%. This is far below the desired level of usage which is 100%. This could be because the health care providers at the dispensing units are not willing to use the format.

Concerning usage rate of HPMRR, results showed that Out of 177 Health posts served by the facilities under study, only 108 of them are sending HPMRR forms for reporting which makes it only 61% which is far below the desired level which is 100%. This in part could be attributed to the lack of technical capacity at health post level.

III. Training and Supportive Supervision

The assessment result on knowledge sources to complete LMIS formats showed that formal IPLS training accounts for 92 % of the knowledge source for completing LMIS formats. This shows that Jimma PFSA provided extensive coverage to IPLS training. Additionally, 40 % of the facilities reported that they received supportive supervision within the last month and another 44% reported that they received it within the last 1 to 3 months and all of them reported that the supervision included drug (product) management and logistic. PFSA was involved in 83 % of the supportive supervision cases. This results

show that Jimma PFSA is highly committed in the implementation of IPLS in order to get the expected fruits of the system.

IV. Distribution and Transportation

One of the purposes of IPLS implementation is to enable facilities decide on the quantity of products that they need. Results showed that 84% of the facilities reported that they are the ones who make the decision on the quantity to be refilled and the remaining 16% said that decisions are made at higher level. This might be because the facilities are not refilled for some products according to the quantity they requested.

Concerning direct source of products and mode of distribution, results are consistent with that of the desired system by IPLS. They reported that PFSA is the direct source of products and mode of distribution is delivery by PFSA for program drugs and facility collection for RDF products.

b. Stock Status Information

Implementation of IPLS was expected to improve stock status information including stock availability, stock out duration, stock on hand, product expiries, and storage conditions at both facility and PFSA level. Except for storage condition, the others can be easily obtained from bin cards and further can be reported from it. Results showed that bin card usage rate was not consistent and differs among facilities and among products. For product group selected for this study, bin card availability ranges from 55 to 88 %.

Group comparison between facilities of Jimma and Ilubabora zones based on Chi-Square test showed that there was significant difference (P-value= 0.008) in bin card availability between Jimma and Ilubabora zones. Bin cards are more available in facilities of Jimma zone (119 out of 140) for the selected product group compared to that of Ilubabora zone (71 out of 100). This can be attributed to their proximity to Jimma PFSA branch.

Storage Condition

Assessment results showed that the storage conditions are excellent in terms of protecting products from extreme weather conditions and securing products from theft. The storage

conditions showed less than 100% for 9 of the other standard parameters used to evaluate storage. The worst result is for using and updating bin cards which is only 52% followed by the storage space which was in 72% of the cases sufficient. Though this problem can't be directly attributed to the IPLS, availability of store rooms that fulfill the required standards is very important for the expected success and impact of IPLS.

c. Logistics System Performance of IPLS

I. LMIS Data Quality

Results of data quality assessed for selected tracer product group for the last refill period at the time of Data collection showed that, the availability of updated bin cards for the selected products is below the average for most products. It was better for antiretroviral products (products 1 & 10) which are 48% and 52% respectively. The percentage discrepancy between the two LMIS data sources (Bin card & RRF) ranges from as low as 0.2 for product 4 and to as high as 40 % for product 1. The two data sources showed discrepancy for all selected product group. The IPLS guideline requires that bin cards are updated regularly and bimonthly reports be prepared based on the data on the bin card. Results in this case are not in favor of the implemented system.

II. Reliability

Fill rate maximization is the SCOR KPI for SC reliability, customer focused attribute describing system's ability to deliver the right quantity and quality in the right time (SCC, 2010). According to Beamon (1998), fill rate maximization is one among SC performance measures based on customer responsiveness.

1. Order Fill Rate – according to recorded data

Jimma PFSA resupplies its customers (Health facilities) based on the standard IPLS guideline which says facilities should be refilled every two months and the maximum and minimum stock level at facilities is four and two months respectively. So, facilities are expected to send their report and request every two months and PFSA hence refill them every two months based on their request. So, refill performance as described by percentage refilled against requested could be taken as proxy indicator for order fill rate.

As can be seen in the result, the overall refill rate performance is 54.7 % with variations among product groups (130% for AZT+3TC+NVP Vs 15.8% for KHB) showing gap in planning and optimizing. The performance for HIV related products such as TDF+3TC+EFV, AZT+3TC+NVP and Cotrimoxazole is relatively high. This might be because these products are given more attention and priority as compared to the others.

In addition, several internal and external factors like consistent availability of products, delivery lead time, operation efficiency, capacity, and/or demand- supply situations affects the overall figure. These factors do affect each product group differently according to the product requirement in terms of demand/supply.

Independent sample t-test performed showed that the mean refill rate between Jimma and Ilubabora zones was significantly different (p-value = 0.014). The refill rate was significantly higher for facilities of Jimma zone than that of Ilubabora zone. The most likely reason for this is the fact that health facilities of Jimma zone are within short distance than that of Ilubabora zone facilities.

As per IPLS guideline, facilities are said to be reached emergency order point when they are left with stock on hand (SOH) that serves only for two weeks and hence are supposed to place emergency order. The higher the number of emergency orders, the higher the problem of the system. Number of emergency orders placed could be considered as indirect indicator of order fill rate. As seen in the result 64% of the facilities placed at least one emergency order in the last three months. This can be considered as unhealthy. Further comparison of the two zones (group comparison) in terms of emergency orders placed using Chi-square test showed that there was significant difference (p-value= 0.003) in number of emergency orders placed in the last three months between Jimma and Ilubabora zones. Emergency orders were more placed by facilities of Jimma zone compared to that of Ilubabora zone. Plausible explanation for this is that, health facilities under Jimma zone are not sending their reports on timely basis and the other is that when the SOH at PFSA level of some products are not enough to address the demands of all facilities requested the product, the branch makes rationing and usually assigns smaller quantities to facilities of Jimma zone because of their closer proximity to Jimma and hence can be addressed by emergency orders.

2. Order Fill Rate as perceived by the facilities

When asked whether or not they receive the quantity of products they requested, 72% of the facility representatives replied that they don't usually receive the quantity they requested. They added, the problem is more with RDF products than program products. This can be seen from two angles. First, for program products, as they are funders dependent, sometimes it happens that products are not available by central PFSA to the branches in the required quantity and there are also other reasons. Second, for RDF products, the fact that PFSA is the sole supplier of these products for all public health facilities in the country made it difficult. These could be because of technical, infrastructure, resource, capacity, etc problems.

III. Stock Out Rate

As can be seen in the result, the stock out rate at the main dispensary units at the time of the visit ranged from as low as 0% for product 4 (Cotrimoxazole suspension) to as high as 72% and 80% for products 3 and 9 (ceftriaxone inj and ORS) respectively. The result showed that the stock out rate for TB and family planning products is lower than the other products. For any business operation, stock out is a sign of weakness of a system. But, for health products, stock out is even more serious issue. Results showed that system's performance in this regard is lower than the desired level (<5%) for most of the selected products except for two of them.

IV. Responsiveness – Delivery Lead Time

As can be seen from the result, majority of the health facilities (88%) reported that, delivery lead time is between 2 weeks to 1 month and between 1 to 2 months each of which account for 44%. IPLS implementation guideline says delivery lead time would be between two weeks to one month which in this case is only 44% as per the response of the facilities assessed.

d. Customer Satisfaction on Supply Chain Services

Enhancing customer satisfaction is one among important objectives of SCM according to many authors (Tummala *et al*, 2006; Trkman *et al*; Habib, 2011). According to Beamon

(1998), customer satisfaction (pre transaction, transaction, and post transaction) is one among qualitative supply chain performance measures.

As seen in the result, the overall pre-transaction customer satisfaction is good according to the mean of the parameters used which are more or less between 3 and 4 except for one parameter. The high level pre-transaction customer satisfaction is mainly due to written customer policy, availing of required quantity of formats and technical support being provided on IPLS. Otherwise, the level of satisfaction on the pre transaction flexibility of the system to address customer needs is not satisfactory. This shows company's focus on long term collaborative capacity building and incentive schemes like training is as expected.

Mann-Whitney U test used to compare pre-transaction customer satisfaction of Jimma and ilubabora zones health facilities showed the 2-tailed Asymp significance values 0.037, 0.001 and 0.029 for the second, third and fourth parameters which are less than the significance level 0.05 (95% confidence interval) which meant that there is statistically significant difference in pre transaction customer satisfaction between Jimma and ilubabora zones health facilities. Facilities under Jimma zone are more satisfied in the pre-transaction. This implies that Jimma PFSA is availing updated LMIS formats in the required quantity to facilities under Jimma zone more than that of facilities under ilubabora zone. Additionally, it is providing more technical support on IPLS to facilities under Jimma zone.

According to Beamon (1998), suppliers' performance in delivering the right good in the right time is one among the qualitative Supply Chain performance measures. As can be seen from the result, overall transaction customer satisfaction is weak according to the means which are more or less between 2 and 3 or below average. The systems inability to provide the right quantity and the right product at the right time contributed the major part for the low performance. The majority of respondents agreed that the system is better in delivering products in the right quality. Although delivering quality health products is important, delivering the right product in the right quantity and right time is equally important.

Mann-Whitney U test used to compare transaction customer satisfaction of Jimma and ilubabora zones health facilities p-values are greater than 0.05 for all parameters which meant that there is no significant difference in the level of transaction customer satisfaction. The lower satisfaction level is true for both group of health facilities.

As can be seen from the result, overall post-transaction customer satisfaction is good according to the mean which are more or less between 3 and 4. This success is mainly contributed by invoicing procedure and complaints handling. However, the system's post-transaction performance in terms of availing spare parts and in the clarity of its returns policy is weak. Even though, standard recall and logistics support system for facilities is well in place in paper the company is not committed enough to implement the system to avoid short term costs and product expiries at its warehouses.

Mann-Whitney U test used to compare transaction customer satisfaction of Jimma and ilubabora zones health facilities p-values are greater than 0.05 for all parameters except for the last parameter which is returns policy. This means that facilities under ilubabora zone are not happy with the returns policy of Jimma PFSA. This could be because of the distance from Jimma PFSA branch.

As can be seen from the result, overall customer satisfaction on the system is average, mean around 3. Relatively strong pre-transaction and post-transaction supply chain services could have contributed to the overall satisfaction.

CHAPTER FIVE

5. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary of Major Findings

- The public health supply chain practice of Jimma branch PFSA within its catchment area can be described as follows:
 - The vertical network structure of Jimma PFSA includes one firm on the first tier supplier side and more than 300 hundred firms (health facilities) exist on the customer side.
 - The relationship management style with both the supplier (central PFSA) and customers (health facilities) is supplier dominant collaborative relationship.
 - There is inventory control system and model in place that helps in deciding quantity and time of order.
 - The distribution system is designed for products to go directly from the branch PFSA to health facilities for most of the facilities while it goes through woreda for some facilities.
 - Type and extent of information sharing practices of Jimma PFSA with supplier, customers, and within the organization is as follows:
 - ✓ More strategic and operational level information like demand plan, operation, and quality control are shared with the supplier.
 - ✓ The internal information management system is good but need further integration and harmonization to get optimal output.
 - ✓ The practice with customers even though not uniform is mostly on operational level information like short term demands.
 - ICT implementation initiatives including the basic ones (fax, internet...) and the software (HCMIS) being used is satisfactory. The implementation didn't go along with the required process changes and redesign activities to the required extent. The usual outstanding challenges in relation to change management and culture are also pertinent in Jimma PFSA's context.

- Availability of LMIS formats at the facilities is excellent and the usage of the formats ranges from as low as 60 % to as high as 100%
 - PFSA gave extensive coverage in terms of training and supportive supervision in the implementation of IPLS
 - The distribution and transportation practice is in line with the IPLS implementation guideline
- Storage condition of stores of the assessed facilities only fulfilled 100% for 2 of the standard parameters used out of 11.
- Stock out rate assessment at the major dispensary units of the facilities assessed at the time of the visit showed as high as 80 % for selected program drugs.
- The supply chain performance of the IPLS as per SCOR KPIs at the selected facilities is as follows:
 - Bin card availability for selected drug group ranges from 55% to 88% and the availability of updated bin card that gives stock status information for same group of products range from 60 to 80%
 - Most of the facilities assessed for the selected drug products filled and sent RRF report without updating their respective bin cards which shows data quality problem
 - The overall order fill rate based on the records reviewed is 54.7% though it ranges from as low as 15% to as high as 130%
 - The order fill rate as perceived by customers (health facilities) is 28% for all product groups.
 - Delivery lead time for available products according to the assessed facilities is between 2 weeks to 1 month (44%) and between 1 to 2 months (44%).
- Customer satisfaction on pre transaction and Post-transaction supply chain services is strong or more. But, it is weak on transaction supply chain services
- The result of the assessment on the system's consistence in performance between the two zones is as follows:

- Bin card is significantly more available at facilities of under Jimma zone as compared to that of Ilubabora zone
- Refill rate is found to be significantly different and is more for facilities under Jimma zone
- Emergency order is more frequently placed by facilities under Jimma zone
- The 2-tailed Asympt significance value on Mann Whitney U test has shown that,
 - ✓ There is no statistically significant difference between Jimma and ilubabora facilities in transaction customer satisfaction level.
 - ✓ The pre-transaction and post-transaction customer satisfaction for Jimma zone facilities is better than Ilubabora zone facilities.

5.2. Conclusions

- The supply chain is characterized by narrow and long network structure on the supplier side combined with short and wide structure on the customer side.
- Reactive sole sourcing strategy for majority of core products along with arm's length relationship management puts Jimma PFSA's supply chain performance and reliability at risk. This is because, the ability to deliver right products, in the right quantity and the right time depends highly on a single supplier (central PFSA).
- The level of collaboration with facilities in terms of technical bonding and seamless information sharing is not satisfactory.
- ICT projects are not going along with the required process changes and re-design activities. Rather, they are implemented to improve processes individually without considering the big picture.
- Availability of LMIS formats is very good. However, there was inconsistency in the usage rate of the formats and was unacceptable for some products. PFSA is providing training and technical support to the expected level and distribution and transportation practice was also in line with IPLS implementation guideline.

- Storage condition of stores of the assessed facilities did not fulfill most of the standard parameters used for this study. However, there were tangible improvements in storage condition as compared to pre IPLS era.
- Stock out rate at the major dispensary units of the facilities for the selected program drug groups was higher than acceptable level.
- IPLS's SC performance was not good as it was expected to be:
 - The availability of updated bin card that gives stock status information for the selected product was far below the expected 100% which makes it unreliable for logistics decision.
 - Most of the facilities assessed for the selected drug products filled and sent RRF reports without updating their respective bin cards and many of them are not completed for all products which shows data quality problem.
 - Reliability – Order Fill Rate based on available records was bad for most selected product groups and even worse as perceived by majority of health facilities.
 - The IPLS system was only able to meet its standard delivery lead time in only 44% of the facilities assessed.
- Low level of customer satisfaction in transaction supply chain services and post-transaction product return policy have the potential to affect company's long term profitability and existence.
- IPLS's performance in terms of consistency is not good. Therefore it can be said that the numbers of distribution centers (PFSA branches) are not sufficient to access Ethiopia's vast geography and population as can be seen in the difference between Jimma and Ilubabora zones.

5.3. Recommendations

- The company should work hard and invest more to bring the required level of integration both at the supplier and customers' side to improve customer satisfaction, performance, and reduce cost. This involves objective alignment, collaboration, data visibility, streamlining processes through removing unnecessary steps, and increasing responsiveness and resilience.

- Core internal processes (functional departments) of Jimma PFSA should be integrated to optimize and utilize limited resources efficiently. It is believed that, it will help a lot in mitigating efficiency problems arising due to poor planning and coordination.
- Improving integration with first line customers through collaboration and relationship based on mutual benefit and trust (win win). Specifically, the company should invest more resource to optimize the whole supply chain through technical and financial support. And, more coordination mechanisms like joint demand forecasting should be there.
- The company should work hard and invest on improving visibility of information to achieve seamless integration with its supplier and customers within the supply chain..
- Process automation should follow process mapping and improvement to avoid optimization of sub optimal process. That is, ICT implementation should go along with the required process changes and re design activities executed through incremental processes. Change management activities should also be part of the overall automation initiatives to minimize risk associated with human factors mostly due to resistance to change.
- Jimma PFSA should maintain the system's strong performance in terms of LMIS formats availability and usage, training and supervision and Distribution and transportation.
- Health Facilities under Jimma branch should strive to improve the storage condition of Health products.
- The importance of data in supply chain decision should also be promoted in parallel. Maintaining logistics records and compiling and sending quality logistics reports from the customer side should be associated with some kind of accountability
- It is also advisable to implement supply chain monitoring systems taking KPIs from SCOR model. This should be considered in the company's business strategy.
- Work on improving the post-transaction customer satisfaction through strengthening the already existing post-transaction supply chain services like stock redistribution and product recall system. It is also important to give due attention to distant facilities improving transaction and post transaction supply chain services.

- It is also recommended that the branch PFSA should work hard to improve the systems performance in terms of consistency or consider establishing a new branch in Ilubabora zone.

5.4. Future Research Direction

Similar studies should be conducted at the remaining facilities of SNNP region that were included in phase one IPLS implementation and are being served by Jimma PFSA in order to get a comprehensive insight on the impact of IPLS at the branch and its catchment area as a whole. The study should further be done at the remaining PFSA branches to see the national impact.

Limitation of the Study

Out of 46 phase I IPLS implementation sites of Jimma PFSA branch, this study was conducted on 25 of them located in Jimma and Ilubabora zones. The study did not include local and international suppliers at the upper tier and phase II and phase III IPLS implementation sites down the tier.

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APPENDICES

1. Informed Consent Form

Jimma University

College of Business and Economics

Department of Management

Masters in Business Administration (MBA) postgraduate programme

Informed consent form:

Dear respondent I am a postgraduate student in MBA at Jimma University and I am conducting a research study on impact of integrated pharmaceutical logistics system on supply chain management of pharmaceuticals at health facilities and pharmaceutical fund and supply agency of jimma branch. The results of this study will hopefully contribute to improve the IPLS implementation and hence benefit the health facilities.

It is my understanding that you are currently involved in pharmaceutical supply chain management at your health facility. I want you to participate in this study to provide information regarding IPLS implementation status and practices and the challenges your health facility is currently experiencing with respect to supply chain management of pharmaceuticals.

I want to stress that your participation in this study is voluntary and all efforts to protect your identity and keep the information confidential will be taken. Your answers will not be linked to your name and will only be used for this evaluation. It may take 30 minutes of your time to fill the forms.

Please indicate below if you are willing to participate in the study

I agree to participate

I do not agree to participate

If you are Volunteer to participate please answer the following questions

2. Integrated Pharmaceuticals Logistics System Implementation Impact Data Collection Tool

Date: _____ Interviewer/s Name: _____	DAY MONTH YEAR
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First, ask the following questions of the in-charge or pharmacy head/store manager. After asking questions 01 -06 under section I, visit the storeroom, or storage area where the health products listed are managed. If you are referred to another staff member for the stocktaking exercise, introduce the survey goals and objectives as you did during the introduction. Hand the respondent the list of products that are included in the survey, and explain that we will refer to the list for some of the following questions.

Section I: Background Characteristics of the Respondent

No.	Question	Code Classification
01.	Name, title and mobile phone number of person interviewed for this survey	Name: _____ Title: _____ Mobile number: _____
02.	Number of years and months you have worked at this facility?	Years: Months:
03.	Are you the primary person responsible for managing drugs and medicine products at this facility?	Yes 1 No.....0
04.	How many staff the facility has under the pharmacy unit?	Number of pharmacy unit staff /_____/
05.	How many of them are trained in IPLS?	Number trained /_____/
06.	Educational qualification of pharmacy unit staff	# of staff with Degree /_____/ # of staff with Diploma /_____/ Other # /_____/

Section II: Facility Services and Infrastructure

No.	Question	Code Classification
01.	Name of the facility	
02.	Region	
03.	Zone	
04.	Woreda	
05.	City/town:	
06.	Supplying Hub:	
07.	Facility Code:	
08	Type of facility	1=PFSA Center 2=PFSA hub 3= Hospital 4= Health centre 5=Health Post 6=Other _____
09	Provide ART Service	1=Yes 2=No
10	Product Delivery Modalities from PFSA	1=Direct 2=Indirect
11	Availability of the following facilities at the health facility:	
	Paved Road to the facility	1=Yes 2=No
	Operational electricity on day of visit	1=Yes 2=No
	Operational water in the building on the day of visit	1=Yes 2=No
	Operational telephone (land line or mobile)	1=Yes 2=No
12	Availability of the following facilities at the health facility store:	
	Operational electricity on day of visit	1=Yes 2=No
	Operational water in the room on the day of visit	1=Yes 2=No
	Operational telephone (land line or mobile)	1=Yes 2=No
	Operational Computer	1=Yes 2=No
	Internet Access	1=Yes 2=No

Section III. IPLS Implementation

No.	Questions	Code Classification
01	<p>Are the following LMIS Formats, Job Aides and SOPs available at the facility? (Ask for documents to verify)</p> <p>Bin Cards</p> <p>Health Post Monthly Report and Re-supply form (HPMRR)</p> <p>Internal Facility Report and Requisition Voucher (IFRR)</p> <p>Facility Report and Requisition Form (RRF)</p> <p>Standard Operation Procedure (SOP) for IPLS</p>	<p>Yes 1 No 0</p> <p>Yes 1 No 0</p> <p>Yes 1 No 0</p> <p>Yes 1 No 0</p> <p>Yes 1 No 0</p>
02	<p>Do you use the following stock keeping logistics forms to manage health products in this facility? Must be verified by checking sample completed bin cards</p> <p>A. Bin Cards</p> <p>B. Other (specify) _____</p>	<p>Yes 1 No 0</p> <p>Yes 1 (specify) _____ No 0</p>
03.	<p>What LMIS forms do you use for reporting/ordering? Multiple responses are possible. Must be verified with completed report</p> <p>A. IFRR</p> <p>B. RRF</p> <p>D. Other _____</p>	<p>Yes 1 No 0</p> <p>Yes 1 No 0</p> <p>Yes (specify) _____ 1 No 0</p>
04	<p>The health facility compiles and sends RRF reports to higher level?</p>	<p>Yes 1 No 0</p> <p style="text-align: right;">If No → 09</p>
05	<p>If yes, to who: Multiple responses are possible. DO NOT READ THE RESPONSES</p>	<p>PFSA.....A RHB.....B Zone Health Office.....C WoHO.....D Don't Know.....F Other (specify) W</p>
06	<p>If yes, how often are these LMIS (RRF) reports sent to the higher level? Multiple responses are possible. DO NOT READ THE RESPONSES</p>	<p>MonthlyA Bimonthly (every two months).....B Quarterly.....C Semi-annually.....D AnnuallyE Other W</p>

07.	When was the last time this facility sent RRF? Must be verified with completed report	Never 1 Within the last month.....2 2 months ago 3 3 months ago 3 More than 3 months ago..... 4
08.	Are all the columns in RRF completed for all medicines? Must be verified with last completed report.	Yes 1 No 0 Completed report not available 9
09.	Do major dispensing units (DUs) use IFRR for regular reporting? Must be verified with completed report	
	OPD	Yes 1 No 0 NA 99
	ART	Yes 1 No 0 NA 99
	MCH	Yes 1 No 0 NA 99
	LAB	Yes 1 No 0 NA 99
	TB	Yes 1 No 0 NA 99
10.	If health center, how many health posts are served under the health center? (only for health centers)	_____
11.	If health center, how many health posts submitted HPMRR reports in the past three months (three month prior to survey month)? Note: health posts submitted two or three reports should only be counted once.	_____ Ask to see reports and check here # of reports verified.
12.	How did you learn to complete the forms/records used at this facility? Multiple responses are possible. (a)	Formal IPLS Trainings.....A Pre service Trainings.....B Other formal trainings (Specify) _C On-the-job training (other staff from facility)D On-the-job training (someone outside facility).....E Never been trained.....F Other (specify)_____W

13.	How many emergency orders have you placed in the last 3 months? If available, ask for documents to verify using RRF	None 0 1 1 2 2 3 3 More than 3.....4 NA 5								
14.	Who determines this facility's resupply quantities? (b) Multiple responses are possible.	The facility itself A Higher-level facility (Health Center, PFSA/Woreda/Zone/RHB) B Other _____ W								
15	What are the direct sources of supply for the following the program commodities at this facility? Multiple responses are possible.	<table border="1"> <tr> <td data-bbox="277 638 829 823">HIV and OI</td> <td data-bbox="829 638 1354 823">PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W</td> </tr> <tr> <td data-bbox="277 823 829 1008">TB</td> <td data-bbox="829 823 1354 1008">PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W</td> </tr> <tr> <td data-bbox="277 1008 829 1192">Family Planning</td> <td data-bbox="829 1008 1354 1192">PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W</td> </tr> <tr> <td data-bbox="277 1192 829 1394">Malaria</td> <td data-bbox="829 1192 1354 1394">PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W</td> </tr> </table>	HIV and OI	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W	TB	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W	Family Planning	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W	Malaria	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W
HIV and OI	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W									
TB	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W									
Family Planning	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W									
Malaria	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify)_____W									
16	If multiple responses, what is the usual source (or most common source) Select only one answer	<table border="1"> <tr> <td data-bbox="277 1499 829 1684">HIV and OI</td> <td data-bbox="829 1499 1354 1684">PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify)_____6</td> </tr> <tr> <td data-bbox="277 1684 829 1866">TB</td> <td data-bbox="829 1684 1354 1866">PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify)_____6</td> </tr> </table>	HIV and OI	PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify)_____6	TB	PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify)_____6				
HIV and OI	PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify)_____6									
TB	PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify)_____6									

	Family Planning	PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify).....6
17	What are the sources of supply for RDF commodities at this facility? Multiple responses are possible.	PFSA.....A RHB.....B ZHD.....C Woreda.....D Health Center.....E Other (specify).....W
18	If multiple responses, what is the usual source (or most common source) Select only one answer	PFSA.....1 RHB.....2 ZHD.....3 Woreda HO.....4 Health Center.....5 Other (specify).....6
19	On average, for a normal order approximately how long does it take between sending an order and receiving product from main resupply point?	Less than 2 weeks 1 2 weeks to 1 month 2 Between 1 and 2 months 3 More than 2 months 4
20	Does the facility usually get the quantities of products it orders?	Yes 1 No 0 Don't know 9 If YES or DK →22
21	If no, why not? _____	The resupply point does not have adequate supply.....A The resupply point was stocked out....B Order amount changed at the resupply point.....C Other (specify).....W
22	Does this facility normally collect or are the pharmaceuticals/commodities delivered?	
	Program Commodities	Collect.....1 Are delivered.....2 Both (explain)3
	RDF	Collect.....1 Are delivered.....2 Both (explain)3
23	Who is responsible for transporting products to your facility? (c) Program Commodities Multiple responses are possible.	PFSA.....A RHB.....B ZHD.....C Woreda.....D Hospital.....E Health Center.....F Health Post.....G Other (specify).....W

	RDF Multiple responses are possible.	PFSA.....A RHB.....B ZHD.....C Woreda.....D Hospital.....E Health Center.....F Health Post.....G Other (specify) _____ W
24	If you collect, what type of transportation is most often used?	Facility vehicle 1 Public transportation 2 Private vehicle 3 Motorcycle 5 Bicycle 6 On foot 7 (d) Other (specify) _____ 9
25	Distance from usual resupply point (approximately)	/_____/KM /_____/_____/ time Hr min

26	When did you receive your most recent supervision visit? Check visitors book, if necessary.	Never received 1 Within the last month 2 1 - 3 months ago 3 3 - 6 months ago 4 More than 6 months ago 5 i. Other (specify) _____ 9
27	Did your last supervision visit include drug management/logistics (e.g., bin cards checked, logistics reports checked, storage conditions checked, etc.)?	Yes 1 No 0 Don't know 9
28	The last supervision visit that included drug management was by: Multiple responses are possible.	PFSA.....A RHB.....B Zone Health Office.....C Woreda.....D Health Center.....E Partner(specify) _____ F Other (specify) _____ W

Section IV. Product Availability

Table 1. Stock Status (Specify a full six month period prior to this data collection; and the day of visit)

Column:

1. Name of all authorized products that will be counted
2. Unit of count for the product

Note: Columns 1 and 2 will be filled out before questionnaires are printed for the survey.

3. Record whether or not the product is managed at this facility, answer Y for yes or N if no.
4. Check if the bin card is available, answer Y for yes or N for no.
5. Check if the bin card has been updated within the last 30 days, answer Y for yes or N for no. Note: If the bin card was last updated with the balance of 0 and the facility has not received any resupply, consider the bin card up-to-date.
6. Record the balance on the bin card.
7. Record if the facility has had any stockout of the product during the 6 month period from Sept 2015, to Feb 2016, answer Y for yes or N for no.
8. Record how many times the product stocked out during the 6 month period from Sept 2015, to Feb 2016, according to bin cards, if available.
9. Record the total number of days the product was stocked out between Sept 2015, to Feb 2016, only.
10. Record the quantity of product issued from the storeroom between Sept 2015, to Feb 2016, only.
11. Record the number of months the issued data represents (may be 6 months or less); record the months for which there is any data available, including 0.
12. Record the physical count in the storeroom.
13. Record if the facility experiencing a stockout of the product on the day of the visit, answer Y for yes or N for no. If products are available outside the storeroom there is no stockout. Visually verify that usable products are in stock.
14. Record if the facility has expired products. If there are products that are near expiry (within one month), note the product and quantity in the comments section.

Maximum months of stock _____ Minimum months of stock _____ Order interval _____

Note: For any product that experienced a stock out in the last six months (including the day of the visit), please note reasons (by product).

	Product	Units of count	Managed at this facility? (Y/N)	Bin card available? (Y/N)	Bin card updated? (Y/N)	Balance on bin card	Stockout most recent 6 months (Y/N)	Number of stockouts	Total number of days stocked out	Total issued (most recent 6 months)	Number of Months of data available	Physical inventory — Store room	Stockout today? (Y/N)	Availability of expired product (Y/N)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Amoxicillin 500mg/250 mg Capsule	10												
2	TDF+3TC+EFV 300+300+600mg Tab of 30	PK												
3	Ceftriaxone 1g-m/500mg injection	Vial												
4	Co-trimoxazole 480mg/960mg of 1000	PK												
5	Co-trimoxazole 240mg/5ml suspension, 100ml	Bottle												
6	RHZE-150mg/75mg+400mg+27	24X28												
7	Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection with 1 ml syringe	vial												
8	Stat pack of 20 or KHB of 50	Pack												
9	Oral Rehydration Salt (ORS)	Sachet												
10	AZT+3TC+NVP 300+150+200mg of 60	Pack												

Table 2: Stock Status in Dispensary Units

Column:

1. Name of all authorized products that will be assessed
2. Unit of count for the product balance of 0 and the dispensing unit has not received any resupply, consider the bin card up-to-date.
3. Record if the dispensing unit experiencing a stockout of the product on the day of the visit, answer Y for yes or N for no. Visually verify that usable products are in stock.

Sr No	Product	Units of Count	OPD	ART	MCH	TB	IPD	
			Stockout today?	Stockout today?	Stockout today?	Stockout today?	Stockout today?	
			(Y/N)	(Y/N)	(Y/N)	(Y/N)	(Y/N)	
	1	2	3	3	3	3	3	
1	Amoxicillin 500mg/250mg capsule	10						
2	TDF+3TC+EFV 300+300+600mg Tab of 30	PK						
3	Ceftriaxoneg-1gm/500mg injection	Vial						
4	Co-trimoxazole 480mg/960mg of 1000 tab	PK						
5	Co-trimoxazole 240mg/5ml suspension, 100ml	Bottle						
6	RHZE- 150mg/75mg+400mg+275mg-tablet	24X28						
7	Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection with 1 ml syringe and needle	vial						
8	Stat pack of 20 or KHB of 50	Pack						
9	Oral Rehydration Salt (ORS)	Sachet						
10	AZT+3TC+NVP 300+150+200mg of 60	PK						

Section VI. Storage Conditions

Table 3. Storage Conditions

Items 1 -11 should be assessed for all facilities for products that are ready to be issued or distributed to clients. Place a check mark in the appropriate column based on visual inspection of the storage facility; note any relevant observations in the comments column. **To qualify as “yes,” all products and cartons must meet the criteria for each item.**

No	b. Description	No	Yes	Comments
01.	Pharmaceuticals are arranged & organized according to a logical categorization, e.g. zoning			
02.	Bin Cards are used & updated regularly? (Observe by checking a five or more sample BCs.)			
03.	Are unwanted items (damaged or expired drugs, non-pharmaceutical items, etc.) in the store room separated from the usable stock?			
04.	Products are arranged so that ID labels, expiry dates, and/or manufacturing dates are visible.			
05.	Products are stored & organized in a manner which facilitates use of First-to-expire, first-out (FEFO).			
06.	Products are protected from direct sunlight and high heat at all times of the day/during all seasons.			
07.	The storeroom is maintained in good condition (clean, no trash, sturdy shelves, and boxes well-organized).			
08.	The current space and organization is sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for foreseeable future).			
09.	Storage area is secured with a lock and key, but is accessible during normal working hours; access is limited to authorized personnel.			
10.	Storage area is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents [droppings or insects].)			
11.	Cartons and products are in good condition, not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation			

Section VII. LMIS Data Quality

Table 4. LMIS Data Quality: Usable Stock on Hand at Time of Most Recent LMIS Report
Column:

1. Will be pre-populated with the same products as in table 1.
2. Whether or not the product is managed at this facility, answer Y for yes or N if no.
3. Check if the bin cards and RRF are available, answer Y for yes or N for no.
4. Get the most recent RRF report showing the selected products, and record the stock on hand from the RRF report in column 3.
5. Write the quantity of usable stock on hand from the bin card from the time of the selected RRF report.
6. Note the reasons for any discrepancy.

Product	Usable Stock on Hand (at time of most recent LMIS report)				
	Managed at the facility No=0 Yes = 1	Are order records available (bin card and RRF)? (If NO to RRF or bin card skip to next item – only use acceptable data sources) No=0 Yes = 1	According to most recent RRF report	From bin card from time of RRF report	Reasons for discrepancy
1	2	3	4	5	6
Amoxicillin 500mg/250mg capsule					
TDF+3TC+EFV 300+300+600mg Tab of					
Ceftriaxoneg-1gm/500mg injection					
Co-trimoxazole 480mg/960mg of 1000 tab					
Co-trimoxazole 240mg/5ml suspension, 100ml					
RHZE-150mg/75mg+400mg+275mg-tablet					
Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection with 1 ml syringe and needle					
Stat pack of 20 or KHB of 50					
Oral Rehydration Salt (ORS)					
AZT+3TC+NVP 300+150+200mg of 60					

Section VIII. Order Fill Rate

Table 5. Percentage Difference between Quantity Ordered and Quantity Received

Column:

1. List the same products as in table 1 or use a sample of those products.
2. Whether or not the product is managed at this facility, answer Y for yes or N if no.
3. Check if the bin cards and RRF are available, answer Y for yes or N for no.
4. Enter the quantity ordered for the last order period for which products should have been received (i.e., don't include open orders whose expected receipt date has not arrived).
5. Enter the quantity received in the last order.

Product	Managed at the facility No=0 Yes = 1	Are RRFs available? No=0 Yes = 1 <i>(If NO Skip to next item – only use acceptable data sources)</i>	Quantity Ordered For Last Order Period	Quantity Received In Last Order/Procurement	Reasons for discrepancy
1	2	3	4	5	
Amoxicillin 500mg/250mg capsule					
TDF+3TC+EFV 300+300+600mg					
Ceftriaxone-1gm/500mg injection					
Co-trimoxazole 480mg/960mg of					
Co-trimoxazole 240mg/5ml					
RHZE-150mg/75mg+400mg+275mg-					
Medroxyprogesterone Acetate 150mg/ml in 1 ml vial (Depo-Provera) Injection with 1 ml syringe and needle					
Stat pack of 20 or KHB of 50					
Oral Rehydration Salt (ORS)					
AZT+3TC+NVP 300+150+200mg					

Part IX: likert scale type questions for the assessment of inventory management challenges. The following questions are for the assessment of inventory management challenges, please give your answer by encircling the numbers provided after each questions. The numbers stand for the level of responses i.e. 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

S.	Questions	Level of responses				
		1	2	3	4	5
01	Automated recording system can improve your inventory management practice	1	2	3	4	5
02	The type of trainings has an impact on your inventory management practice	1	2	3	4	5
03	The type of personnel involved in inventory management practice does not matter, as far as they are certified from any discipline	1	2	3	4	5
04	Service years do have an impact on inventory management	1	2	3	4	5
05	Incentives to staffs can improve inventory management practice	1	2	3	4	5
06	Frequency of stock taking does not matter once the records are accurately filled	1	2	3	4	5
07	Regular supervision does have input for improvement of inventory management practice	1	2	3	4	5
08	Regular meeting for discussion on inventory management practice does have an influence on inventory management performance	1	2	3	4	5
09	Medicines stock out rate in your facility is a major	1	2	3	4	5

	problem					
10	Interruption of electric power supply affects your storage condition	1	2	3	4	5

Part X: likert scale type questions for the assessment of pre-transaction, transaction and post-transaction Customer Satisfaction. The following questions are for the assessment of Customer Satisfaction, please give your answer by encircling the numbers provided after each questions. The numbers stand for the level of responses i.e. 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

S.	Questions	Level of responses				
		1	2	3	4	5
	Pre-Transaction					
01	PFSA has written customer service policy	1	2	3	4	5
02	There is continues support from PFSA on IPLS (SCM)	1	2	3	4	5
03	LMIS formats are available to required quantity	1	2	3	4	5
04	Updated LMIS formats are availed timely	1	2	3	4	5
05	PFSA has clear organizational structure	1	2	3	4	5
06	PFSA has flexible system that can address customer needs	1	2	3	4	5
07	The staff who handle orders is accessible	1	2	3	4	5
	Transaction					
08	Products arrive in a good condition	1	2	3	4	5
09	Products arrive timely	1	2	3	4	5

10	We receive the quantity we ordered	1	2	3	4	5
11	We receive all the products we ordered	1	2	3	4	5
12	It is easy to check our order status information	1	2	3	4	5
	Post-transaction					
13	PFSA properly handles customer complaints	1	2	3	4	5
14	The invoicing procedure is clear and accurate	1	2	3	4	5
15	It has good product tracing/warranty	1	2	3	4	5
16	PFSA avails enough spares for medical equipment	1	2	3	4	5
17	It has clear and good Returns policy	1	2	3	4	5

Section XI: Wastage Rate

1. Total cost of pharmaceuticals procured in 2007 EC.
 - a. RDF = _____
 - b. Program = _____
2. Total cost of Pharmaceuticals expired in 2007 ECC
 - a. RDF = _____
 - b. Program = _____

Ask the person/people you interviewed if they want to ask you any questions. Comments or general observations on products management:

Thank the person/people who talked with you. Reiterate how they have helped the program achieve its objectives, and assure them that the results will be used to develop improvements in logistics system performance.

Notes/Comments

Questionnaire for Key Informant Interview

A. Supply chain network Structure

1. How do you describe the supply chain network structure of the branch?
2. Who are the stake holders (suppliers and customers)?
3. What is the role of each stake holder?
4. What other organizations are supporting the supply chain networks and how?
5. Describe the implementation of IPLS by the branch!

B. Relationship Management

1. How do you describe your branch's relationship with its suppliers and customers?
2. What efforts does the branch exert to improve and maintain good relationship with its suppliers and customers?
3. How do you describe the branch's relationship with supporting partners?
4. What are the roles and responsibilities of each stake holders in maintain good relationship?
5. What are the challenges of the branch related to relationship management?

C. Information sharing practice

1. Describe the information sharing practice of the branch with its suppliers and customers!
2. How frequent and what type of information do the branch share with its supplier and customers?
3. How is the information sharing practice of the branch among its core business processes?
4. What are the challenges of the branch related to information sharing practice?

D. ICT Implementation

1. How do you describe the level of ICT availability and use of the branch?
2. To what extent does the branch rely on using ICT for communication with stake holders and among its core business processes?
3. Describe the system (software) the branch is using, if any!
4. Briefly describe the functions and processes that are automated!
5. What are the main functions and outputs of the system?

6. What challenges did the branch face with regard to the system?

E. Forecasting

1. Describe the forecasting process of the branch! Who forecasts? When is forecasting done? How frequently is forecasting done?
2. What factors does the branch take into consideration in the preparation of forecasts?
3. What is the role of suppliers and customers in forecasting?

F. Inventory control Procedure

1. Describe what type of inventory control system is used and describe the system!
2. How does each level of the system calculate resupply quantity!
3. What are the challenges of the branch regarding inventory management?
4. Describe the implementation and usage level of LMIS by the branch!

G. Warehousing and Storage

1. Describe the branch's warehousing and storage practice!
2. What product categories are managed at the branch's warehouses?
3. How do you describe the capacity the branch's warehouse?
4. What is the branch's plan to manage program expansion?
5. What are the activities that are carried out at the warehouses?
6. What types of written procedures are used in the branch's warehouses?
7. Describe usage and keeping of records of the warehouses!
8. Describe notable problems faced in the past year!

H. Transport and Distribution

1. How are products delivered between each level of the system?
2. How are routes determined?
3. What written procedures does the branch use for transportation and distribution?
4. Describe the capacity of the organization in terms of capacity for transportation and distribution! (availability of vehicle, drivers, etc)
5. What are the main challenges in this regard?

I. Supply chain challenges

1. What are the branch's supply chain related challenges?
2. What are the challenges being faced in relation to supply and demand?
3. What are the challenges related to internal operations?
4. What are the challenges the branch is facing from external environment?