FACTORS AFFECTING MATERIALS HANDLING PRACTICES IN ETHIOPIAN PHARMACEUTICALS SUPPLY AGENCY OF JIMMA BRANCH, SOUTH WEST ETHIOPIA

A RESEARCH PAPER SUBMITTED TO DEPARTMENT OF MANAGEMENT (M.A) IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTERS DEGREE LOGISTICS AND TRANSPORTATION

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FACTORS AFFECTING MATERIALS HANDLING PRACTICES, A CASE STUDY ON ETHIOPIAN PHARMACEUTICALS SUPPLY AGENCY OF JIMMA BRANCH, SOUTH WEST ETHIOPIA

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Abstract

In today's fierce competitive global markets, customers are demanding adjustable lot sizes, shorter lead times, higher quality and flexibility; in short, they want it all. In order to stay competitive in the market, companies need to attain both customer satisfaction and cost reduction in all operations. The purpose of this study was to examine factors affecting material handling practices at Ethiopian Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma, Ethiopia. Implementing material handling systems poses the challenge of solving the silo type of operations usually found in large organizations such as EPFA. The study employed descriptive method with a cross sectional study design. The target populations were all professional staffs working under stock and distribution directorate and all of them were include in the study. Questionnaires are the main data collection instruments. The study was employed both quantitative and qualitative analysis techniques. Data was presented using tables, pie charts and bar graphs. Inferential statistics includes correlation and regression analysis. The collected data was analyzed SPSS and the expected out or results of this study was descriptive statistics, such as mean, frequency and standard-deviation and inferential statistics, regression analysis results. The finding of this research, in which, information technology, warehouse management and employee involvement have positive significant relationship with material handling practices in accordance with the results of different statistical tests conducted using SPSS version 20. In addition to this, information technology, warehouse management and employee involvement significantly explain the variations (69.5%) in material handling practices. It can be concluded from this study that material handling practices is significantly positively affected by information technology, warehouse management and employee involvement. Finally, further research is recommended to examine *factors affecting material handling practices at Ethiopian Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma*

Key words: Material handling, material flow, materials management, material handling management, practice

Declaration

I, the under signed, declare that this thesis entitled "*factors affecting material handling practices: A Case of Ethiopian Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma, Ethiopia*", is my original work and to the best of my knowledge has not been presented for a degree by any other person, and that all the sources of material used for the thesis have been duly acknowledged.

Declared by:

Umar A/Gojjam A/Bora

Date & Signature

Statement of Certification

This is to certify that the thesis carried out by Umar A/Gojjam A/Bora on the topic entitled: "*factors affecting material handling practices: A Case of Ethiopian Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma, Ethiopia*" is his original work and is suitable for submission for the award of Masters of Art Degree in Logistics and Transportation Management.

Advisor: MesfinMekonin

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Date & Signature

CO-Adviser :Abera Leta

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Date & Signature

Approved by the Examining Committee

This is to certify that the thesis carried out by Umar A/Gojjam A/Bora, entitled: "*factors affecting material handling practices: A Case of Ethiopian Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma, Ethiopia*" and submitted in partial fulfillment of the requirements of the Degree of Master of Art in Logistics and Transportation Managementcomplies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Advisor Signature:_____ Date:_____

Internal Examiner Signature: _____Date: _____

External Examiner Signature: _____ Date: _____

Chairperson Signature: _____ Date: _____

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List of Abbreviation

SCM	Supply chain management
RFID	Radio Frequency Identification
WMS	Warehouse Management Systems
AGVS	Automated Guided Vehicle System
MHS	Material Handling System
JIT.	Just-In-Time System
VIF	Variance inflation factor
PFSA	Pharmaceutical Fund and Supply Agency
SPSS	Statistical Package for Social Sciences
WMF	Warehouse Management Factors
IT	Information Technology

CHAPTER ONE : INTRODUCTION

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

1.1. Background Of The Study

Materials management is the scientific method of procuring, storing, safeguarding, transporting and utilizing materials on site in order to ensure economy and achieve waste minimization Materials management, (Adeagbo& Kunya, 2003).Material management is no doubt a serious business today. The reason is not far-fetched: organizations are achieving significant competitive advantage by the way they configure and manage their supply chain operations (Chase, Jacobs &Aquila no, 2004). Material management seeks to synchronize a firm‟s functions and those of its suppliers to match the flow of materials services and information with customers demand.

The definitions of logistics involve activities that ensure the necessary material is available at the right place and at the right time. Gourd in (2001) identifies some of these activities and states that a logistics system can consist of several different functional elements, such as storage and material handling, transportation, information processing, demand forecasting, production planning, and so forth. Further, Christopher (2005) introduces a total system viewpoint, which consists of different sub-systems that shares the same goal; satisfying the needs of the next customer in the supply chain. Each sub-system; material supply, production, and distribution monitor and control the material flow by various value-. Adding activities

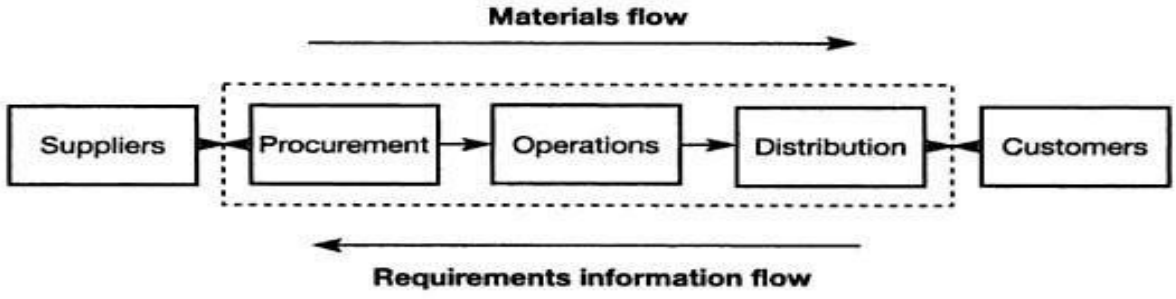

Figure1.1.Logistics management process (Christopher, 2005)

Material management is the key component of the broader Supply chain management (SCM) which encompasses the planning and management of all activities involving in the sourcing, procurement and other activities and all the logistics management activities and which also includes the coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers (Usaid/Deliver Project, 2011). Appropriate material management such as racking systems and material handling tools are needed to comply with these responsibilities and to complete both the information and material cycle (UDP, 2014). Inventory management is the art and science of maintaining stock levels of a given group of items incurring the least cost consistent with other relevant targets and objectives set by management (A, (1994)) It is important that managers organizations that deals with inventory, to have in mind, the objective of satisfying customer needs and keeping inventory costs at a minimum level Dobler (2000) argues that well and efficiently controlled effective material handling can contribute to the effective operation of the firm and hence the firm‟s overall profit. Proper Material Handling plays a big role in enabling other operations such as production, purchases, sales, marketing and financial management to be carried out smoothly. Basic challenge however is to determine the inventory level that works most effectively with the operating system or system existing within the organization.

Material handling practices plays a decisive role in the enhancement of efficiency and competitiveness of business enterprises Empirical evidence suggests that institutions throughout the world have adopted Material Handling systems into their operations and changes in the organizational policy would necessitate and result in changes of inventory management. In particular, institutions would seek for systems that wasenable them manage their supply chains more effectively and efficiently.

The challenges in logistics management can be categorized under strategic, tactical and operational levels, but the center of these challenges is the need of connecting suppliers with company‟s own processes, and then with customers in an efficient way in the current century, the Material Handling practices have changed significantly. In Ethiopia very few researches are conducted in the area of logistics and none of these researches are directly related to the practice of outsourcing logistics to material handling management practices around Ethiopian Pharmaceutical Fund Agency *(EPFA)*

Therefore, this study was to examine factors affecting material handling practices and the challenges they face in material handling practices, improve customer satisfaction and lower their cost and gain

greater profit. It also needs to fill the knowledge gap that occur in third party logistics service users by reviewing different literatures and assessing the best practice and found solution for the problems .

1.2. Organization of the Paper

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

1.3. Background of the organization

Pharmaceutical Fund and Supply Agency (PFSA) initiated by the Federal Ministry of Health (FMOH) that ensures an efficient and high-performing healthcare supply chain that ensures equitable access to affordable medicines for all Ethiopians. PFSA has responsibility of the strengthening of the pharmaceutical supply system including the procurement, and distribution of health commodities throughout Ethiopian regions through its branches and is established in 2007 by the proclamation number 553/2007. PFSA is mandated to avail affordable and quality pharmaceuticals sustainably to all public health facilities and ensure their rational use (Pharmaceutical Fund and Supply Agency, 2015).

Clustering EPSA branches is a new initiative intended to coordinate, collaborate and accelerate the existing supply chain through a strong team spirit. Since its inception, the cluster system has accomplished several activities. Western Cluster is one of the six clusters consisting of three branches: Jimma, Nekemet and Gambella. Jimma, Nekemet and Gambella hubs have served as key governmental structures for the implementation of IPLS and distribution of essential health commodities (RDF and Program) for public and private health facilities found in 17 zones, 2 Special woredas and 1 town administration serving around 8,591,795 people living in the catchment area. They also provide supervisory, material support and capacity building to health facilities for strengthening and enforcing

the implementation of IPLS and pharmacy service.EPSA, is legal entity established under the law of Federal Democratic Republic of Ethiopia Government to overcome the problems and assure uninterrupted supply of pharmaceuticals to the public at an affordable price. The Pharmaceuticals Fund and Supply Agency was established in September 2007 by Proclamation No. 553/2007 as part of Pharmaceutical Logistic Master Plan implementation with the following objectives:

- To enable public health institutions to supply quality assured essential pharmaceuticals at affordable prices in a sustainable manner to the public;
- To play a complementary role in developmental efforts for health service expansion and strengthening by ensuring enhanced and sustainable supply of pharmaceuticals;
- To create enabling conditions for enhancing the accumulation of funds in its revolving and cost recovery process and thereby ensure the realization of the objectives

1.4. Statement of the Problem

The determination of a material handling system involves both the selection of suitable material handling equipment and the assignment of material handling operations to each individual piece of equipment (Sujono&Lashkari, 2006). Hence, according to Sujono&Lashkari (2006) material handling system selection can be defined as the selection of material handling equipment to perform material handling operations within a working area considering all aspects of the products to be handled. The right choice of materials handling equipment and location of inventory is fundamental for the optimization of a company's performance capacity. Bowers ox and Closes (1996) state that a critical factor in positioning stocks in process is a balance between convenience and consolidation to create efficiencies when the stock flows along the value chain.

Regardless of the importance of materials handling equipment's practices in an organization and rapid development of technology in the vicinity of material handling, most organization still are not succeeding to effectively and efficiently utilize the potential invested in well-developed material handling activities in both equipments and process so as to avoid the associated problems in manual material handling. Though, the Material Handling across the pharmaceutical supply chain has showed significant improvement in the last five years in terms of establishing inventory control system and implementing the integrated pharmaceutical system, there are challenges which still remain to be addressed to provide adequate different Material Handling equipment at all levels (EPFA, 2015).Even though importance of selecting a suitable material handling has frequently been addressed in the

literature, most of the in-house material handling system design frameworks merely include only equipment selection processes and/or scheduling of the system. Due to lack of enough unavailability of material handling practices, problems can arise in a wide range of contexts, for example longer lead times, high amount of time spent on material handling and unnecessary movements can occur.

Very few papers in the literature present models and discuss material handling problems from a broad point of view that includes different aspects that can eliminate MHS‟s dilemma between high delivery performance or low buffer levels on the shop floor (Lins, 1998).According to Koumanakos (2008) Material Handling practices have come to be recognized as a vital problem area needing top priority.

There are no more researches in Ethiopia which examine factors affecting Material Handling practices with respect to health logistics. Therefore, study intends to fill these research gaps by identifying these factors material handling practices at PFSA

Basic Research questions

- ✓ What are the key materials handling equipment's are currently used by EPFA?
- ✓ How the material handling equipment's does contributing for the effectiveness of the organization?
- ✓ What factors affecting the material handling system in organization?
- ✓ Which dimensions/factors of material handling affecting more in the material handling practice of the organization?
- ✓ What are challenges faced the organization in adopting/practicing Material Handling?

1.5. Objective of the Study

1.5.1General Objective

The general objective of the study is to examine factors affecting pharmaceutical Material Handling practice, the case of Ethiopian Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma, Ethiopia

1.6.2. Specific Objectives

The Specific objectives of the study are:

- To identify the key Material Handling equipment currently used by EPFA ,
- To explain contribution of material handling equipment for the effectiveness of the EPFA;
- To examine factors affecting Material Handling System in Organization,
- To assess the dimensions of MH affecting more in the Material Handling Practices of EPFA,
- To identify the Challenges faced the organization in using MHE effectively,

1.6. Significance of study

The findings of this study may be of major significance to a number of stakeholders, including, hospital management, policy makers and planners, future researchers and the researcher.

- EPFA Management: The hospital management is likely to use the findings of this study to improve their management and support strategies for the material handling system
- The study also contributed on the limited knowledge in the area of material handling practice of pharmaceuticals in Ethiopia..
- Future Researchers: Future researchers would be used this study as a source of reference, and to be motivated by the same study to undertake further research on the material handling system subject area.
- Researcher: The study would lead to the award of an Executive Master's in Logistic and Transportation Management in Jimma University.

1.7. Scope of the Study

The scope of the study is to examine effects of Information Technology, Warehouse Management, and Employee involvement on Material Handling practice of PFSA. The study did not consider end to end pharmaceutical supply chain due to time and budgetary constraints

1.9. Operational Definition

Inventory: is the sum of all usable pharmaceutical products held in warehouse (MSH, 2012).

Inventory management: is the management of materials in motion and at rest. Material **Handling:** Providing the right amount of the right material in the right condition, at the right place, at the right time, in the right position and for the right cost by using the right method. (Chan, 2002).

Pharmaceuticals- any substance or mixture of substances used in the diagnosis, treatment, mitigation or prevention of a disease, and includes medical instruments and medical supplies (PFSA, 2015).

Put-away is the process that moves materials from the receiving area to the storage, replenishment, or pick areas in SKU(Smart turn Inc., 2014) and a product kept in stock is also called a stock keeping unit (SKU) (Faber, 2015).

Warehouse is a facility in the supply chain to consolidate products to reduce transportation cost, achieve economies of scale in manufacturing or in purchasing, provide value added processes and shorten response time for the customers (Rama, et al., 2012)

Warehouse management is about managing the physical movement of stock into, within, out of

a warehouse (SIAPS, 2014) .

In conclusion, this chapter reviews the factors affecting material handling practices with regard to the study objectives, problem statement, research questions, hypotheses, conceptual framework, significance of the study and study scope. The parameters of the study scope and limitations were also highlighted in this chapter. The next chapter provides an overview of the literature on factors affecting material handling practices.

CHAPTER TWO: LITERATUREREVIEW

2. INTRODUCTION

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

2.1. Theoretical Framework

In this chapter the theories that are relevant to fulfil purpose of this study was highlighted in order to provide a deeper understanding on the research field. Theoretical framework would investigate the problems/challenges and concepts/features related to MHSs.

2.2. Components of the Theoretical Framework

This sub section presents literature reviewed according to the study objectives which are Information Technology, Warehouses Management and Employee Involvement factors.

2.2.1. Information Technology factors

The rapid evolution of warehousing and material handling operations especially in the area of technological integration makes it imperative for organization to either adapt to modern trends of doing business or risk being crowded out. Technologies like Warehouse Management Systems (WMS), Radio Frequency Identification (RFID), and Automated Guided Vehicle System (AGVS) among others, have transformed and revolutionalised the landscape of warehousing and material handling across parts of globe. For instance the RFID uses radio waves to exchange data between a reader and electronic tags attached on objects. The data on the tags can be read and written to facilitate the identification and tracking of the objects in warehouses (Chen et. al., 2013). The RFID has attracted significant attention in the fields of logistics and supply chain because of its effectiveness and efficiency (Hunt et al., 2007) in tracking goods throughout the supply chain and also as one of the new technologies influencing the

operations in production, warehousing, and distribution sectors (Chen et. al., 2013). The AGVS is a material handling system that uses independently operated, selfpropelled vehicles guided along defined pathways in the facility floor. It is an automated material handling system, which moves along predefined and pre-programmed path along an aisle from one station to another. The main parts of an AGVS include structure; drive system, steering mechanism, power source (battery) and onboard computer for control (Aized, 2006).

Research has shown that, the WMS and RFID technology are integrated at three levels thus, data collection, data movement and data management (Tan, 2008). According to Tompkins & Smith (1998), a computerized WMS represents a tool that can facilitate the automation and optimization of material handling processes; improve inventory accuracy and facility usage; reduce labor costs; and enhance order-picking accuracy. Computer systems are placed in strategic locations to facilitate the movement of these goods from bulk storage area to the next activity areas of the warehouse. It is further justified to state that current developments in material handling operations are leading to automated systems that move faster, accommodate greater throughput, and require less maintenance (García, et. al., 2003).

2.2.2. Warehouses Management Factors

Warehousing forms an integral part of logistics and supply chain operations. Basically, a warehouse connotes an organization's planned space used for storage and material handling purposes (Tompkins, 2010). A typical look at the supply chain from the upstream through the focal firm to the downstream indicates that, storage takes place at the various tiers from production to distribution. Warehouse management is therefore essential in ensuring a balance between production and demand. Essentially, warehouses minimize the effects of supply chain inefficiencies, improve logistics accuracy and inventory management, and allow product accumulation, consolidation, and customization. The cost of warehousing should be commensurate with the contribution of warehousing to the overall logistics performance. Although many organizations have examined the possibilities of practicing the Just-in-Time philosophy, and others looking at how effective cross-docking techniques could invalidate the significance of warehousing. The extant literature has shown that it would be very expensive, if not impossible to completely do away with warehouses. Worthy to note is the fact that, warehousing and material handling operations work hand-in-hand. The objective of material handling is to ensure efficient products and material movement, protection, storage and control in the warehouse. The concept of material handling has become important with the advent of technology integration into warehouse

operations. Subsequently, some organizations operate warehouses with advanced material handling equipment. These material handling equipment increase productivity and accuracy, compared to the completely manual operations (Blanchard, 2010). Warehousing and material handling operations has seen massive integration of technology into their operations, however, not all jurisdictions have benefitted from these technological outlays or injections.

2.2.3. Employee Involvement factors

The success of implementing a new concept without involving related employees is almost equal to zero (Baudin, 2004). Therefore, employee-involvement and training for the achievement of an effective and efficient in-house material handling system is essential (Mulcahy, 1998). Baudin (2004) underlines that human are the key component for successful implementation, start-up, and continued operation of an in-house transportation concept or equipment. For this reason, Mulcahy (1999) claims that it is vital to increase training and motivating activities related to in-house material transportation management and employees. However, employee involvement and needs should be addressed in earlier stages of design in order the get the best results from system implementation. On the other hand, it is crucial not to forget management involvement both in functional and physical levels of implementation (Motiwalla& Thompson, 2009).

Hassan (2010) states that human and management are essential factors for MHS designs. The term human refers to employees who will operate the system; while on the other hand, management refers how we manage the MHS according to time schedules, constraints and principles, and so on. While designing or improving a material handling system not only physical elements, but also supportive aspects such as employee involvement and compatibility with the manufacturing system are essential, since they will affect success of the design dramatically. Below several concepts related to issue will be mentioned.

2.3. Material Handling Equipment

Fixed path equipment's:- which move in a fixed path. Conveyors, monorail devices, chutes and pulley drive equipment‟s belong to this category. A slight variation in this category is provided by the overhead crane, which though restricted, can move materials in any manner within a restricted area by virtue of its design. Overhead cranes have a very good range in terms of hauling tonnage and are used for handling bulky materials, stacking and at times palletizing.

Variable path equipment's:-have no restrictions in the direction of movement although their size is a factor to be given due consideration trucks, forklifts mobile cranes and industrial tractors belong to this category. Forklifts are available in many ranges, they are maneuverable and various attachments are provided to increase their versatility. Availability of staging facilities and handling equipment should be considered .If the primary mode is truck/trailer, there must be ample outdoor storage facilities and there turning room for this material handling equipment.

Availability of staging facilities and handling equipment should be considered .If the primary mode is truck/trailer, there must be ample outdoor storage facilities and there turning room for this material handling equipment. Pallets, shelves, racks, storage cabinets, bins and warehouses are essentials for material storage. Use of the above equipment enhances effective storage and material handling hence reducing cost, damage of materials thus increasing profitability of a firm. CIPS (2011).

2.4. Equipment Utilization Ratio

Equipment utilization ratio is an important indicator for judging the materials handling system. This ratio can be computed and compared with similar firms or in the same over a period of time. In order to know the total effort needed for moving materials, it may be necessary to compute materials handling labour (MHL) ratio.

This ratio is calculated as under: $MHL = \frac{\text{Personnel assigned to materials handling}}{\text{Total operating work force}}$

In order to ascertain whether the handling system delivers materials work center with maximum efficiency is, it is desirable to compute direct labour handling loss ratio.

The ratio is: $DLHL = \frac{\text{Materials handling time lost of labour}}{\text{Total direct labour time}}$

In modern Material Handling literature, numerous transportation concepts are presented (Mulcahy, 1998). However, in this thesis regarding to delimitations and suitability to case company‟s environment, only unit-load, above-floor, horizontal movement transportation concepts will be elaborated.

2.5. Material Handling System Concepts

In literature several researchers approach MHS design issues from different aspects. Tompkins *et al.* (1996) clarify the ideal Material Handling System from three different perspectives; theoretical, ultimate and technologically workable. The theoretical ideal MHS is a perfect system with zero cost, quality defects, safety hazards, wasted space and no management inefficiency. On the other hand, an ultimate ideal system is probably achievable at some point in future, but Tompkins *et al.* (1996) mark that lack of available technology is the reason that the system is not achievable at the present time. The technologically workable ideal system is a system that the required technology is available; however, some factors such as cost might be an obstacle in the way of installing some components. In the end, Tomkins *et al.* (1996) recommend companies to implement a cost effective system that is able to work at the present time without any obstacle for its successful implementation. Figure below shows the ideal systems approach (Nadler, 1965). According to Chittratanawat and Noble (1999), material handling systems are fundamental factors for any problem related to manufacturing such as inventory levels, scheduling and production planning, delivery performance. Hence, MHS should be the first place to investigate for reducing operational costs and improving production systems. Typical factors that can affect design of MHSs are cost, distance and material flow; however; distance and material flow are key elements for pre-design, while cost is taken into consideration during selecting between design options (Chittratanawat& Noble, 1999).

2.6. Problems and Challenges related to Material Handling Systems

Tompkins et al. (1996) emphasize the importance of understanding the requirements of a MHS before coming up with different solutions to improve it. To be able to find out what can be the potential problems or which factors can cause inefficiency in an internal MHS, it is essential to know how a well-functioning internal MHS operates and what sorts of internal and external factors can have an impact on the system. Tompkins et al. (1996) shed lights on that MHS is much more than only handlingmaterials. It is a comprehensive concept that involves the movement, storage, control, and protection of material with the aim of providing time and place utility. However, there is no unique definition that can cover all the features and activities in an internal MHS. Several researchers have been defined the concept of internal MHS from their point of view. The following represents some of the definitions of MHS:

For Magad and Amos (1995) in-house MHS is the art and science of moving, storing, protecting and controlling material. Internal MHS is about providing the right amount of material, at the right time, at the right place and with the right method(s) (Kulwiec, 1985).

Mattsson (2012) defines in-plant MHS as a system that has material and immaterial exchanges inside a factory where different departments and features are involved and working together to create value for the end-users. He points out that despite suppliers and customers are not involved in an in-house MHS, they do belong to the system's environment and can have huge impacts on its effectiveness. Hassan (2006) denotes that without a well-designed MHS production could encounter delays, production time and cost could increase owing to unnecessary movement of products within the facility, and also products could get damaged or contaminated. On the other hand, a well-designed MHS would improve manufacturing and logistics operations, enhance delivery performance and quality on the shop floor, and also reduce work-in-progress inventories

Table 2.1: Possible Problems and Challenges related to Material Handling Systems

Problems / Challenges	References
Delivey Precision - by eliminating unnecessary movements of products within the facility, products can be delivered at the right time, at the right place and in the right sequence - insufficient MH would cause production delays and increase production times	Mulhacy (1998), Hassan (2006), and Tompkins et al. (1996)
Inventory Levels Holding the right amount of material both in manufacturing and distribution Just-in-time inventory management Decreased work-in-progress material	Hassan (2006) and Tompkins et al. (1996)
Operation Costs - to ensure possibly lowest operation costs the system should be designed in a way that it can enhance revenue rather than be a cost contributor	Mulhacy (1998), Hassan (2006), and Tompkins et al. (1996)
Delivery Quality - quality on the shop floor can be achieved by receiving right material, in right condition, and with right methods	Hassan (2006) and Tompkins et al. (1996)

Information Flow - providing proper material and information flow accurate material identification systems real time information	Mulhacy (1998)
Safety minimize employee injury Protect products from getting damaged or being contaminated	Mulhacy (1998) and Hassan (2006)

2.7. Integrating Technology into Warehousing and Material Handling Operations

The rapid evolution of warehousing and material handling operations especially in the area of technological integration makes it imperative for organizations to either adapt to modern trends of doing business or risk being crowded out. Technologies like Warehouse Management Systems (WMS), Radio Frequency Identification (RFID), and Automated Guided Vehicle System (AGVS) among others, have transformed and revolutionalised the landscape of warehousing and material handling across parts of globe. For instance the RFID uses radio waves to exchange data between a reader and electronic tags attached on objects. The data on the tags can be read and written to facilitate the identification and tracking of the objects in warehouses (Chen et. al., 2013). The RFID has attracted significant attention in the fields of logistics and supply chain because of its effectiveness and efficiency (Hunt et al., 2007) in tracking goods throughout the supply chain and also as one of the new technologies influencing the operations in production, warehousing, and distribution sectors (Chen et. al., 2013).

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Research has shown that, the WMS and RFID technology are integrated at three levels thus, data collection, data movement and data management (Tan, 2008). According to Tompkins & Smith (1998), a computerized WMS represents a tool that can facilitate the automation and optimization of material handling processes; improve inventory accuracy and facility usage; reduce labor costs; and enhance order-picking accuracy. A WMS is therefore a key part of logistics and supply chains as it aims at controlling the movement and storage of materials within warehouses. The system also directs and optimizes stock put away based on real-time information about the status of bin utilization (Arora,

2009). The objective of a WMS is therefore to provide a set of computerized procedures to handle the receipt of stock and returns into a warehouse facility; model and manage the logical representation of the physical storage facilities; manage the stock within the facility and enable a seamless link to order processing and logistics management (Arora, 2009). It is significant to acknowledge that, an automated warehouse forms an integral part of sustainable warehousing because it often reduces operational costs.

A thoughtfully planned automated system leaves little or no wastes. All types of goods maintained in a warehouse or distribution center are carried out through automation systems with the assistance of conveyors and overhead pulley systems (Garcia et. al., 2003). Computer systems are placed in strategic locations to facilitate the movement of these goods from bulk storage area to the next activity areas of the warehouse. It is further justified to state that current developments in material handling operations are leading to automated systems that move faster, accommodate greater throughput, and require less maintenance (García, et. al., 2003).

2.8. Warehousing and Material Handling Operations in Perspective

Warehousing has become an important activity of the supply chain principally for the reason that, it is often impossible for suppliers to effectively meet the lead times required by customers, hence these customers need to be served from inventory rather than from direct order (Harrison and van Hoek, 2005). Additionally, it is prudent to hold strategic inventory at designated points in the supply chain to separate lean manufacturing activities from the downstream agile response to volatile market places (Christopher and Towill, 2001). Alternatively, supply and distribution networks may be of sufficient complexity that, there may be the need for goods to be consolidated at inventory holding points so that multiproduct orders for customers can be delivered together (Higginson and Bookbinder, 2005). The operations of such warehouses are critical to the provision of high customer service levels and they need to achieve this reliably within high tolerances of speed, accuracy and lack of damage (Baker, 2004). With this critical impact on customer service levels and logistics costs, as well as the degree of complexity involved, it is thus imperative to the success of organizations that warehouses are designed to function cost effectively (Rouwenhorst et al., 2000).

It is further important to assert that, because warehousing and material handling work handin-hand, it is imperative to properly and appropriately handle material designated for future use to ensure that they efficiently support operations for which they are meant to execute (Childe, 2003).This means that without a well-designed and functional material handling system, it could encounter delays; production

times could increase; products could get damaged or contaminated; and cost of movement within facilities could increase, thereby increasing holding cost. On the other hand, a well thought-out and planned material handling system could help organization and logistics facilities improve their performance, enhance inventory‟ quality, and reduce operating costs (Hassan, 2006).

Indeed, in order to promote effective and efficient material handling operations, the Material Handling Institute (MHI, 2000), has proposed what has become known as the "Ten Material Handling Principles".

2.9. Manual and Mechanical Material Handling Operations

According to the University of California's DAVIS Safety Services (2015), material handling is classified as manual when it involves the use of absolute physical labour in lifting, lowering, and carrying objects. It is important to indicate that, in manual handling if ergonomic principles are ignored, there is a high probability of strain on the muscles, joints, and disks in the back which could eventually lead to injury. For this reason, it is advised that objects that are too heavy or bulky for safe manual handling by employees should be lifted and moved by mechanical lifting devices. Throughout that process, operators with various manufacturing tasks routinely lift/lower, push/pull and carry objects, where risk factors sometimes leading to musculoskeletal par.ccsenet.org Public Administration Research Vol. 7, No. 1; 2018 disorders (MSDs) may occur (Batish& Singh, 2008). It is imperative to stress that, although technology has advanced in materials handling techniques, manual handling of materials have remained essentially the same.

Most jobs require some manual handling, but about 10 per cent require extensive manual material handling (Texas Department of Insurance, Division of Workers‟ Compensation (TDI, DWC, 2009). While emphasizing that manual material handling is required in most operations, it is significant to stress that sometimes a material handling operations could be executed either completely manual or automated. The level of mechanization is classified with respect to the degree of practitioner involvement and computer applications in operating equipment. With regards to mechanized operations, mechanical means instead of physical effort is used for driving the equipment. Trucks, conveyors, and cranes fall into this level.

Accordingly, operators are needed for operating the equipment as opposed to using physical strength. As the degree of mechanization increases, there is system complexity, which results in improved efficiency but increases design and operating costs (Groover, 2007). Mechanized material-handling equipment is

mostly used by organizations to attain higher efficiency and improved productivity at a relatively lower cost. Although mechanical handling creates a new set of hazards, the net result is fewer injuries, lower workers‟ compensation expenses, and a more productive workplace (TDI, DWC, 2009).

2.10. Elements and Characteristics of Material Handling System

Materials handling study requires that several elements are considered. The first is a handling system project, which covers activities of sequencing, velocity, layout and routing (Groover, 2001). In order to complete the analysis, Groover (2001) recommends analyzing the material itself (or object) to be transported. Therefore, it suggests the classification of Muther and Hagan (apudGroover, 2001), which considers: (i) physical state (solid, liquid, gas); (ii) size (volume, length, width, height); (iii) weight; (iv) condition (hot, cold, dry, dirty, sticky, adhesive); (v) risk of damage (weak or strong); and (vi) safety hazards (explosive, flammable, toxic, corrosive, etc.

2.11. Inventory Management Techniques

Inventory control techniques can bring about substantial savings in material costs, bust these savings are a relatively small percentage when compared to the savings that can accrue through economical and efficient use of materials. Every effort must therefore be made at all levels in the organization to utilize supplies in the most conscientious manner avoiding any form of wastage. Particulars care should be taken to ensure that there is no over-preparation of food, chemicals, etc. which have a limited shelf- life. Inventory management relates to the tracking and management of commodities which includes the monitoring of commodities moved into and out of stockroom locations and the reconciling of the inventory balances.

Some of the techniques used in managing inventories were discussed below:

2.11.1 ABC ANALYSIS

ABC examination is an essential action method that follows the Pareto Principle Concerning an organization’s arrangement of stock. This technique assigns items to three groups according to the relative impact or values of the items that makes up the group. Those thought to have the greatest impact, or value, for example, constituted the „A‟ group, while those items thought to have a lesser impact or value were contained in the „B „and „C‟ groups respectively (Coyle, 2003) The ABC stock control technique relies on that the decision a little bundle of the things may usually address the weight of money estimation of the total stock. It is used as a part of the era method, while a tremendous number

of things may happen from a little part of the money estimation of stores. Accordingly, to manage stock control high regard things are more soundly controlled than Low regard things.

The ABC approach ranks using the following criteria: A things represent 70–80% of the firm‟s annual Consumption approximation and just 10–20% of aggregate stocked items. B things represent 15–25% of annual use esteem and 30% of aggregate the stock, and C things characterize 5%of the annual application of esteem and half of total stocked items. The purpose of this classification is to ensure that purchasing staff use resources to maximum efficiency by concentrating on those items that have the greatest potential savings. Selective control will be more effective than an approach that treats all items identically (Assefa F, 2011)3).

2.11.2. Economic Order Quantity (EOQ)

According to (Bowersox, .(2002).)), the inventory management needs to be organized in a logical way sothattheorganizationcanbeabletoknowwhentoorderandhowmuchtoorder.This must be attained through calculating the Economic Order Quantity (EOQ). Monetary request engages correlation to arrange their stock re-establishment on an ideal premise For instance, the arrangement can be scheduled to happen from month to month, quarterly, half yearly, or yearly. By so doing, enablesfirmstohaveinsignificantlimitcostsorzeroinsidetheircirculation focuses. Along these lines, as associations attempt to enhance the stock administration, the EOQ and Re-Order Point (ROP) are necessary instruments that associations can utilize. (Amin, (2007),)) defines Economic Order Quantity as an accounting formula that determines the point at which the combination of order costs and inventory costs are the least. Lysons and Gillingham (2003), also defines Economic Order Quantity as the optimal ordering quantity for an item of stock that minimizes cost.

According to (Lysons, (2003))to calculate the Economic Order Quantity, a mathematical model of reality must be constructed. All mathematical models make assumptions that simplify reality. The model is valid only when the assumptions are true or nearly true. When an assumption is modified or deleted, a new model must be constructed. Economic Order Quantity approaches have proven to be effective inventory management technique when the demand and lead time are relatively stable, as well as when significant inconsistency and uncertainty exist

2.11.3. Just-In-Time System (JIT)

(Shapiro, (2009).)Defined Just-In-Time (JIT) System as an inventory control system that attempts to reduce inventory levels by coordinating demand and supply by the point where the desired item arrives just in time for use. The Just-In-Time System suggests that inventories should be available when an organization needs them, not any earlier, nor any later. Ideally, products should arrive exactly when a firm needs it, with no tolerance for late or early deliveries. (Lysons, (2003))Also defined Just-In-Time System as an inventory control philosophy whose goal is to maintain first enough material in just the right place at just the right time to make just the right product. (Hutchins, (2008))Characterizes JIT as a process that is prepared for moment response to the request without the necessity for any over stocking, either in the desire of the application being approaching or as a Concern of improvident characteristics all the while

2.12. Summary of Empirical Literature and Major Findings and Knowledge Gaps

Summary of empirical literature and Scholars Studies and Major Findings and Knowledge Gaps

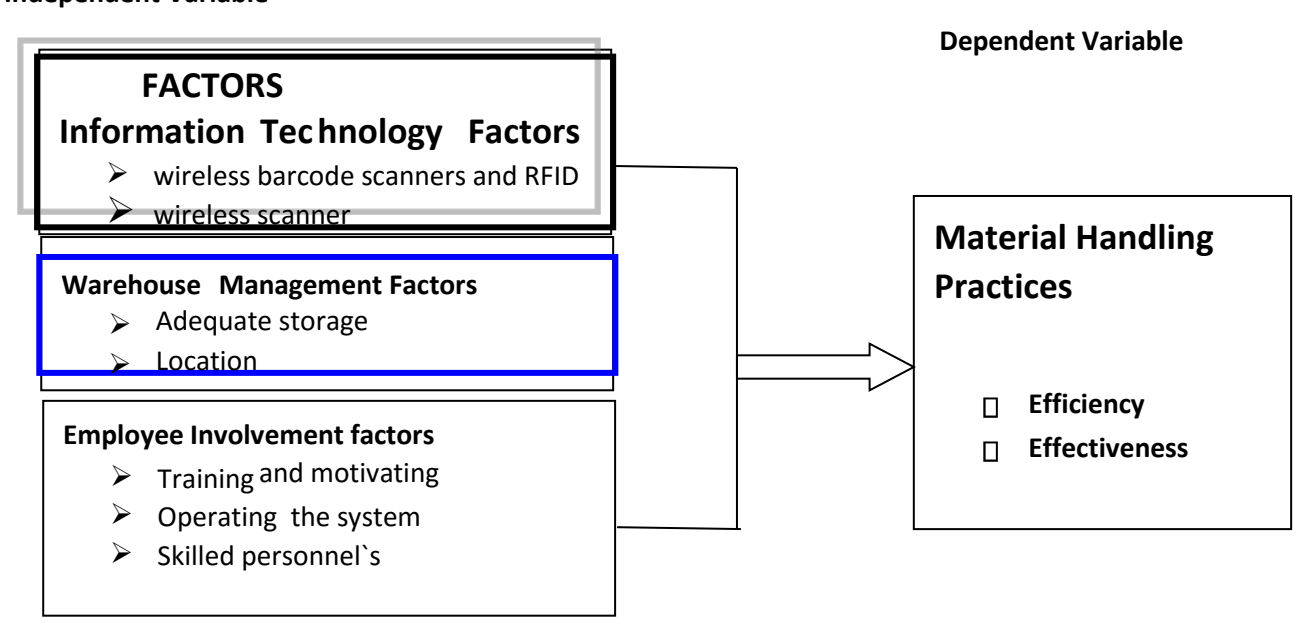
Summary of the Literature Review and Knowledge Gaps

Scholars	Study	Major Findings	Knowledge Gaps
Hassan‟s (2010)	MHS design framework. Chosen features, in terms of fulfilling purpose	Categorized under three main pillars; design principles & physical elements, information & software, and human & management.	the study did not address Material handling practices
Lornum et al, (2007)	warehouse is an important building in any company	industries to store their materials until the market demands them, making it a business necessity	The study did not focus on warehouse Management practices.
Tompkins et al. (1996)	the importance of understanding the requirements of a MHS	solutions to potential problems or which factors can cause inefficiency in an internal MHS	The study was limited to Inefficiency only not on in effectiveness
Hassan (2006	a well-designed MHS would improve manufacturing and logistics operations	enhance delivery performance and quality on the shop floor, and also reduce work-in-progress inventories	The study was Limited on material handling in manufacturing only

ersity of California‟s DAVIS Safety Services (2015),	Material handling is classified as manual when it involves the use of absolute physical labour in lifting, lowering, and carrying objects.	There is a high probability of strain on the muscles, joints, and disks in the back which could eventually lead to injury.	The study focused only on manual material handling

2.13. Conceptual Framework

Figure 1: shows the conceptual framework adopted for the study. This is the scheme of concept that was operationalized in order to achieve the set objectives. It is the hypothesized model identifying the concepts under the study and their relationships.



A conceptual framework illustrating the relationship between the study variables

Source: Adopted from Source: Adopted from Armstrong (2006) and modified by the researcher

This conceptual framework in figure 1 explains the relationship between the independent variable (factors affecting material handling practices in EPFA) and the dependent variable (Material Handling practices Performance). The factors here will be Information Technology, Warehouse Management and Employee Involvement.

By implementing *Information technologies* not only financial gains, but also efficiency gains can be achieved through improved Material Handling system and visibility, higher speeds, greater accuracy and

better customer service (Drum, 2009).Similar to wireless scanners, Radio Frequency Identification(RFID) tags are additional tools in terms of fostering information link within MHS (Knill, 1996). The major benefits of implementing wireless communication technology in three main categories, functional benefits through whole organization, provided visibility and increased control through the whole chain, and the possibility of restructuring the information systems infrastructure.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3. INTRODUCTION

This Chapter presents and describes the approaches and techniques the researcher was to collect data and investigate the research problem. They include the research design, study population, sample size and selection, sampling techniques and procedure, data collection methods, data collection instruments, data quality control (validity and reliability), procedure of data collection, data analysis and measurement of variables.

3.1. Research Design

An Explanatory research design was adopted for the proposed study. It entails collecting data from a cross section of respondents at a single point in time. Kothari (2004) states that cross sectional survey; contain multiple wealth of details, totality and variation which allows the author to understand fully how and where intervention may have worked collectively with correlated general effects. The descriptive cross sectional survey designs validate emerging constructs and proposition in the data set; guiding the study of various units within the identified case by underlining the mechanism by which an incident is brought to being (Kothari, 2004). Across sectional survey contributes significantly to a researcher's own learning process by shaping the skills needed to do a good research. Though proof may be hard to come by owing to absence of hard theory, learning is certainly possible (Kothari, 2004). The above design is usually the simplest and least costly alternative.

The study was also applying both quantitative and qualitative approaches. Creswell (2009) notes that quantitative methods are more objective and help to investigate the relationships between the identified variables. This study was apply qualitative approaches which was involved in depth probe and application of subjectively interpreted data. As pointed out by Kothari (2004) qualitative researchers aim to gather an in-depth understanding of human behavior and the reasons that govern such behavior. The quantitative and qualitative approaches were adopted in sampling, collection of data, data quality control and in data analysis. Triangulation was adopted for purposes of getting quality data. Triangulation means using more than one method to collect data on the same topic (Somekh& Lewin, 2005). Elsewhere triangulation is defined as a way of assuring the validity of research through the use of a variety of methods to collect data on the same topic, which involves different types of samples as well as

methods of data collection (Groves, Fowler, Couper, Lepkowski, Singer, Tourangeau&2009).However, the purpose of triangulation is not limited to cross validation of data but also to capture different dimensions of the same phenomenon (Kothari, 2004).

3.2. Study Population

The population under study was 132 comprising of all members of the Ethiopian Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma, Ethiopia it was organized in three technical process (forecasting and capacity building ,procurement, storage and distribution) and three support process (fund management , management information system, HRM and general service)

3.3. Sample Size and Determination

Good research requires an understanding of the statistics that drive the range of sample size decisions you need to make. Before we can calculate a sample size, you need to determine a few things about the target population and the sample you need: Population Size, the confidence level and margin of error (precision of error).The most commonly used and recommended confident level is 95%, and 0.5 margin of error. This numbers are the most tolerant number and ensure that our sample was best representative (Kotari, 2004).In order to determine sample size, this study use Kothari (2004) formula which based on the precision rate and confidence level. For finite population, Sample size when estimating a percentage or proportion is as in the following;

$$n = \frac{Z^2 pqN}{e^2(N-1)+Z^2 pq} \quad \text{.....(3.1)}$$

Where, p = proportion of success, q = proportion of fail,n = the required number sample size, 'i" is the number of Department, z = confidence level, e = Standard error, N= total population

$$\mathrm{n} = \frac{\mathrm{Z^2 pqN}}{\mathrm{e^2(N-1)+Z^2 pq}} \quad \text{..... (3.1)}$$

Whereas, number "n" is the number of required sample size for this study. But, in order to obtain representative sample, we need to apply proportional sampling for each Departmental the following equation (3.1);

$$\mathrm{n_i} = \frac{\mathrm{N_i}}{\mathrm{N}} * \mathrm{n} \quad \text{..... (3.2)}$$

As shown in table3.1, the number of required sample size for this study, n=90, which computed by the above formula (3.1).Given that p = 75%, q = 25%, z = 1.96, e = 5%,

N=132; the required number of sample size is determined as;

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq} = \frac{1.96^2(0.75 * .25) * 132}{0.05^2(132-1) + 1.96^2(0.75 * .25)} = 90$$

Table 3.1 Sampling Determination

Workers Population	(N)	Sample (n)	Sample size percentage
Fund management	50	37	4 0 %
MIS .	20	15	16 %
HRM	30	20	22%
General Service	32	20	22%
Total	132	90	100 %

3.4. Stratified Sampling and Procedure

Probability sampling, or random sampling, is a sampling technique in which the probability of getting any particular sample may be calculated (Ragin, 2007). The advantage of probability sampling is its lower cost compared to non-probability sampling. Systematic with proportional sampling was adopted in sampling Heads of Department representatives within EPFA. According to Creswell (2009), simple random sampling ensures that every member has an equal chance of being recruited into the sample. A sample frame was constructed and then the members were randomly sampled.

3.5. Data Collection Methods

3.5.1. Questionnaire Survey

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Although they are often designed for statistical analysis of the responses, this is not always the case. The researcher was use the questionnaire survey because it is practical, large amounts of information can be collected, questionnaires data can easily be quantified, it is also a cheap way of collecting data, a large group of respondents is covered within a short time, it also allows in-depth research, to gain firsthand information and more experience over a short period of time (Kothari, 2004). The questionnaire was designed in a way that would help the researcher get information on success factors for material handling practices.

3.5.2. Interviews

According to Kothari (2004), interviews describe the life events and experiences of the respondents with respect to analysis of the significance of the portrayed phenomena. As Groves, Fowler, Couper, Lepkowski, Singer &Tourangeau (2009) argue, interviews are basically the correct technique to use when exploring sensitive topics, to create conducive environment for respondent to take part. This method constituted the fundamental part of the data collection for this study where two types of interviews were used. These were consist of; face-to-face interviews and telephone interviews. Both structured interview and semi structured interviews was follow the why and how questions. Interviews were used because they have the advantage of ensuring probing for more information, clarification and capturing facial expression of the interviewees (Somekh and Lewin, 2005). In addition they also give an opportunity to the researcher to revisit some of the issues that have been an oversight in other instruments and yet they are considered vital for the study. The researcher was used the interviews to explore issues on the study variables.

3.5.3. Documentary Review

In the secondary analysis of qualitative data, good documentation cannot be underestimated as it provides necessary background and much needed context both of which make re-use a more worthwhile and systematic endeavor (Kothari, 2004). Secondary data is obtained through the use of published and unpublished documents (Jonker and Pennink, 2010). According to Ragin (2011), secondary data can be helpful in the research design of primary research and can provide a baseline with which the collected

primary data results can be compared to other methods. The issues that were explored were as indicated in the study objectives and as laid down in the independent and dependent variables of the study.

3.6. Validity and Reliability

A data quality control technique was ensured that data collected is valid and reliable; the instruments were first tested to ensure validity and reliability.

3.6.1. Validity

Validity refers to the truthfulness of findings or the extent to which the instrument is relevant in measuring what it is supposed to measure (Earl-Babbie, 2013). The validity of the instrument quantitatively was established using the Content Validity Index (CVI). This was involved the expert scoring of the relevance of the questions in the instrument in relation to the study variables. The instrument that was yield a CVI above 0.7 was within the accepted ranges. Index (CVI) was computed using the formula below:

$$CVI = \frac{\text{Total number of items}}{\text{Number of relevant items}} \quad X\ 100$$

To establish validity qualitatively , the instruments were given to the experts (supervisor) to evaluate the relevance of each item in the instrument to the objectives and rate each item on the scale of very relevant (4), quite relevant (3), somewhat relevant (2), and not relevant (1).

3.6.2. Reliability

Qualitatively, the reliability of the instruments was established through a pilot test of the questionnaire to ensure consistency and dependability and its ability to tap data that would answer the objectives of the study. The results was subjected to a reliability analysis

(Creswell, 2003). Quantitatively, reliability was established using the Cronbach's Alpha Reliability Coefficient test. Upon performing the test, if the value is 0.7 and above, the items in the instrument was regarded reliable. Based on Cronbach's Alpha Coefficient, the scales for the variables were reliable. In the case of psychometric tests, must fall within the range of 0.7 above for the test to be reliable (Bill, 2011).

Table 3.1: Reliability test

	No of items	Corrected Item-Total Correlation	Cronbach's Alpha
Information Technology Factors	13	.854	.942
Warehouse Management factors	14	.898	.929
Employee Involvement Factors	14	.939	.916
Materials handling practices	5	.829	.950

Source, Survey, 2020

Reliability analysis was subsequently done using Cronbach's Alpha which measures the internal consistency by establishing if certain item within a scale measures the same construct. Cronbach's alpha was calculated by application of SPSS for reliability analysis (see table above). An alpha value of 0.7 or above will be considered reliable.

The results of data analysis showed that the survey indicators, which were adopted from mature measurement scales, have good content validity. The Cronbach's α used in this study for the dimensions of each construct is higher than the critical value of 0.7, as proposed by (Nunnally, 1978), indicating that the internal consistency of the scale used in this research is good. Since the Sig. (2-tailed) value < 0.05, then the item is valid and if Sig. > 0.05alpha, the item is invalid. (Note that the Sig. (2-tailed) value also known as the *p-value, is in most valid circumstances take the "*0.000" value)

3.7. Data collection Procedure

The researcher through proper channels was ask for an introductory letter from Jimma University which he was use for purposes of introduction before the participants when collecting data from the field. The researcher wasensured confidentiality of the survey sheets since the identities are not important. Participants receiving the questionnaire were given time to respond and the researcher was collect the survey instruments on the next day. Participants for the interviews werebe provided with an appointment during which the researcher was conduct the interview in a private environment, a tape recorder was used to aid memory. The researcher was not offered any incentives for participating in the research.

3.8. Data Analysis

The researcher was used both qualitative and quantitative methods of data analysis. Data Analysis follows an inductive content analysis that permits identification of themes and patterns of explicit word used in raw data and literature reviews (Ragin, 2007).

3.8.1. Quantitative Data Analysis

Data was sorted using the Statistical Package for Social Sciences (SPSS) method. Both Excel and SPSS have a similar feel, with pull-down menus, a host of built-in statistical functions and spreadsheet format for easy data entry. SPSS has faster and easier basic function access, it has awider variety of graphs and charts and it is easier to find statistical tests (Junker and Pennink,2010). The analysis was relying on both descriptive and inferential statistics. Quantitative data got from the questionnaires was computed into frequency counts and percentage. The descriptive statistics was included use of frequency tables, mean, and standard deviation. The researcher was adopting multivariate analysis techniques in analyzing his data. Multivariate analysis is the simplest form of quantitative (statistical) analysis. In this case, Pearson Correlation coefficient and regression was used to analyze and test the hypotheses of the study. In addition to frequency distribution, tables, mean, standard deviation and other measures of central tendency was used in data analysis

3.8.2. Qualitative data analysis

To grasp the meaning of all qualitative data produced by the interviews and document analysis, explanation building through content analysis as an interpretive technique was adopted. The case content analysis is informed by deducing the inference of contextual data holding on to naturalistic patterns. These are; direct content analysis, conventional and summative content analysis (Earl- Babbie, 2013). The proposed study was take on a summative content analysis whose basis was to understand why certain opinions are held. Summative content analysis describes studied keywords to construct meaning to the themes being studied in a broader context. All primary data was thus being structured through formation of categories and examining the theories fully to understand the variables of the study (Creswell, 2009). It is through this lenses that meaningful concepts and themes informed by the research questions was be extracted to generate credibility to raw data to meaningful processed data and draw conclusion.

3.9. Measurement of Variables

The independent variable and the dependent variable was measured on a five point Likert type scale (1-strongly disagree, 2-Disagree, 3-Not sure, 4- Agree and 5-Strongly agree). The choice of this measurement is that each point on the scale carries a numerical score which is used to measure the respondents‟ attitude and it is the most frequently used summated scale in the study of social attitude. According to Bill (2011), the Likert scale is able to measure perception, attitudes, values and behaviors of individuals towards a given phenomenon.

3.10. Ethical Considerations

Honesty: There are several reasons why it is important to adhere to ethical norms in research. First, norms promote the aims of research, such as knowledge, truth, and avoidance of error. For example, prohibitions against fabricating, falsifying, or misrepresenting research data promote the truth and avoid error. Second, since research often involves a great deal of cooperation and coordination among many different people in different disciplines and institutions, ethical standards promote the values that are essential to collaborative work, such as trust, accountability, mutual respect, and fairness (Amin, 2005). To avoid plagiarism, works of different authors was acknowledged whenever they are used.

Informed Consent: The ethics framework is essential as it entails the voluntary informed consent of the participants. This requires giving the participants adequate information about what the study was involve and an assurance that their consent to participate would be free and voluntary rather than coerced. According to Sekaran (2003) participants informed consent may be obtained either through a letter or form that clearly specifies what the research involves, includes clearly laid down procedures the participants can expect to follow and explain the ways in which their confidentiality was assured. In this case, a letter was obtained for this purpose. It may also be imperative to describe possible risks and benefits of the research (Sekaran, 2003). The

Signing of the voluntary informed consent by each individual participant was confirmation that the respondents are not coerced to participate in the study but are doing so willingly. Some respondents wererequiring further verbal assurance that the tapes will under no circumstances be handed over to their supervisors.

Anonymity: Respondent’s names were withheld to ensure anonymity and confidentiality in terms of any future prospects. In order to avoid bias, the researcher was interview the respondents one after the other

and ensure that he informs them about the nature and extent of his study and on the other hand he was give them reasons as to why is interviewing them. Confidentiality: The researcher was protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.

Justice and beneficence: The researcher was explaining to respondent's use of certain gadgets that they do not understand or have little knowledge about e.g. camera and tape recorders. Some respondents was require further verbal assurance that the tapes was under no circumstances behanded over to their supervisors

Objectivity: The researcher was avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, expert testimony, and other aspects of research where objectivity is expected or required. He was avoided or minimizes bias or self-deception.

CHAPTER FOUR

DATAANALYSIS, PRESENTATION, AND INTERPRETATION

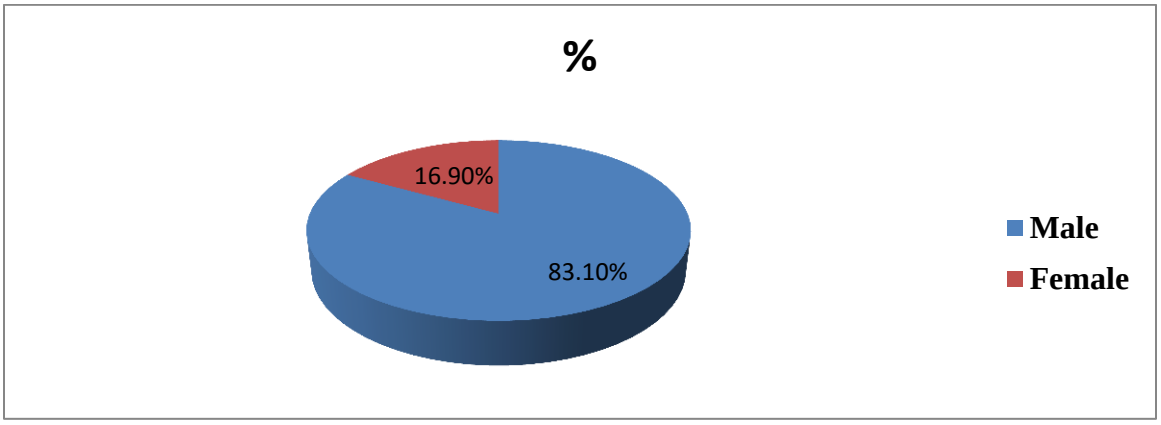
This chapter contains the presentation, analysis and interpretations of data. The statistical techniques that were outlined in chapter three were applied to the data, and the results obtained are presented in this chapter. The first part describes the demographic characteristics of respondents in terms of sex, age group, and education level and service years.

In the second part the analysis and interpretation of data gathered through questionnaire were discussed descriptions of the variables with their mean and standard deviation values.

4.1. Findings of Demographic Analysis

The study sought to collect data from 90 staffs of EPSA Jimma branch but the researcher managed to collect 83 questionnaires. This represents a response rate of 92.2 percent which is very good for analysis. According to Babbie (2004) a response rate of 60 percent isgood and that of 92.2 percent is feasible and logical, which was near to the confidence level 95% .

Figure 4.1: Sex distribution of Respondents



Source, survey, 20

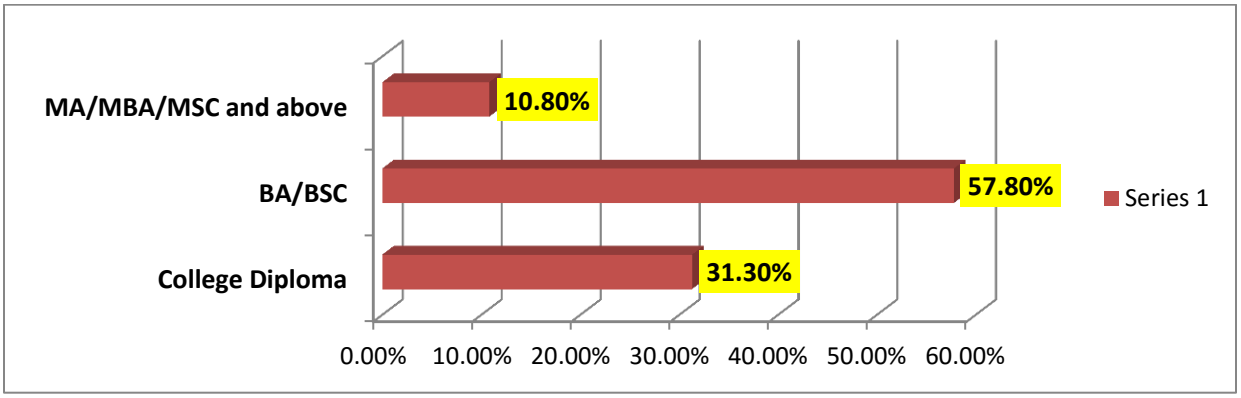
As indicated the information above on figure 4.1, concerning sex wise distribution of respondents' larger proportion of respondents 83.1 % were male whereas the remaining 16.9 % were female. From this we can conclude that the proportion of male employees higher than female employees in EPSA Jimma branch. This shows that males dominantly handle material handling practices activities in Agency than females.

Table 4.1: Respondents' Current position					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Warehouse and inventory management officer	26	31.3	31.3	31.3
	WIM team leader	1	1.2	1.2	32.5
	Distribution officers & delivery personnel's	24	28.9	28.9	61.4
	Distribution team leader	1	1.2	1.2	62.7
	Warehouse managers & dispatch officers	14	16.9	16.9	79.5
	Warehouse supervisors	5	6.0	6.0	85.5
	It officers	5	6.0	6.0	91.6
	Others	7	8.4	8.4	100.0
	Total	83	100.0	100.0	

Source, survey, 2020

The study sought to find the agency staff's position and responsibilities. The results indicated that larger proportion of respondents 31.3 % of them were WIM officers followed by 28.9 % & 16.9 % of (distribution officers & delivery personnel's) and (warehouse managers & dispatch officers) respectively. The least proportion 1.2 % of them was team leaders for WIM team and distribution team (see Table 4.1 above). The above finding could suggest the participants of the study were found at their different title and responsibility holding level. Thus, they could able to evaluate the agency's factors affecting materials handling practices from different angles with varied insights of the participants

Figure 4.2: Respondents Educational Level



Source, survey, 2020

In relation to respondents' educational level, as indicated on figure 4.2, the result showed that larger proportion 57.8 % of the respondents were hold their first degree followed by 31.3 % were possessed diploma and the remaining least group 10.8 % were found at their 2nd degree and above educational level status. This implies that most of the agency staff's found at their degree level. Thus, they had been qualified enough and had a potential to evaluate the materials handling practices of the agency.

4.2. Factors Affecting Materials Handling Practices of EPSA Jimma branch

The descriptive statistics utilized are based on frequency tables to provide information on the demographic variables. Through tables, summary statistics such as means, standard deviations, minimum and maximum are computed for each factors affectingand organizational materials handing practices in this study. The findings which identified on this study presented as follows.

Mesfin (2016) used a kind of rule of thumb to create equal intervals for a range of five points Likert scale (that ranges from strongly disagree to strongly agree in the survey questionnaire). A calculated mean value that ranges from 1 to 1.80 implies strong disagreement, a mean range from 1.81 to 2.6, from 2.61 to 3.4,from 3.41 to 4.2 and from 4.21 to 5.00 represented respondents' perceptions of somewhat disagree, neutral, somewhat agree and strongly agree respectively. The 0.8 served as a boundary for each elements of the measurement in the questionnaire.

Accordingly, the 0.8 was a result found by dividing the difference between the maximum (5) and minimum (1) scores to the maximum score (5) of the questionnaire. In the process of examining of the data, standard deviation was used. Small standard deviations (relative to the value of the mean itself) indicate that data are close to the mean whereas a large standard deviation (relative to the mean) indicates that the data points are distant from the mean. The mean is a poor fit of the data. Standard deviation is a measure of how well the mean represents the data (Field 2009). All of the variables were measured using a five point likert scale where 1 stands for Strongly Disagree and 5 stands of Strongly Agree. Therefore the interpretation made using the mean of each variable, as a matter of fact the mean falls between the two ranges, hence if the mean approaches to 1 the interpretation would be the respondents didn't agree on the raised issue or variable and if it approaches to 5 the reverse would be true.

Table 4.2: Descriptive analysis of Factors and material handling practices of EPSA Jimma Branch			
	N	Mean	Std. Deviation
Information Technology Factors	83	3.48	1.329
Warehouse Management factors	83	3.49	1.400
Employee Involvement Factors	83	3.39	1.351
Materials handling practices	83	3.64	1.312

Source, survey, 2020

Table 4.2.; represents the calculated means and standard deviations for the dependent variable (Materials handling practices) and independent variables (Information technology factors, warehouse management factors and Employee involvement factors). The mean of information technology factors is 3.48 which found in the range 3.41-4.2, showed that average employees on the study areas were nearly agree for the effect of information technology factors on the materials handling practices of the agency. This indicates that ITFs could influence materials handling practices in the study area. On the same vein warehouse management factors with the mean value of 3.49, which average number of respondents were approve their agreement of its influence on the materials handling practices of the agency. However, the mean value for employee involvement factors was 3.39 which is found within a range of 2.61-3.4 which average number of respondents were not sure for the influence of employee involvement on materials handling practices on the study area. This implies that the employee involvement at the agency was not potential enough to influence on the materials handling practices of the agency. On the other hand the mean value for materials handling practices was 3.64 found in a cut point of agree on average number of respondents. This imply that the current materials handling practices of the agency could able to convince most of the study participants.

4.2.1. Information Technology (IT) Utilization in Warehouse Operations

Technologies like Warehouse Management Systems (WMS), Radio Frequency Identification (RFID), and Automated Guided Vehicle System (AGVS) among others, have transformed and revolutionaries' the landscape of warehousing and material handling across parts of globe. The descriptive findings about IT utilization in warehouse operations of EPSA Jimma branch presented as shown below;

Table 4.2.1: Descriptive Statistics of IT utilization of EPSA Jimma branch			
	N	Mean	Std. Deviation
The agency warehouse management system based on RFID technology	83	2.40	1.178
The agency frequently using bar coding and radio identification (RFID) to increase logistic system	83	2.43	1.128
The agency use IT to manage the order picking activities of materials/inventories with in the warehouse	83	3.49	1.223
The agency uses to generate invoices for receipts and issued materials from the warehouse	83	3.76	1.206
The agency recently using wireless barcode scanners and RFID in warehouse	83	2.45	1.140
The agency is using IT to generate useful report easily to support decision making (real time data availability)	83	3.42	1.380
The level of IT usage for warehouse operations is minimal	83	2.52	1.291
The management recognize the importance of IT for warehouse operations management	83	3.84	1.234
Inadequate staff knowledge and skill is a challenge for efficient utilization of ICT	83	2.84	1.410
Frequent electric interruption/outages make it difficult to use theICT	83	3.54	1.319
The use of IT has improved employee productivity	83	3.61	1.267
There is use of electronic warehouse managements system	83	3.59	1.259
Recording the flow of products in and out of the warehouse (receipt & dispatch) is often paper based	83	3.59	1.279

Source, survey, 2020

Table 4.2; represents the calculated means and standard deviations for information technology utilization for warehouse operations of EPSA Jimma branch. The mean value for the agency use IT to manage the order picking activities of materials/inventories within the warehouse, the agency uses to generate invoices for receipts and issued materials from the warehouse, the agency is using IT to generate useful report easily to support decision making (real time data availability), the management recognizes the impotence of IT for warehouse operations management, frequent electric interruption/outages make it difficult to use the ICT, the use of IT has improved employee productivity,

there is use of electronic warehouse managements system and Recording the flow of products in and out of the warehouse (receipt & dispatch) is often paper based was found at the ranges of 3.42-4.2, which mean that the average number of respondents were reported their agreement for the above indicated statements. This implies that the agency uses information technology for the order picking activities, to generate invoices for receipts and issued materials, to generate useful report for decision making. Additionally, the management recognizes the importance of IT. Thus, they tend to enhance its utilization for better outcome. However, the agency faced frequent interruption of electric which made a barrier on IT utilization. The agency utilized IT through its warehouse operations with its known software HCMIS (Health commodity management system) which aids on the transaction process of the products, generate useful reports, aid in the follow up of the stock. Thus, the agency utilized IT for all warehouse interlinked operations.

On the other hand, the mean value for the agency warehouse management system based on RFID technology, the agency frequently using bar coding and radio identification (RFID) to increase logistic system, the agency recently using wireless barcode scanners and RFID in warehouse and the level of IT usage for warehouse operations is minimal was found in the range of 1.8-2.6, which mean that average number of respondents were disagreed on the above indicated statements. This implies that the agency not launched RFID technology on the warehouse operations, the agency not functionalize using bar coding & RFID. Whereas, they were stated the level of IT usage level for warehouse operations is not minimal. This might give an insight for the agency to pay a great concern on upgrading the level of IT utilization on the warehouse operations.

4.2.2. Warehouse Management Factors in EPSA Jimma Branch

Warehouse management is therefore essential in ensuring a balance between production and demand. Essentially, warehouses minimize the effects of supply chain inefficiencies, improve logistics accuracy and inventory management, and allow product accumulation, consolidation, and customization. The descriptive findings of warehouse management factors for material handling practices of EPSA Jimma branch presented as shown below.

Table 4.2.2: Descriptive Statistics Warehouse management Factors			
	N	Mean	Std. Deviation
There is enough warehouse space during inbound & outbound transportation	83	3.82	1.149
A warehouse management system uses information to create visibility of the warehouse's inventory	83	3.64	1.235
Warehouses are poorly designed with inadequate storage space and conditions	83	3.77	1.130
The warehouse space utilization is good and enough	83	3.29	1.283
The agency recently identified the most problem hindering about not availability of enough warehouse	83	2.92	1.327
There should be adequate lighting, temperature, and humidity control in warehouse	83	3.72	1.213
The adequate storage satisfied warehouse manage practices	83	3.73	1.180
The location of warehouse is more satisfied the management of the warehouse	83	3.48	1.282
Warehouse satisfy the requirements of the customer without much customization	83	3.52	1.426
Pharmaceuticals products enter and exit the warehouse quickie and efficiently on their way to the service delivery point	83	3.43	1.450
There are appropriate warehousing infrastructure like (e.g. pallets, shelving, good housekeeping, safety control, quality control, for material handling management	83	3.54	1.364
The integration of the warehouse data with supply chain application is not enough	83	2.61	1.257
Warehouse layout must include a greater ratio of aisle staging space to actual storage space	83	3.61	1.387
There is integration of warehouse data with supply chain applications	83	3.77	1.182

Source, survey, 2020

Table 4.3; represents the calculated means and standard deviations for warehouse management factors of EPSA Jimma branch. The mean value for there is enough warehouse space during inbound & outbound transportation, a warehouse management system uses information to create visibility of the warehouse's inventory, warehouses are poorly designed with inadequate storage space and conditions, there should be adequate lighting, temperature, and humidity control in warehouse , the adequate storage satisfied warehouse manage practices, the location of warehouse is more satisfied the management of the warehouse, warehouse satisfy the requirements of the customer without much customization, pharmaceuticals products enter and exit the warehouse quickie and efficiently on their way to the service delivery point, there are appropriate warehousing infrastructure like (e.g. pallets, shelving, good housekeeping, safety control, quality control, for material handling management, warehouse layout must include a greater ratio of aisle staging space to actual storage space and there is integration of warehouse data with supply chain applications was found in the range of 3.41-4.2, which mean that the average number of employees were agreed on the above indicated statements. This imply that, EPSA Jimma branch had enough warehouse space, the warehouse management was system based management however, warehouse poorly designed thus, there exist inadequate storage area, the location of the warehouse satisfied in terms of accessibility, customer requirement and security and also there was appropriate warehouse infrastructure in the study area.

Whereas the mean value for the agency recently identified the most problem hindering about not availability of enough warehouse and the integration of the warehouse data with supply chain application is not enough found in the range between 2.61-3.4 which average number of respondents were neutral/not sure for the statements indicated above. This imply that identification for most problem hindering about not availability of enough warehouse and being not enough integration of warehouse data with supply chain application not clear/ unknown. Thus, the agency should have to pay a concern to inform the staffs about on sharing the facts. Additionally, the agency should have exerted the necessary efforts on the indicated points.

4.2.3. Employee Involvement Factors on Material Handling Practices of EPSA Jimma Branch

While designing or improving a material handling system not only physical elements, but also supportive aspects such as employee involvement and compatibility with the manufacturing system are

essential, since they will affect success of the design dramatically. Below several concepts related to issue will be mentioned.

The descriptive findings employee involvement factors presented as shown below

Source, survey, 2020

Table 4.2.3: Descriptive Statistics Employee Involvement Factors			
	N	Mean	Std. Deviation
The agency employees are well trained to effectively execute the material handling management practices	83	3.28	1.328
The agency employee involvement and training is effectively applied	83	3.00	1.353
The employee involvement system training implementation is fully applied	83	3.23	1.337
The agency has system of meetings between head master or superiors and all staff for whom they are responsible	83	3.75	1.218
The agency encouraging the development of knowledge & skills' of employees and their team work	83	3.64	1.340
The agency has involved related employees with related job	83	3.48	1.426
The agency have sufficient human resource in all departments	83	3.30	1.323
The agency train employees for capacity building	83	3.36	1.367
The agency strengthening the potential of employees by developing their skills and responsibility	83	3.40	1.361
There is allocating right number of people in right place to produce quality work	83	3.46	1.213
The agency empower their people, build organizations as team, develop human resources on all levels	83	3.29	1.427
The agency motivate workers to participate in team work in order to achieve quality	83	3.37	1.350
The agency strengthening the potential of employees by developing their skills and responsibility	83	3.37	1.454
the agency training their employees for best performance of the organization	83	3.52	1.365

Table 4.4; represents the calculated means and standard deviations for employee involvement factors of EPSA Jimma branch. The mean value forthe agency has system of meetings between head master or superiors and all staff for whom they are responsible, the agency encouraging the development of knowledge & skills' of employees and their team work, the agency has involved related employees with related job and there is allocating right number of people in right place to produce quality work, was found in the range of 3.41-4.2 which mean average number respondents were agreed on the above statements. This imply that there exist a system of meeting between head masters and all staff, the agency have been encouraging the development of knowledge & skills to initiate team work, ensures professionalism with assigning the right employees for the related job and also the right number of employees as per the structures hired for their right place. This might ensures quality work, team work involvement, as the material handling practices on the right person on team work.

On the other hand the mean value for the agency motivate workers to participate in team work in order to achieve quality, the agency strengthening the potential of employees by developing their skills and responsibility, the agency employees are well trained to effectively execute the material handling management practices, the agency employee involvement and training is effectively applied, the employee involvement system training implementation is fully applied, the agency train employees for capacity building, the agency empower their people, build organizations as team, develop human resources on all levels, the agency motivate workers to participate in team work in order to achieve quality and the agency strengthening the potential of employees by developing their skills and responsibility was found in the range 2.61-3.4, which mean that the mean number of respondents were gave neutral response for the above indicated statements. This implies that the agency should not play a convincing role on the above indicated essential tasks. Thus, most of the employees failed to gave clear cut response on the statements indicated above.

4.2.4. Materials Handling Practices of EPSA Jimma branch

MHS should be the first place to investigate for reducing operational costs and improving production systems. Typical factors that can affect design of MHSs are cost, distance and material flow; however; distance and material flow are key elements for pre-design, while cost is taken into consideration during selecting between design options (Chittratanawat& Noble, 1999). Thus, the findings of MHPs of EPSA Jimma branch presented as shown below;

Table 4.5: Descriptive Statistics of Material Handling Practices			
	N	Mean	Std. Deviation
There is mechanical materials handling practices in the warehouse	83	3.41	1.307
High load materials lifted with a forklift to put at the right locations	83	3.53	1.417
Materials safety kept in the warehouse	83	3.41	1.448
Materials are repair and maintain regularly with fixed interval	83	2.82	1.363
The warehouse infrastructure suits for materials handling practices	83	3.59	1.298
Materials handling practiced at the lowest cost	83	3.08	1.363
Materials are properly handled inthe warehouse	83	3.17	1.395

Source, survey, 2020

Table 4.5; represents the calculated means and standard deviations for material handling practices of EPSA Jimma branch. The mean value for high load materials lifted with a forklift to put at the right locations, the warehouse infrastructure suits for materials handling practices, materials safety kept in the warehouse and there is mechanical materials handling practices in the warehouse was found in the range of 3.41-4.2 which mean that average number of respondents were agreed on the above indicated statements. This implies the application of material handling machine in the warehouse operations, conducive warehouse infrastructures for material handling practices, safe material keeping, and mechanical material handling practices exist on the study area.

However, the mean value for materials are repair and maintain regularly with fixed interval, materials handling practiced at the lowest cost and materials are properly handled in the warehouse was found in the range of 2.61-3.4 which mean neutral response were gave by average number of respondents. This implies that there is a gap on the above indicated tasks of the agency. Therefore, the agency should have to focus on the efficiency of material handling practices of the agency.

4.3. Regression Assumption tests

4.3.1 Sample characteristics of normality test

According to normal Q-Q plots and box plot showed that the data information technology factors, warehouse management factors, employee involvement factors, and materials handling practices were normally distributed with the value of asymptotic significance (p-value) 0.612 which is higher than alpha ($\alpha = 0.05$). The value of asymptotic significance for information technology factors was 0.518, for warehouse management factors0.618, for employee involvement factors is 0.558, andfor materials handling practices was 0.762.

4.3.2. Sample characteristics of Multi co linearity

Multico linearity Testing—Multi co linearity is a condition in which one or more independent variables are in a linear contribution with other independent variables (Suyono&Hariyanto, 2012). A useful approach is the examination of the variance inflation factors (VIFs) or the tolerances of the explanatory variables. The VIFs are inversely related to the tolerances with larger values indicating involvement in more severe relationships (according to a rule of thumb, VIFsabove 10 or tolerances below 0.1 are seen as a cause of concern). (Sabine L. &Brian S.E., 2004). Hence, in this research multico linearity testing was conducted from variance inflation factor (VIF) in which:

- If the value of VIF lies between 1 &10 is less than 10 or tolerance more than 0.1, there is no multico linearity;
- If the VIF <1 or >10 or tolerance less than 0.1, then there is multico linearity.

Table 4.6: Co linearity statistics

Variables	Tolerance	VIF
Information Technology Factors	.236	4.241
Warehouse Management Factors	.171	5.859
Employee Involvement Factors	.116	8.592

Dependent variable: Material Handling Practices

Source: 2020 survey

According to the information observed above on table 4.8, Output of variance inflation factor (VIF) column in the coefficients table of the regression output shows that VIF for ITF (4.241), WMF (5.859), and EIF (8.592), all are smaller than 10. It means that there is no problem of multi co linearity between independent variables and dependent variable. This can be further ascertained from the Tolerance column of the same table in which the tolerance for the three independent variables 0.236, 0.171 and 0.116 respectively all > 0.1 indicating that there is no multi co linearity

4.3.3 Goodness of fit test

We want to run a regression of Material handling practices (Y) on affecting (X) factors Information Technology Factors (X**1**), Warehouse Management Factors (X**2)**, and Employee Involvement Factors (X**3**) for EPSA Jimma branch. Material handling practices (Y) = function of Information Technology Factors (X**1**), Warehouse Management Factors (X2), and Employee Involvement Factors (X3) or, as relevant text book will have it,

$$Y=\alpha+\beta 1x1+\beta 2x2+\beta kxk+e$$

The real question here is that "does this model works? How can we know that?Three ways to answer this question. Always we have to look at the model fit ("ANOVA") first. We do not have to make the mistake of looking at the R-square before checking the goodness of fit.

Table 4.7: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	98.152	3	32.717	60.102	.000[b]
	Residual	43.005	79	.544		
	Total	141.157	82			

a. Dependent Variable: Materials handling practices

b. Predictors: (Constant), Employee Involvement Factors, Information Technology Factors, Warehouse Management factors

Source: 2020 survey

Significance of the model *("Did the model explain the deviations in the dependent variable")*

The last column in the above table (ANOVA-table) shows the goodness of fit of the model. It is p-value or observed significance of the F. *The lower this number, the better the fit*. Typically, if "Sig" is greater than 0.05, we conclude that our model could not fit the data.

The F is comparing the two models below:

1. ***MHP*= β0 + β1****ITF*+ β2****WMF*+ β3*EIF +et ,**

2. ***MHP*= β0**

(In formal terms, the F is testing the hypothesis: **β0**= β1 = β2 = β3 = β4= β5=0)

If the F is not significant, then we cannot say that model 1 is any better than model

2. The implication is obvious-the use of the independent variables has not assisted in predicting the dependent variable. If Sig < .01, then the model is significant at 99%, if Sig < .05, then the model is significant at 95%, and if Sig <.1, the model is significant at 90%. Significance implies that we can accept the model. If Sig >.1 then the model was not significant (a relationship could not be found) or "R-square is not significantly different from zero", the model does not work at all. Note that p-value is the Sig. column value

Test of the goodness of fit of the model in this research showed negative results. From the result of F-test, it is known that the F-statistic 60.102 is higher than the critical value 3.141 (from t-table) and the probability (p-value or the Sig. value) 0.000 is smaller than alpha (0.05). Therefore, the model is fit. The third confirmatory test is looking at the R^2 value of the model summary which is .695> 0. As this value gets approach to +1, the better the model will be.

Table 4.8: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.834[a]	.695	.684	.738	.695	60.102	3	79	.000

a. Predictors: (Constant), Employee Involvement Factors, Information Technology Factors, Warehouse Management factors

b. Dependent Variable: Materials handling practices

Source: Survey, 2020

If we had to compute it by hand the F value, it would be… $F= \frac{R^2/_{k-1}}{1-R2/_{(N-k)}}$

Where:

F=F-value that is resulted from the calculation;

R2 =coefficient of determination;

k=number of variables (# of dependent and independent variables);

N=number of observations (# of sample respondents).

(K-1) = degree of freedom

Given

R^2=0.695……..from regression summary table

K-1 = 4 – 1 = 3, 1 - R^2= 1-0.695 = 0.305 and N-k = 83- 4 = 79=df2

Therefore, F= 0. 695/3 ÷0.305/79

= 0.695/3 * 79/0.305 = .232*79 ÷ .0.305 = 18.302/.305 = 60.09

= 0.232*259.02= 60.09

The value is similar, **60.09=60.102**; the difference could be the effect of rounding.

The results from the regression model summary and analysis of variance above indicate that Information Technology Factors,Warehouse Management Factors, and Employee involvement factorscould significantly contribute towards the R^2 value, which is a statistical measure of how close the data are to the fitted regression line Based on the R^2value of 0.695, these three variables could explained 69.5 % variation in the material handling practices of the agency.

Table 4.9: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Co linearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.795	.234		3.394	.001		
	Information Technology Factors	.293	.126	.294	2.325	.017	.236	4.241

	Warehouse Management factors	.285	.141	.304	2.020	.047	.171	5.859
	Employee Involvement Factors	.451	.177	.464	2.549	.013	.116	8.592
a. Dependent Variable: Materials handling practices								

Source: Survey,2020

The regression coefficients are shown in the above table. The intercept, 0.795, is representing the estimated average value of material handling practices when information technology factors; warehouse management factors, and employee involvement factors are zero. Thus an organization with no information technology factors; warehouse management factors, and employee involvement factors will have severe impact on material handling practices. The slop of independent variables also exhibits useful predictive information about the implication. The slop of information technology factors; warehouse management factors, and employee involvement factors which are 0.294, 0.304 and 0.464 means that organization material handling practices changes increased by 0.294, 0.304 and 0.464 when information technology factors; warehouse management factors, and employee involvement factors increases by 1.

An examination of these three independent variables indicated that employee involvementrepresented the strongest positive interference on the organization material handling practices with the standard beta of 0.464 followed by warehouse management with beta of 0.304, and information technology with β of 0,294. Thus the statistical results prove that information technology factors; warehouse management factors, and employee involvement factorshad a positive and linear relationship with material handling practices

Table 4.9.1:Summary of the Regression output

Variables	F-test and T-test						R^2	K	N	Conclusion
	F-statistic	Critical value	Regression coefficient	t	Critical value	p-value				
Goodness of fit testing	60.102	3.141				0.000				Significant

(Constant)	.795	3.394	3.141	.001				Significant
Information Technology Factors (ITF)	.294	2.325	3.141	.017	0.695	4	83	Significant
Warehouse Management Factors (WMF)	.304	2.020	3.141	.047	0.695	4	83	Significant
Employee Involvement Factors (EIF)	.464	2.549	3.141	.013	0.695	4	83	Significant

Source: 2020 survey

Based on the above tables, the regression model will be filled in as follows:

Y = 0.795 +0.294X1+0.304X2+0.464X3+ε

Table 4.10: Correlations

		Information Technology Factors	Warehouse Management factors	Employee Involvement Factors	Materials handling practices
Information Technology Factors	Pearson Correlation	1	.808**	.874**	.745**
	Sig. (2-tailed)		.000	.000	.000
	N	83	83	83	83
Warehouse Management factors	Pearson Correlation	.808**	1	.910**	.802**
	Sig. (2-tailed)	.000		.000	.000
	N	83	83	83	83
Employee Involvement Factors	Pearson Correlation	.874**	.910**	1	.823**
	Sig. (2-tailed)	.000	.000		.000
	N	83	83	83	83
Materials handling practices	Pearson Correlation	.745**	.802**	.823**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	83	83	83	83

**. Correlation is significant at the 0.01 level (2-tailed).

Source: 2020 survey

Table 4.10, demonstrates the results of Pearson's Product Moment Correlation on the relationship between factors (information technology factors, warehouse management factors, and employee involvement factors) and materials handling practices for the sample respondents. Itshows that, the

correlation coefficients for the relationship between the indicated factors and materials handling practices are linear, and positive ranging from medium to high correlationcoefficients.

The results in the above table indicate that, there is a positive and significant relationship between information technology factors and materials handling practices ($r = 0.745$, $p < 0.01$), warehouse management factors and materials handling practices ($r = 0.802$, $P < 0.01$), and employee involvement factors and materials handling practices ($r= 0.823$, $p<0.01$). The finding on table 4.10 above further indicates that among independent variables interference the higher relationship is found between employee involvement factors and materials handling practices and warehouse management factors and materials handling practices according the value of their correlation coefficient.

Individual variables effect/interference testing is based on Pearson correlation coefficients r and P-value to test whether the variables have interference or not, whether the effect is positive or negative.

4.4. Result of hypotheses test

"Hypothesis is a formal statement that presents the expected relationship between an independent and dependent variable."(Creswell, 1994). **The hypothesis** provides a simple statement of association between Y and X. Nothing is indicated about the association that would allow the researcher to determine which variable, Y or X, would tend to cause the other variable to change in value. Based the hypothesis drawn for this study the findings which were revealed presented as shown below

Table 4.11. Hypothesis test Summary

S/No	Hypothesis	Sig. (2-tailed)	Pearson Correlation	tested value
1	Ho1: Information technology not significantly influences materials handling practices of EPSA Jimma branch.	.000 (p<0.01)	.745	**rejected**
2	Ho2: Warehouse management not significantly influences materials handling practices of EPSA Jimma branch.	.000 (p<0.01)	.802	**Rejected**

3	Ho3: Employee involvement not significantly influences materials handling practices of EPSA Jimma branch.	.000 (p<0.01)	.823	**rejected**

4.4.1 Result of first hypothesis testing (Information Technology Factors)

In a summary, Pearson correlation analysis indicated that, information technology positively predicted material handling practices of EPSA Jimma branch. This could suggested as information technology had a positive relationship with significant interference of with material handling practices (which p-value= 0.000 (< 0.01) and r=0.745).Thus, the null hypothesis **Ho_1:** Information technology not significantly influences materials handling practices of EPSA Jimma branch was rejected and H_{A1}: Information technology significantly influences materials handling practices of EPSA Jimma branch was accepted.Research has shown that, the WMS and RFID technology are integrated at three levels thus, data collection, data movement and data management (Tan, 2008). According to Tompkins & Smith (1998), a computerized WMS represents a tool that can facilitate the automation and optimization of material handling processes; improve inventory accuracy and facility usage; reduce labor costs; and enhance order-picking accuracy. Thus, the agency with implementing IT utilization for warehouse operations could enhance the practices of its material handlings.

4.4.2 Result of Second hypothesis testing (Warehouse Management Factors)

In a summary, Pearson correlation analysis indicated that, warehouse management positively predicted material handling practices of EPSA Jimma branch. This could suggested as warehouse management had a positive relationship with significant interference of with material handling practices (which p-value= 0.000 (< 0.01) and r=0.802).Thus, the null hypothesis **Ho_2:** Warehouse management not significantly influences materials handling practices of EPSA Jimma branch was rejected and H_{A2}: Warehouse management significantly influences materials handling practices of EPSA Jimma branch was accepted. According to the facts supported by the literature it is further important to assert that, because warehousing and material handling work hand-in-hand, it is imperative to properly and appropriately handle material designated for future use to ensure that they efficiently support operations for which they are meant to execute (Childe, 2003).This means that without a well-designed and functional material handling system, it could encounter delays; production times could increase;

products could get damaged or contaminated; and cost of movement within facilities could increase, thereby increasing holding cost. On the other hand, a well thought-out and planned material handling system could help organization and logistics facilities improve their performance, enhance inventory‟ quality, and reduce operating costs (Hassan, 2006). Thus, according to the facts indicated above warehouse management and material handling practices support each other it argues that their positive and significant relationship between them.

4.4.3 Result of third hypothesis testing (Employee Involvement Factors)

In a summary, Pearson correlation analysis indicated that, employee involvement positively predicted material handling practices of EPSA Jimma branch. This could suggested as employee involvement had a positive relationship with significant interference of with material handling practices (which p-value= 0.000 (< 0.01) and r=0.823).Thus, the null hypothesis **Ho_3:** Employee involvement not significantly influences materials handling practices of EPSA Jimma branch was rejected and H_{A1}: Employee involvement significantly influences materials handling practices of EPSA Jimma branch was accepted.The success of implementing a new concept without involving related employees is almost equal to zero (Baudin, 2004). Therefore, employee-involvement and training for the achievement of an effective and efficient in-house material handling system is essential (Mulcahy, 1998). Baudin (2004) underlines that human are the key component for successful implementation, start-up, and continued operation of an in-house transportation concept or equipment. Thus, elopement involvement makes functional the material handling practices. The efficiency and effectiveness improved through training provision, skill development and motivational incentives. This could suggest employee involvement having significant interferences with materials handling practices

CHAPTER FIVE

SUMMARY,CONCLUSIONS &RECOMMENDATIONS

5.1. Summary of Major findings

According to the collected data from the study population, after the study was processed and analyzed this raw data in order to present relevant result of the study with full of interpretation and discussion. The findings on the result part of the study were sorted with descriptive and inferential statistics presentation. Therefore, based on the identified result of the study, the researcher could able to summarize the major findings of the study and present as shown below.

- The study sought to collect data from 90 staff's of EPSA Jimma branch but the researcher managed to collect 83 questionnaires. This represents a response rate of 92.2 percent which is very good for analysis.
- The study sought to find the agency staff's position and responsibilities. The results indicated that larger proportion of respondents 31.3 % of them were WIM officers followed by 28.9 % & 16.9 % of (distribution officers & delivery personnel's) and (warehouse managers & dispatch officers) respectively. The least proportion 1.2 % of them was team leaders for WIM team and distribution team.
- In relation to respondents' educational level, the result showed that larger proportion 57.8 % of the respondents were hold their first degree followed by 31.3 % were possessed diploma and the remaining least group 10.8 % were found at their 2nd degree and above educational level status.
- The mean value for the agency use IT to manage the order picking activities of materials/inventories within the warehouse, the agency uses to generate invoices for receipts and issued materials from the warehouse, the agency is using IT to generate useful report easily to support decision making (real time data availability), the management recognizes the impotence of IT for warehouse operations management, frequent electric interruption/outages make it difficult to use the ICT, the use of IT has improved employee productivity, there is use of electronic warehouse managements system and Recording the flow of products in and out of the warehouse (receipt & dispatch) is often paper based was found at the ranges of 3.42-4.2, which

mean that the average number of respondents were reported their agreement for the above indicated statements.

- On the other hand, the mean value for the agency warehouse management system based on RFID technology, the agency frequently using bar coding and radio identification (RFID) to increase logistic system, the agency recently using wireless barcode scanners and RFID in warehouse and the level of IT usage for warehouse operations is minimal was found in the range of 1.8-2.6, which mean that average number of respondents were disagreed on the above indicated statements.
- The mean value for there is enough warehouse space during inbound & outbound transportation, a warehouse management system uses information to create visibility of the warehouse's inventory, warehouses are poorly designed with inadequate storage space and conditions, there should be adequate lighting, temperature, and humidity control in warehouse , the adequate storage satisfied warehouse manage practices, the location of warehouse is more satisfied the management of the warehouse, warehouse satisfy the requirements of the customer without much customization, pharmaceuticals products enter and exit the warehouse quickie and efficiently on their way to the service delivery point, there are appropriate warehousing infrastructure like (e.g. pallets, shelving, good housekeeping, safety control, quality control, for material handling management, warehouse layout must include a greater ratio of aisle staging space to actual storage space and there is integration of warehouse data with supply chain applications was found in the range of 3.41-4.2, which mean that the average number of employees were agreed on the above indicated statements.
- Whereas the mean value for the agency recently identified the most problem hindering about not availability of enough warehouse and the integration of the warehouse data with supply chain application is not enough found in the range between 2.61-3.4 which average number of respondents were neutral/not sure for the statements indicated above.
- The mean value forthe agency has system of meetings between head master or superiors and all staff for whom they are responsible, the agency encouraging the development of knowledge & skills' of employees and their team work, the agency has involved related employees with related job and there is allocating right number of people in right place to produce quality work, was found in the range of 3.41-4.2 which mean average number respondents were agreed on the above statements.

- On the other hand the mean value for the agency motivate workers to participate in team work in order to achieve quality, the agency strengthening the potential of employees by developing their skills and responsibility, the agency employees are well trained to effectively execute the material handling management practices, the agency employee involvement and training is effectively applied, the employee involvement system training implementation is fully applied, the agency train employees for capacity building, the agency empower their people, build organizations as team, develop human resources on all levels, the agency motivate workers to participate in team work in order to achieve quality and the agency strengthening the potential of employees by developing their skills and responsibility was found in the range 2.61-3.4, which mean that the mean number of respondents were gave neutral response for the above indicated statements.
- The mean value for high load materials lifted with a forklift to put at the right locations, the warehouse infrastructure suits for materials handling practices, materials safety kept in the warehouse and there is mechanical materials handling practices in the warehouse was found in the range of 3.41-4.2 which mean that average number of respondents were agreed on the above indicated statements.
- However, the mean value for materials are repair and maintain regularly with fixed interval, materials handling practiced at the lowest cost and materials are properly handled in the warehouse was found in the range of 2.61-3.4 which mean neutral response were gave by average number of respondents.
- Test of the goodness of fit of the model in this research showed negative results. From the result of F-test, it is known that the F-statistic 60.102 is higher than the critical value 3.141 (from t-table) and the probability (p-value or the Sig. value) 0.000 is smaller than alpha (0.05). Therefore, the model is fit. The third confirmatory test is looking at the R^2 value of the model summary which is .695 > 0. As this value gets approach to +1, the better the model will be.
- The results from the regression model summary and analysis of variance above indicate that Information Technology Factors, Warehouse Management Factors, and Employee involvement factors could significantly contribute towards the R^2 value, which is a statistical measure of how close the data are to the fitted regression line Based on the R^2value of 0.695, these three variables could explained 69.5 % variation in the material handling practices of the agency

- According to the information observed above on table 4.8, Output of variance inflation factor (VIF) column in the coefficients table of the regression output shows that VIF for ITF (4.241), WMF (5.859), and EIF (8.592), all are smaller than 10. It means that there is no problem of multi co linearity between independent variables and dependent variable. This can be further ascertained from the Tolerance column of the same table in which the tolerance for the three independent variables 0.236, 0.171 and 0.116 respectively all > 0.1 indicating that there is no multi co linearity
- The slop of independent variables also exhibits useful predictive information about the implication. The slop of information technology factors; warehouse management factors, and employee involvement factors which are 0.294, 0.304 and 0.464 means that organization material handling practices changes increased by 0.294, 0.304 and 0.464 when information technology factors; warehouse management factors, and employee involvement factors increases by 1.
- An examination of these three independent variables indicated that employee involvementrepresented the strongest positive interference on the organization material handling practices with the standard beta of 0.464 followed by warehouse management with beta of 0.304, and information technology with β of 0,294. Thus the statistical results prove that information technology factors; warehouse management factors, and employee involvement factorshad a positive and linear relationship with material handling practices.
- The results in the above table indicate that, there is a positive and significant relationship between information technology factors and materials handling practices ($r = 0.745$, $p < 0.01$), warehouse management factors and materials handling practices ($r = 0.802$, $P < 0.01$), and employee involvement factors and materials handling practices ($r= 0.823$, $p<0.01$).
- The finding on table 4.10 above further indicates that among independent variables interference the higher relationship is found between employee involvement factors and materials handling practices and warehouse management factors and materials handling practices according the value of their correlation coefficient.
- In a summary, Pearson correlation analysis indicated that, information technology positively predicted material handling practices of EPSA Jimma branch. This could suggested as information technology had a positive relationship with significant interference of with material handling practices (which p-value= 0.000 (< 0.01) and r=0.745).

- In a summary, Pearson correlation analysis indicated that, warehouse management positively predicted material handling practices of EPSA Jimma branch. This could suggested as warehouse management had a positive relationship with significant interference of with material handling practices (which p-value= 0.000 (< 0.01) and r=0.802).
- In a summary, Pearson correlation analysis indicated that, employee involvement positively predicted material handling practices of EPSA Jimma branch. This could suggested as employee involvement had a positive relationship with significant interference of with material handling practices (which p-value= 0.000 (< 0.01) and r=0.823).

5.2. Conclusion

The research findings described in this paper offers and insights into the effects of information technology factors, warehouse management factors and employee involvement factors with workers material handling practices. The results from the different types of analyses and instruments as described in chapter four and five helps to enhance our understanding of the relationships between the underlying variables.

This study aimed at investigating the factors affecting materials handling practices at EPSA Jimma branch in Jimma town. Based on findings of the study, the following conclusions were drawn. The finding for materials handling practices indicated that there is medium level of overall material handling practices in EPSA Jimma branch. In this regard the study showed the gap on properly handling of materials, conducting the task at the lowest cost and lack of regular repair and maintenance material handling equipments.

The finding of this research, in which, information technology, warehouse management and employee involvement have positive significant relationship with material handling practices in accordance with the results of different statistical tests conducted using statistical software, SPSS version 20. In addition to this, the three independent variables; information technology, warehouse management and employee involvement significantly explain the variations (69.5%) in material handling practices. It can be concluded from this study that material handling practices is significantly positively affected by information technology, warehouse management and employee involvement.

5.3. Recommendation

Based on the findings and conclusions of the study, the researcher forwards the following recommendations to the management of EPSA Jimma branch to intervene as a possible solutions for the identified gaps on this study:-.

- The RFID has attracted significant attention in the fields of logistics and supply chain because of its effectiveness and efficiency (Hunt et al., 2007) in tracking goods throughout the supply chain and also as one of the new technologies influencing the operations in production, warehousing, and distribution sectors. Therefore, EPSA Jimma branch should have to implemented RFID technology to its warehouse operations in order to achieve the indicated benefits.
- The staffs should have to train and develop skill on information technology utilization in order to improve their efficient utilization of ICT.
- Space in the warehouse is a crucial component in the warehousing system. EPSA Jimma should have utilize the warehouse space efficiently and economically with organizing and arranging the warehouse systematically.
- The agency should have to empower their people, build organizations as team, and develop human resources on all levels in order to utilize their maximum potentials.
- The agency should have to strengthening the potential of employees by developing their skills and responsibility.
- Materials handling equipments should have to repair and maintain regularly to keep their functionality in the warehouse operations.
- The agency should have handle the materials properly and safely in order to tackle their breakage and damage. As a result losing their functionality.

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Annex-I

SPSS statistical Output

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.834[a]	.695	.684	.738	.695	60.102	3	79	.000

a. Predictors: (Constant), Employee Involvement Factors, Information Technology Factors, Warehouse Management factors

b. Dependent Variable: Materials handling practices

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	98.152	3	32.717	60.102	.000[b]
	Residual	43.005	79	.544		
	Total	141.157	82			

a. Dependent Variable: Materials handling practices

b. Predictors: (Constant), Employee Involvement Factors, Information Technology Factors, Warehouse Management factors

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.795	.234		3.394	.001		
	Information Technology Factors	.293	.126	.294	2.325	.017	.236	4.241
	Warehouse Management factors	.285	.141	.304	2.020	.047	.171	5.859
	Employee Involvement Factors	.451	.177	.464	2.549	.013	.116	8.592

a. Dependent Variable: Materials handling practices

Correlations

		Information Technology Factors	Warehouse Management factors	Employee Involvement Factors	Materials handling practices
Information Technology Factors	Pearson Correlation	1	.808**	.874**	.745**
	Sig. (2-tailed)		.000	.000	.000
	N	83	83	83	83
Warehouse Management factors	Pearson Correlation	.808**	1	.910**	.802**
	Sig. (2-tailed)	.000		.000	.000
	N	83	83	83	83
Employee Involvement Factors	Pearson Correlation	.874**	.910**	1	.823**
	Sig. (2-tailed)	.000	.000		.000
	N	83	83	83	83
Materials handling practices	Pearson Correlation	.745**	.802**	.823**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	83	83	83	83

**. Correlation is significant at the 0.01 level (2-tailed).

Descriptive Statistics

	N	Mean	Std. Deviation
There is enough warehouse sppace during inbound & outbound transportation	83	3.82	1.149
A warehouse management system uses information to create visibility of the warehouse's inventory	83	3.64	1.235
Warehouses are poorly desgned with inadequate storage space and conditions	83	3.77	1.130
The warehouse space utilization is good and enough	83	3.29	1.283

The agency recently identified the most problem hindering about not availability of enough warehouse	83	2.92	1.327
There should be adequate lighting, temprature, and humidity control in warehouse	83	3.72	1.213
The adequate storage satisfied warehouse mannage practices	83	3.73	1.180
The location of warehouse is more satisfied the management of the warehouse	83	3.48	1.282
Warehouse satisfy the requirements of the customer with out much customization	83	3.52	1.426
Pharmaceuticals products enter and exit the warehouse quicky and efficiently on their way to the service delivery point	83	3.43	1.450
There are appropriate warehousing infrastructure like (e.g. palletes, shelving, good house keeping, safety control, quality control, for material handling management	83	3.54	1.364
The integretion of the warehouse data with supply chain application is not enough	83	2.61	1.257
Warehouse layout must include a greater ratio of aisle staging space to actual storage space	83	3.61	1.387
There is integration of warehouse data with supply chain applications	83	3.77	1.182
Valid N (listwise)	83		

Descriptive Statistics

	N	Mean	Std. Deviation
The agency warehouse management system based on RFID technology	83	2.40	1.178
The agency frequently using bar coding and radio identification (RFID) to increase logistic system	83	2.43	1.128
The agency use IT to manage the order picking activities of materials/inventories with in the warehouse	83	3.49	1.223
The agency uses to generate invoices for receipts and issued materials from the warehouse	83	3.76	1.206
The agency recently using wireless barcode scanners and RFID in warehouse	83	2.45	1.140
The agency is using IT to generate useful report easily to support decision making (real time data availability)	83	3.42	1.380
The level of IT usage for warehouse operations is minimal	83	2.52	1.291
The management recognize the impotance of IT for warehouse operations management	83	3.84	1.234
Inadequate staff knowledge and skill is a challenge for efficient utilization of ICT	83	2.84	1.410
Frequent electric interruption/outages make it difficult to use the ICT	83	3.54	1.319
The use of IT has improved employee productivity	83	3.61	1.267
There is use of electronic warehouse managements system	83	3.59	1.259
Recording the flow of products in and out of the warehouse (reciept& dispatch) is often paper based	83	3.59	1.279
Valid N (listwise)	83		

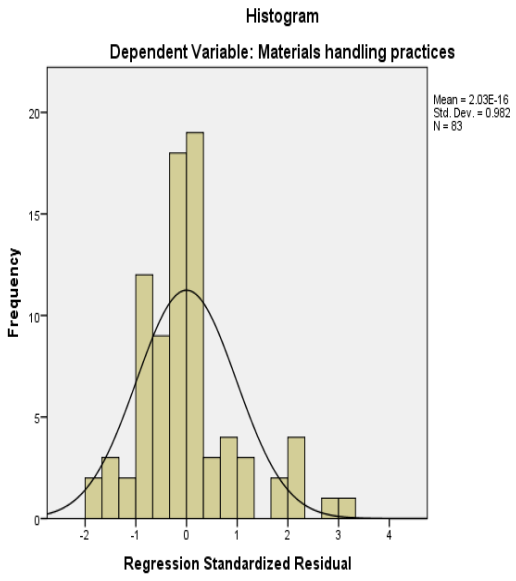
Descriptive Statistics

	N	Mean	Std. Deviation
The agency employees are well trained to effectively excute the material handling management practices	83	3.28	1.328
The agency employee involvement and training is effectively applied	83	3.00	1.353
The employee involvement system training implimentation is fully applied	83	3.23	1.337
The agency has system of meetings between head master or superiors and all staff for whom they are responsible	83	3.75	1.218
The agency encouraging the developmment of knowedge&sskills of employees and their team work	83	3.64	1.340
The agency has involved related employees with related job	83	3.48	1.426
The agency have sufficient human resource in all departments	83	3.30	1.323
The agency train employees for capacity building	83	3.36	1.367
The agency strengthening the potential of employees by developing their skills and responsibility	83	3.40	1.361
There is allocating right number of people in right place to produce quality work	83	3.46	1.213
The agency empower their people, build organizations as team, develop human resources on all levels	83	3.29	1.427
The agency motivate workers to participate in team work in order to achieve quality	83	3.37	1.350
The agency strengthening the potential of employees by developing their skills and responsibility	83	3.37	1.454

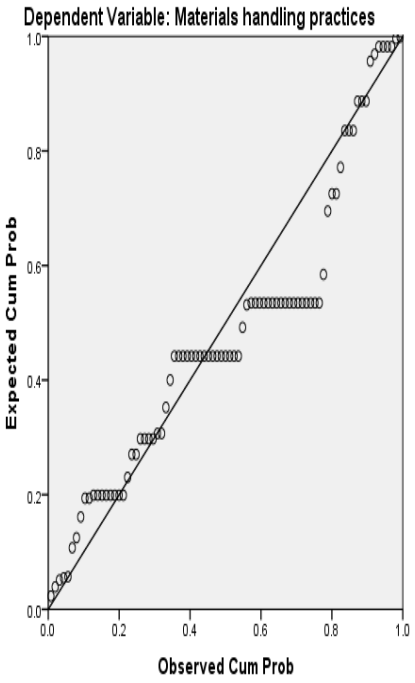
the agency training their employees for best performance of the organization	83	3.52	1.365
Valid N (listwise)	83		

Descriptive Statistics

	N	Mean	Std. Deviation
There is mechanical materials handling practices in the warehouse	83	3.41	1.307
High load materials lifted with a forklift to put at the right locations	83	3.53	1.417
Materials safety kept in the warehouse	83	3.31	1.448
Materials are repair and maintain regularly with fixed interval	83	2.82	1.363
The warehouse infrastructure suits for materials handling practices	83	3.59	1.298
Materials handling practiced at the lowest cost	83	3.08	1.363
Materials are properly handled inthe warehouse	83	3.17	1.395
Valid N (listwise)	83		



Normal P-P Plot of Regression Standardized Residual



Scatterplot

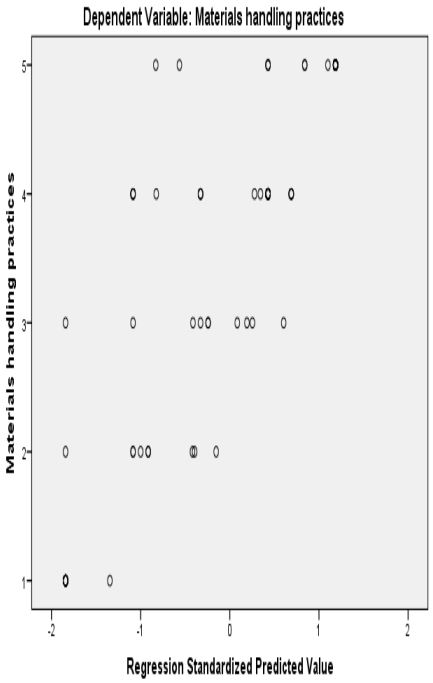


Table A3 The *t*-distribution

The table gives critical values of t for significance at various levels, in a two-tailed/non-directional or a one-tailed/directional test, for different numbers of degrees of freedom. These critical values are the values beyond which lies that proportion of the area under the curve which corresponds to the significance level.

	Significance level: two-tailed/non-directional				
	0.20	*0.10*	*0.05*	*0.02*	*0.01*
Degrees of freedom	*Significance level: one-tailed/directional*				
	0.10	*0.05*	*0.025*	*0.01*	*0.005*
1	3.078	6.314	12.71	31.82	63.66
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.326	2.576

Table A9 The Pearson product–moment correlation coefficient

The table gives the critical values of the Pearson product–moment correlation coefficient, r, for different numbers of pairs of observations, N. For significance, the calculated value of r must be *greater than or equal to* the critical value.

	Significance level: two-tailed/non-directional			
	0.20	*0.10*	*0.05*	*0.01*
	Significance level: one-tailed/directional			
N	*0.10*	*0.05*	*0.025*	*0.005*
3	0.951	0.988	0.997	1.000
4	0.800	0.900	0.950	0.990
5	0.687	0.805	0.878	0.959
6	0.608	0.729	0.811	0.917
7	0.551	0.669	0.754	0.875
8	0.507	0.621	0.707	0.834
9	0.472	0.582	0.666	0.798
10	0.443	0.549	0.632	0.765
11	0.419	0.521	0.602	0.735
12	0.398	0.497	0.576	0.708
13	0.380	0.476	0.553	0.684
14	0.365	0.458	0.532	0.661
15	0.351	0.441	0.514	0.641
16	0.338	0.426	0.497	0.623
17	0.327	0.412	0.482	0.606
18	0.317	0.400	0.468	0.590
19	0.308	0.389	0.456	0.575
20	0.299	0.378	0.444	0.561
21	0.291	0.369	0.433	0.549
22	0.284	0.360	0.423	0.537
23	0.277	0.352	0.413	0.526
24	0.271	0.344	0.404	0.515
25	0.265	0.337	0.396	0.505
26	0.260	0.330	0.388	0.496
27	0.255	0.323	0.381	0.487
28	0.250	0.317	0.374	0.479
29	0.245	0.311	0.367	0.471
30	0.241	0.306	0.361	0.463
40	0.207	0.264	0.312	0.403
50	0.184	0.235	0.279	0.361
60	0.168	0.214	0.254	0.330
70	0.155	0.198	0.235	0.306
80	0.145	0.185	0.220	0.286
90	0.136	0.174	0.207	0.270
100	0.129	0.165	0.197	0.256
200	0.091	0.117	0.139	0.182

Table A10 The Spearman rank correlation coefficient

The table gives the critical values of the Spearman rank correlation coefficient, ρ, for different numbers of pairs of observations, N.

	Significance level: two-tailed/non-directional			
	0.20	*0.10*	*0.05*	*0.01*
	Significance level: one-tailed/directional			
N	*0.10*	*0.05*	*0.025*	*0.005*
5	0.800	0.900	1.000	—
6	0.657	0.829	0.886	1.000
7	0.571	0.714	0.786	0.929
8	0.524	0.643	0.738	0.881
9	0.483	0.600	0.700	0.833
10	0.455	0.564	0.648	0.794
11	0.427	0.536	0.618	0.755
12	0.406	0.503	0.587	0.727
13	0.385	0.484	0.560	0.703
14	0.367	0.464	0.538	0.679
15	0.354	0.446	0.521	0.654
16	0.341	0.429	0.503	0.635
17	0.328	0.414	0.488	0.618
18	0.317	0.401	0.472	0.600
19	0.309	0.391	0.460	0.584
20	0.299	0.380	0.447	0.570
21	0.292	0.370	0.436	0.556
22	0.284	0.361	0.425	0.544
23	0.278	0.353	0.416	0.532
24	0.271	0.344	0.407	0.521
25	0.265	0.337	0.398	0.511
26	0.259	0.331	0.390	0.501
27	0.255	0.324	0.383	0.492
28	0.250	0.318	0.375	0.483
29	0.245	0.312	0.368	0.475
30	0.240	0.306	0.362	0.467
35	0.222	0.283	0.335	0.433
40	0.207	0.264	0.313	0.405
45	0.194	0.248	0.294	0.382
50	0.184	0.235	0.279	0.363
55	0.175	0.224	0.266	0.346
60	0.168	0.214	0.255	0.331

Annex-II Questionnaire

JIMMA UNIVERSITY DEPARTMENT OF LOGISTICS AND TRANSPORTATION MANAGEMEN

Dears

My name is Umar Aba Gojjam conducting a study on factors affecting material handling practices at Ethiopian

Pharmaceutical Fund Agency (EPFA) Southwest Region Jimma, Ethiopia for the partial fulfillment of master's degree in logistics and Transportation Management in Jimma University. I would like to extend my deep appreciation to your company and you for the willingness and cooperation in undertaking this valuable research. Taking part in this study you will contribute towards alleviating factors affecting material handling practices. I request your cooperation to fill and respond truthfully for the asked Questions. If you have any question, you can contact me through 0917006562/0983931947.

Thanks!

PART ONE /ክፍል አንድ

1	**sex**	**Male/ ወንድ**	
		Female/ሴት	
	Your Current Position	Stock and Distribution Directorate Director	
		Revolving drug fund coordinator	
		Health program Coordinator	
		Warehouse manager	
		Stock and Distribution officer	
		Warehouse Supervisor	
		IT officer	
		other, please specify it	
	Respondent`s qualification	College Diploma	

	Levels	BA/ BSC	
		MA/MBA/ MSC and above	

PART TWO/ክፍልሁለት

የድርጅቱ ማቴሪያል አያያዝ አስተዳደር ስራ ላይ እንቂፋት የሆኑት ነገሮች፡በእንፎርሜሽን ተክነሎጂ ምክንያት፤ በመጋዚን አስተዳደር ምክንያት፤በሠራተኞችተሳትፎምክንያት

Factors affecting Material Handling management Practice: Information technology, Warehouses Management factors, Employee Involvement factors.

በእንፎርሜሽን ተክነሎጂ/IT/ ምክንያት አስመልክቶ፤ የእንፎርሜሽን ተክነሎጂ/IT/ አጠቃቀም ስራ በፈንድ እና መድሃኒት አቂርቦት ድርጅት ዉስጥ ያለዉ ሁኔታ በእርሶ ስምምነት ደረጃ እባክ(√) ምልክትአርጉት

2.1 Regarding level of information technology (IT) utilization in warehouse operations at pharmaceuticals fund and supply agency; please put the mark (√) on your level of agreements.

S/N	Information Technology Factors	Strongly disagree **አጥብቆአልተስማማም**	disagree **አልተስማማም**	not sure **እርግጥ ኛአይደለም**	Agree **አስማማለዉ**	Strongly agree **አጥብቆእስማማለው**
		1	2	3	4	5
IT-1	The Agency Warehouse management system based on RFID technology **የድርጅቱየመጋዚንአስተዳደርዘዴ RFID technology ላይመሰረትሆኖነዉ**					
IT-2	The Agency frequently used Barcoding and radio identification (RFID) to increase logistics system					

	ድርጅቱ የ logistics system ለማሳደግሁልግዜBarcodingእና radio identification (RFID)ዘዴይጠቅማል					
IT-3	The agency is using information technology (IT) to manage the order picking activities of materials/inventories within the warehouse የድርድቱመጋዚንዉስጥማትሪያልኞችንበተርታብማስቀመጥበእን ፎር መሸንቴክኖሎጂይጠቀማለ፡፡					
IT-4	The agency is using information technology (IT) to generate invoices for receipts and issued materials from the warehouse ድርጅቱፋክቱርለመጽሃፍወይምለክፍያመላክእንፎርመሸንቴክ ኖሎጂይጠቀማ					
IT-5	The Agency recently using wireless barcode scanners and RFID in Warehouse. አጀንሲበአሁኑሰዓትመጋዚንዉስጥ wireless barcode scanners and RFID እየተጠቀመነዉ					
IT-7	The agency is using information technology to generate useful report easily to support decision making(real time data availability)					
IT-8	The level of information technology usage for warehouse operations is minimal ድርጅቱመጋዚን /ወርሃዉስ/ዉስጥ የ እንፎርመሽንቴክኖሎጂአጠቃቀምአንስትኛነው					
IT-9	The management recognize the importance of information technology(IT) for warehouse operations management					

IT-10	Inadequate staffs knowledge and skill is a challenge for efficient utilization of information technology (ICT) **በቂ ያልሆኔ የመስሪያቤቱ የሰራተኞች እዉቀት እና ችሎታ ለእንፎርመሽን ቴክኖሎጂ ብቃት እና አጠቃቀም ላይ እንቂፋት ያመጣል።**					
IT-11	Frequent electric interruption/outages make it difficult to use the information technology (ICT) **ብዙ ግዜ የእለክትሪክ ብልሽት ለእንፎርመሽን ቴክኖሎጂ አጠቃቂም ላይ ያስቸግራል።**					
IT-12	The Use of information technology has improved employee productivity **የእንፎርመሽን ቴክኖሎጂ አጠቃቂም የሰራተኛ ምርታማነት አሻሽሉዋል።**					
IT-13	There is the use of electronic warehouse management systems(WMS). **ድርጅቱ ዉስጥ የኤሊክትሪክ ወርሃዉስ አያያዝዘዴ**(WMS) **አለ።**					
IT-14	Recording the flow of products in and out of the warehouse (receipt and dispatch) is often paper-based. **ማቴሪያሎችወደ** warehouse **እና ከ** warehouse **ወደ ዉጭ ስወጡ ብዙ ጊዜ የሚመዘገቡት በ ወረቀት ነዉ።**					

2.2 RegardingWarehouses Management Factorson the material handling management practices at pharmaceutical fund and supply agency; please put the mark (√) on the level of your agreements.

የመጋዚን አስተዳደር በተመለከተ በማቴሪያል አያያዝ ላይ ያለዉ ንእንቅፋት እርሶ ያሉትን ሃሳብ እባክ(√) **ምልክትአርጉት**

S/N	Warehouses Management Factors **በመጋዚንአያያዝሚክንያትየሚመጡትነገሮች**	Strongly disagree **አጥብቆአል ተስማማም**	disagree **አልተስማማም**	not sure **እርግጥኛ አይደለም**	Agree **አስማማለዉ**	Strongly agree **አጥብቆ እስማማለው**

		1	2	3	4	5
WM-1	There is enough warehouse space during inbound and outbound transportation. በመግቢያእናበመዉጫሂዴትግዜበቂየ መጋዚን					
WM-2	A warehouse management system uses information to create visibility of the warehouse's inventory. የመጋዚን አያያዝ ዘዴዉ ስጥ IT የሚጠቀሙት መጋዚን ዉስጥ ያለዉ እንቨንቴሪዎች በጥሩ እንዲታወቅ ሁኔታ ለመፍጠር ነው፡፡					
	Warehouses are poorly designed with inadequate storage space and conditions. የመጋዚኑ ዲዛይን ጥሩ ያልሆኔ ና ለማጠራቀሚያ ቦታ የማይበቃ ሁኔታ ነውያለዉ፡፡					
WM-4	The warehouse space utilization is good and enough የመጋዚኑ ለአጠቃቀም ጥሩ እና					
WM-5	The Agency recently identified the most problem hindering about not availability of enough warehouse. ድርጂቱ ብዙ ችግሮች በአሁን ግዜ በቂ ለይቶ					
WM-6	There should be adequate lighting, temperature, and humidity control in warehouse መጋዚኑ ዉስጥ በቂ ብርሃን ፤መጠኛኛ ሙቀት እና እርጥበት መቆጣጠርያ መኖር አለበት፡፡					
WM7	The adequate storage satisfied warehouse management practices. መጋዚኑ በቂ ቦታ መኖሩ ለመጋዚኑ ስራ ሚቹሁ ኔታ ፈጥሩዋል፡፡					
WM-8	The location of warehouse is more satisfied the management of warehouse. የመጋዚኑ አቀማመጥ ለማገዚኑ አያያዝ ዘዴ ብዙ					

	እራካታ ሰቶአል፡፡					
WM-9	Warehouse Satisfy the requirements of the customer without much customization መጋዚኑ ለደንበኛ የሚያስፈለጉ ሁኔታዎች ለማሙላት					
WM-10	Pharmaceutical Products enter and exit the warehouse quickly and efficiently on their way to the service delivery point. መድሃኒት እና የተለያዩ የፋርማሲስቲካል አይነቶች ወዴ መጋዚን ሲገቡ እና ከመጋዚን ወጡ በየመድረሻ ቦታቸዉ ለመድረስ በፍጥነት ና በቅልጥፊና ሁኔታ ነው፡፡					
WM-11	There are appropriate warehousing infrastructurelike(e.g., pallets, shelving),good housekeeping, safety, quality control, and for material handling management መጋዚኑ ለ ማቴሪልአያያዝ ና መስተዳደርተስማሚናመሰረታዊነገሮችየተሞላነዉ፡፡					
WM-12	The integration of the warehouse data with supply chain applications is not enough. የመጋዚንስራና የ supply chain applicationsአንድነት					
WM-13	Warehouse layout must include a greater ratio of aisle/መተላለፊያ/ and staging space to actual storage space. የመጋዚኑአቀማመጥበግድየተወሰነመጠንገደብመተላ					

	ለፍያእናማረፊያቦታመኖርአለበት፡፡					
WM-14	There is integration of the warehouse data with supply chain applications					

2.3. Regarding **Employee Involvement factors**at pharmaceuticals fund and supply agency; please put the mark (√) on the level of your agreements.

በድሪጂቱዉስጥየሠራተኞችተሳትፎምክንያትአስመልክቶያሎትንሃሳብበእርሶስምምነትደረጃእባኮ (√) ምልክትአርጉት

S/N	Employee Involvement factors በሠራተኞችተሳትፎምክንያት	Strongly disagree አጥብቆአልተስማማም	disagree አልተስማማም	not sure እርግጥኛአይደለም	Agree አስማማለዉ	Strongly agree አጥብቆ እስማማለው
		1	2	3	4	5
EI -1	The Agency employees are well trained to effectively execute the Material handling management practices.. **የድርጅቱ ሰራተኞች የማቴሪል አያያዝ ስራ ለይ በጥሩ ሁኔታለማስፈጸም በደንብ የሰለጠኑ ናቸው**					

EI -2	The Agency employee-involvement and training is effectively applied. **የድርጂቱ ሠራተኞች ተሳትፎ እና የአቂም ግንባታቸዉ እ ንደሁም ሰልጠና በደንብ የወሰዱ ናቸዉ፡፡**					
EI- 3	The employee involvement system training implementation is fully applied. **ሰራተኞች ተሳትፎአቸዉ ና የሰልጠና ዘዴ ሙሉ በሙሉ ስራ ላይ የዋለ ነዉ፡፡**					
EI -4	The Agency has system of meetings between Headmaster or superiors and all staff for whom they are responsible. **ድርጂቱ በከፊተኛ መሪዎች ወይም አለቆች ና ሙሉ ስታፍ ሰራተኞች መሃል ያለዉ ግንኙነት ዘዴ ለ መፍጠር ሃላፊነት አለዉ፡፡**					
EI -5	The Agency encouraging the development of knowledge and skills of employees and their teamwork **ድርጅቱ የሰራተኞች እዉቀት እና ችሎታን ለማሳደግ የ ህብረትስራ/teamwork/ ዘዴ እያበረታታ ይገኛል፡፡**					
EI- 6	The Agency has involved related employees with related job **ድሪጂቱ ተመሳሳይ ስራ ለተመሳሳይ ሰራተኛ ለይቶ አስ ቀምጡአል፡፡**					

EI-7	The Agency have sufficient human recourse in all departments. **ድሪጂቱ በሁሉም ክፍል ዉስጥ በቂ የሰዉ ሃይል የተሞላ ነው፡፡**					
EI-8	The Agency training employees on Capacity building **ድሪጂቱ የሰራተኞቹ አቂም ግንባታ ለማሳደግ**					

	ስልጠና ይሰጣል፡፡					
EI-9	The Agency strengthening the potential of employees by developing their skills and responsibility ድርጂቱ የሰራተኞች አቀም፤ ችሎታቸዉን ና ተጠያቂነታቸዉን እያሳደገነዉ					
EI-10	There is allocating right number of people in the right place to produce quality work.					
	ድርጂቱ ዉስጥ ሰራተኞች በትክክልኛዉ የስራመ ደባቸዉ ላይ የተመደቡት ጥራት ያለዉ ዉጤት ለ ድሪጂቱ እንደሚያመጡት ነዉ፡፡					
EI-11	The Agency empower their people, build organizations as teams, and develop human resources on all levels ድሪጂቱ ሰራተኞቻቸዉ በቅነጅት ፤በአንድነት እና በሁሉም ደራጃ የሰዉ ሃይል ያሳደጋል፡፡					
EI-12	The Agency motivate workers to participate in team-work in order to achieve quality ድርጂቱ ሰራተኞቹ በቅነጀት ና በአንድነት እነዲሰሩ በማድረግ በስራቸዉ በጥራት ና ለድሪጂቱ ከፈተኛዉጠት እንደሚያመጡ ማበረታቻነገሮችያደርጋል፡፡					
EI-13	The Agency strengthening the potential of employees by developing their skills and responsibility ድሪጂቱ የሰራተኞችን ክሂሎች ለማጠናከር					

	ችሎታቸዉን እና ሀላፊነታቸዉን ስለወጡ ነዉ።					
EI-14	The Agency training their employees for best performance of the organization ለድሪጂቱሰራተኞችን ለጥሩአፈ ጥሩ ስልጠና እየሰጠ ነዉ።					

Annex-III In-depth Interview

INTERVIEW QUESTIONS

FOR MANAGERIAL BODY/HIGHER OFFICIALS OF THE AGENCY

1. How do you evaluate the material handling practices of the agency on the practical aspects?

- Information technology factors_____
- Warehouse management factors_____
- Employee Involvement factors _____

1. What likes the trends materials handling practices of the agency on supporting the performance pharmaceuticals supply chain?
2. What the agency faced challenges/bottlenecks on its material handling practices?
3. Any other points to be mentioned on the agency material handling practices and its influencing factors_____

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