ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE UNIT OF LOGISTICS AND SUPPLLY CHAIN MANAGEMENT

EFFECT OF ORDER PICKING PRACTICE ON WAREHOUSE PERFORMANCE; THE CASE OF PHARMACEUTICALS FUND AND SUPPLY AGENCY ADDIS ABABA BRANCH – EMPLOYEES' PERSPECTIVE

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A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE FOR PARTIAL FULFILMENT OF THE REQUIREMENT OF MSATERS DEGREE IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Advisor

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Addis Ababa

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Declaration

I, the under signed, declare that this thesis entitled *"The effect of order picking practice on warehouse performance, a case of Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch – Employees' Perspective"* is my original work and has not been presented for a degree by any other person, and all the source of the material used for this thesis have been duly acknowledged.

Declared by:

Manayeh Wubalem Fikade

_____

Date and Signature

Statement of Certification

This is to certify that the thesis carried out by **Manayeh Wubalem Fikade** on the topic entitled *"The effect of order picking practice on warehouse performance, the case of Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch – Employees' Perspective"* is his original work and is suitable for submission of the award of Masters of Art Degree in Logistics and Supply Chain Management

Advisor

Fisseha Afework (Ast. Prof.)

_____

Date & Signature

ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE

"The effect of order picking practice on warehouse performance, the case of Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch – Employees' Perspective"

Approved by Examining Committee

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Abstract

Nowadays, the customer needs in terms of order accuracy, and response time, order frequency, order quantity and order size have dramatically changed. All these needs of a customer may be affected by one main warehouse operation, order picking, as it is a central function of warehouse logistics and may have significant influence on warehouse performance. In this specific study the effect of order picking practice on warehouse performance, a case of Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch – Employees' Perspective, three indicators of order picking were used, namely; quality, time and productivity as these indicators are the best to measure the effect of order picking practice on warehouse performance. As an introduction order picking and warehouses are dealt with in brief based on the most recognized literature. Having small number of study subjects, the study employed census method for population and sampling. The methodology used for this specific study was both quantitative and qualitative method of analysis and case study as a study design. Questionnaire was used as a mode of data collection. The result from the study showed that all of them have huge impact on the warehouse performance because if we see quality, as it is shown in the study the quality measuring entities showed that there was a quality problem in order picking practice. Time indicator likewise affects the warehouse performance as the order picking is the longest time taking process as compared to the other operations and it is not in the best interest of customers. And finally when we see productivity indicator, the space utilization of the warehouse is not as it is expected from an agency whose one of the core processes is warehousing. To this end the study advocates working on researches like this in detail so that we can know what really is the problem with our warehouses and on the ground, a lot has to be done to improve the order picking practice in turn improving the warehouse performance.

Key words: Order Picking, Warehouse, Performance

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List of Acronyms

SKU - Stock Keeping Unit

PFSA- Pharmaceuticals Fund and Supply Agency

HIV/AIDS – Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome

STI – Sexually Transmitted Infection

TB – Tuberculosis

CHAPTER ONE

INTRODUCTION

1. Background of the study

Order picking is one of warehouse operations and is defined as a process of retrieving items from storage locations in response to a specific customer request; it is the most laborious and the most costly activity in a typical warehouse, with up to 55% of warehouse total operating costs (Tompkins et al. 2003). Due to this warehouse picking is the attracting area to look in to when we think of productivity improvements and potential cost savings (de Vries, de Koster and Stam, 2016)

The concept of warehouses came with the evolution of this world. With the progress in trade all over the world the importance of warehouse has also increased and the storage level of products increased because of the manufacturing and due to the purchasing power of the human beings. With world trade expanding the necessity for commercial warehouses increased and warehouses were mostly built on ports. The first commercial warehouse was built in Venice (Younis. et al; 2013).

Warehousing can be defined by three functions: receiving goods from a source, storing goods until they are needed by a customer (internal or external), and retrieving the goods when requested (Tonelli. et al; 2003). Warehouses nowadays are playing a pivotal role in the success and/or failure of business, as they are playing a critical intermediate role in between supply chain members, affecting both supply chain cost and service (Faber, N, 2015). The functions of warehousing remain the same and successful warehouse layouts must accomplish the following objectives, regardless of material being stored: maximize the use of space, maximize the use of equipment, maximize the use of labor, maximize accessibility to all items, and maximize protection of all items (Tonelli et al; 2003).

As these warehouses are for storing/warehousing different kinds of goods, when these goods arrive at the inbound dock, they are received, and they are placed or transferred to storage locations where they are stored and when the warehouse operatives receive orders from the

customers, these goods are to be retrieved from their storage locations for being dispatched to the customer who brought the orders (M. Bataineh and M. Khasawneh, 2016).

For warehouses to function well, there are warehouse operations which are performed on a daily basis in a warehouse, so there are four main warehouse operations; receiving, storage, order picking and shipping/dispatching in this study I am going to focus on order picking (Sooksaksun, N., Kachitvichyanukul, V, 1999).

Nowadays, the customer needs in terms of order accuracy, and response time, order frequency, order quantity and order size have dramatically changed with the global changes and new economic trends (Accorsi. et al; 2014). All these needs of a customer may be affected by one main warehouse operation, order picking, as it is a central function of warehouse logistics and has significant influence on warehouse performance (Rammelmeier, Galka, Günthner, 2011)

Warehouse performance improvement is in the form of fast and lower cost operations: to remain competitive warehouses must receive, organize, pick and dispatch/ship products faster to keep them moving to the customer through the supply chain to make sure that the customers receive their orders when they need them. Order picking is critical to each supply chain, because underperformance results in an unsatisfactory customer service (Long processing and delivery times, and incorrect shipments), and higher costs from labor cost, and cost of additional or emergency shipments (Henn et al., 2013). As stated earlier order picking constitutes around 55% of all warehouse costs, making order picking the most important warehouse operation that warehouses must focus for performance improvement. (Bataineh and Khasawneh, 2016).

As this study focuses on an agency which acts as a distribution center of pharmaceuticals and medical supplies for health facilities in Addis Ababa and regions around Addis Ababa, pharmaceuticals and medical supplies are special commodities in the logistics and supply chain management as their quality and facticity will be related to people's life safety, in relation to this countries have strict laws and regulations on the administration of Pharmaceuticals and Medical Supplies, and present strict requirements on Pharmaceuticals and Medical Supplies warehouse management (Xiaohuan X. et al; 2016)

All Pharmaceuticals and Medical Supplies have a defined shelf life and need a precise warehousing condition and these Pharmaceuticals and Medical Supplies require balance in between the availability of them and service demand from the public. The proper storage of Pharmaceuticals and Medical Supplies ensures their safety, efficacy, stability and quality; this can be achieved partly by storing Pharmaceuticals and Medical Supplies according to their specific storage condition separate from other non-Pharmaceuticals and Medical Supplies (Gizat Mola Kassie, Samson Mamo, 2014)

1.1. Overview of Pharmaceuticals Fund and Supply Agency (PFSA)

Pharmaceuticals Fund and Supply Agency, PFSA, is a legal entity established under the law of the Federal Democratic Republic of Ethiopia Government to overcome the problems and ensure uninterrupted supply of Pharmaceuticals and Medical Supplies to the public at an affordable price. The Pharmaceuticals Fund and Supply Agency was established in September 2007 by proclamation No. 533/2007 as part of Pharmaceutical Logistic Master Plan implementation with the objectives of;

I. To enable public health institutions to supply quality assured essential Pharmaceuticals and Medical Supplies at affordable prices in a sustainable manner to the public
II. To play complementary role in developmental efforts for health services expansion and strengthening by ensuring enhanced and sustainable supply of Pharmaceuticals and Medical Supplies
III. 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

The agency under its umbrella has nine directorates;

a. Audit directorate
b. Management information system
c. Women and youth affairs
d. Ethics liaison directorate

e. Public relations
f. Branches coordination
g. Human resources
h. Storage and distribution
i. Forecasting and capacity building (PFSA, 2017).

1.2. Statement of the problem

Order picking is a major logistic process in a warehouse, for this it can be considered as the main influencer of customer satisfaction. There are errors in order picking specially in manual man-to-goods picking system. So the errors can be miss pick, wrong quantity, omission error, and condition error (Rammelmeier, Galka, Günthner, 2011).

Order picking consists of receiving orders by each picker, traveling to the location of each item on the order, picking and then delivering the collected items to the dispatching area. In all these activities travelling routs, restrictions, and policies can affect the total processing time (Bataineh and Khasawneh, 2016). Travel time is determined largely by two factors: routing policies (for calculating a path that visits all required locations) and storage assignment policies (for assigning storage locations to incoming products) (Dekker, Roodbergen and Kalleveen, 2010).

The organization of order picking operation directly impacts the performance of distribution centers and there by the performance of the supply chain. Between the times an order is released and to the warehouse and the time it takes to reach its destination, there is ample opportunity for errors in both accuracy and completeness, not to mention time lost (De Koster, Le-Duc and Roodbergen, 2007).

Pharmaceuticals Fund and Supply Agency, as stated earlier is an agency established for the purpose of distributing pharmaceuticals and medical supplies to the public through health facilities. As a result warehousing is one of the main core processes of the agency and it is a must to store pharmaceuticals and medical supplies until the facilities come and collect what is necessary for their consumption. Taking this in to consideration the agency failed to conduct studies on how to improve the performance of the vast majority of the warehouses which are located all over the country. Considering the gaps mentioned before, this study tried to determine

the effect of order picking practice on the performance of the warehouses of the agency focusing on only Addis Ababa branch according to the employees working in this warehouses, as the warehouses of the agency are managed traditionally and the agency's fund rests on these pharmaceuticals and medical supplies all in all, the researcher feels it is necessary to conduct studies like this one to improve the performance of these warehouses.

1.3. Research questions

It is the following questions that this study tried to answer:

1. What is the level of order picking practice in the warehouses of Pharmaceuticals Fund and Supply Agency Addis Ababa Branch in relation with warehouse performance?
2. Which order picking indicator mostly affects the warehouse performance of Pharmaceuticals Fund and Supply Agency Addis Ababa Branch from the perspective of the employees?
3. What are the challenges faced by warehouse managers and operators in practicing efficient order picking?

1.4. Research objectives

1.4.1. General objectives

The general objective of the study is to determine the effect of order picking practice on warehouse performance of Pharmaceuticals Fund and Supply Agency Addis Ababa branch based on the perspective of the employees.

1.4.2. Specific objectives

The specific objectives of the study are:

I. To determine the level of order picking practice in the warehouses of Pharmaceuticals Fund and Supply Agency
II. To determine the order picking indicator that mostly affects the warehouse performance according to the employees

III. To identify the challenges faced by warehouse managers and operators in fulfilling efficient order picking

1.5. Significance of the study

Researches in relation with effects of order picking are hard to find in countries like Ethiopia, as topics like this are overlooked. But studying and proving the effect of order picking on warehouse performance is great for the field as well as it may lead the way for the experts in the field to consider studying it in detail and change the performance of warehouses of Pharmaceuticals Fund and Supply Agency and the whole active warehouses in the country. Moreover, order picking is one of the main warehouse operations and is considered to take the biggest share in affecting the performance of a warehouse. So, looking at it in detail may bring about changes in performances of warehouses, as it is necessary to look from the bottom to see the big picture or else looking only the big picture may not let us know the root causes of failure to perform as is needed.

So the significance of this study is:

1. It is was conducted in partial fulfillment of master's degree in supply chain management,
2. As it has been tried to explain before studies like this one are very important in countries like ours'. Because, order picking is one of the very important warehouse operations. And it is necessary to study about order picking and its effect on warehouse performance.

1.6. Scope of the study

Pharmaceuticals Fund and Supply Agency, as stated earlier, is a distribution center for pharmaceuticals and medical supplies for health facilities of the country. The agency has seventeen branches all over the country, and Addis Ababa branch is one of these branches and is the biggest of all by the number of health facilities it serves. So, this study is about the effect of order picking practice on warehouse performance of Pharmaceuticals Fund and Supply Agency Addis Ababa branch based on the perspectives of the employees, which are divided in to two by health program and revolving drug fund. These warehouses are located in Akaki Kality, Nifas Silk Lafto and Yeka sub cities with a total of five warehouses including one cold room for vaccine and heat sensitive pharmaceuticals storage. The picking practices of these warehouses

were assessed based on how the practice is performed in the warehouses, its efficiency and accuracy.

1.7. Limitation of the study

The study was conducted in Pharmaceuticals Fund and Supply Agency (PFSA) Addis Ababa branch only. As a result it may not represent the order picking practices of the whole seventeen branches of the agency all over the country. This was the case because it was difficult to see all of the branches, as there is a budget constraint for that. Apart from this the order picking indicators that are going to be used in this study are only order picking quality, time and productivity excluding financial indicators in contrary to the recommendation by Arononovich etal, 2010 and Frazelle 2002. And the respondents are not from uniform educational background which may have contributed to the large data variance during analysis.

1.8. Definition of terms

Order picking: is a warehouse function dealing with the retrieval of items from their storage location in order to satisfy a given demand specified by the customer requests (Henn et al, 2013).

Warehouse: is a facility in the supply chain to consolidate products to reduce transportation cost, achieve, economies of scale in manufacturing or purchasing or provide value added processes and shorten response time (A, N. Subramanya and M. Rangaswamy, 2012).

Performance: is the accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed (businessdictionary.com, 2018).

1.9. Organization of the study

This study is organized in a way that it has introduction as the first chapter under which there are nine sub chapters. Namely: Background of the study, Statement of the problem, Research questions, Research objectives, Significance of the study, Scope of the study, Limitation of the study, Definition of terms and Organization of the study. Chapter two is about literature review, in which different previously made researches are reviewed in relation with this study. The next chapter is about Methodology, in which there are sub topics; Description of the study area, Research Approach, Research Design, Population and sample, Data sources and types, Data

collection procedures, Ethical consideration, and Data analysis. Chapter four is about Data analysis Interpretation and Discussion, Chapter Five is about summary, Conclusion and Recommendation

CHAPTER TWO

LITERATURE REVIEW

2. Theoretical Review

2.1. Order picking

2.1.1. The picking process

The picking activity is the most important operation in achieving efficient warehouse functioning (Khanzode and Shah, 2017). The picking area of order-picking warehouse consists of a number of aisles where items/articles are stored; either on racks, pallets, or directly on the ground, on both side of the aisles. Order pickers walk or drive through the warehouse in order to collect items requested by customers. They start at the depot, travel through the picking area, stop at the storage location of the respective articles, remove the required article quantity and return to the depot where they hand the picked items (Henn et al., 2013).

2.1.1.1. Classification of order picking

Order picking is a process of picking products from their storage locations to fill customer orders. This involves the scheduling and releasing of customer orders, the picking of items from their storage locations, and the disposal of the picked items to the dispatch area (Tompkins et al. 2003). The majority of warehouses employ humans for order picking, according to this order picking can be classified as picker-to-parts system, parts-to-picker system and put systems. The kind of order picking system used mostly all over the world is picker-to-parts system (De Koster 2008), where order pickers walk or drive along the aisle toward the items to be picked. Here, there are two types of picker-to-parts systems: low level and high level (man on board) picking (Yu. 2012).

In low level order picking, products are stored in bins or shelves, storage drawers in cabinets, or cartons on flow racks. The height of the storage system is limited to the reaching height of a human being. Order pickers pick the requested items from storage racks or bins, while traveling through the storage aisles. Low level order picking system is widely used in warehouses because of their low initial cost, easy installation and easy re-configurability, and low maintenance cost.

High level order picking systems employ high storage racks. Shelves or store cabinets can be stacked as high as floor loading, weight capacity, throughput requirement, and the height of the ceiling. Here, order pickers travel to the pick locations on board of a lifting order picking track. The machine stops automatically in front of the appropriate pick location and waits for the picker to finish picking. Compared to the low level order picking system the high level order picking system is higher in cost of installation, cost of maintenance, and low re-configurability (Yu. 2012).

The second type of order picking system is parts-to-pickers order picking system. Parts-to-pickers system is a kind of picking system where the automated storage and retrieval systems deliver the items to the stationary picker (Henn et al., 2013). The two most popular parts-to-picker systems are carousels and Automated Storage and Retrieval Systems. A carousel system consists of a number of bins and shelves that rotate either horizontally or vertically, control of this system is either by manual or automatic. Automated storage and retrieval system use aisle bound cranes travelling vertically and horizontally simultaneously in the storage aisle (Yu. 2012).

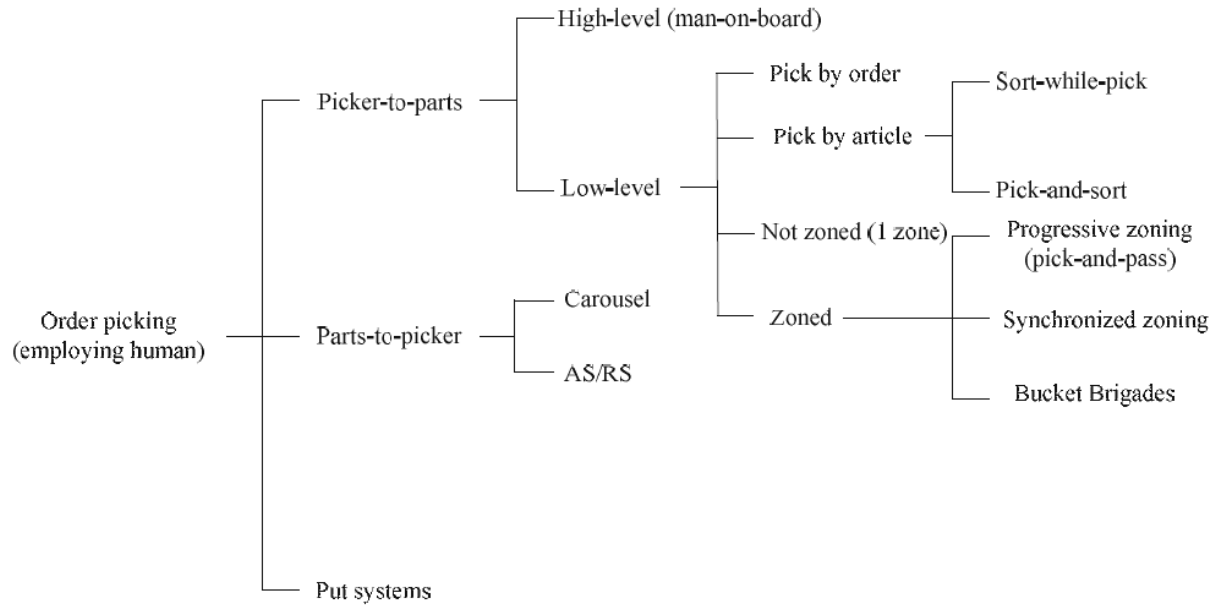

Figure 2.1: Classification of order picking systems (Adopted from Yu, 2012)

As more companies look to cut costs and improve productivity within their warehouses and distribution centers, picking has come under increased scrutiny. Order picking - the process of retrieving products from storage (or buffer areas) in response to a specific customer request - is the most labor-intensive operation in warehouses with manual systems, and a very capital-intensive operation in warehouses with automated systems. For these reasons, warehousing professionals consider order picking as the highest-priority area for productivity improvements (De Koster, Le-Duc and Roodbergen, 2007).

Picking policies determine which stock keeping units (SKUs) are placed on a pick list and subsequently retrieved from their storage locations by a single picker. Strict-order picking is a common policy where pickers complete a tour through the warehouse to pick all SKUs for a single order. This policy is easily implemented and order integrity is always maintained. Combining several orders into batches is an alternative policy that has been shown to reduce total picking time significantly. Zone picking is another policy that divides the warehouse into zones and allows pickers to retrieve SKUs from within a single zone. The major advantage of zoning include familiarity of each picker to his/her zone, shortening of travel distance due to smaller traversed area, reducing congestion and the case of administration and control. According to Petersen and Aese, some firms have combined batching and zoning in to wave picking, where each picker is responsible for SKUs in their zone for numerous orders (Petersen and Aase, 2004).

Depending on the picking strategy, zoning may be further divided in to; Progressive zoning, Synchronized zoning and Bucket Brigades. Under progressive zoning strategy each order is processed in only one zone at a time and an order is finished when the picker visits all the zones containing its line of items. This system is also called pick-and-pass system since orders are passed from one zone to the other.

Under the synchronized zoning strategy, all zone pickers can work on the same order (or normally a batch of orders) at the same time and then consolidate the order in a designated location as it is completed. There may be some idle time of zone pickers waiting until all other zone pickers finish the current order. This synchronization of pickers intends to keep the orders

from being mixed, and so to lessen the complexity of the following stages such as the accumulation and sortation.

A bucket brigade is a version of zoning where the workload, not a fixed break point, defines the zone. The bucket brigade concept initiates from the way of coordinating workers on a progressive assembling line. A balanced allocation of work will be automatically achieved if the workers are positioned from slowest to fastest along the line toward the direction of work flow. Bucket brigade can also be applied to order picking processes, assuming products are stored in a rack grouped in a line. Picking is done by pickers along the storage rack. When the last order picker (toward the flow of the picking line) completes an order, this picker pushes the order container away and walks back to take over the order of the previous order picker, who in turn walks back and takes over the order of the previous picker. The process continues until the first order picker begins a new order. Bucket brigade can be seen as a version of progressive zoning where the zone sizes are variable (Yu, 2012).

Petersen and Aese in their study on Improving Order Picking Efficiency with the Use of Cross Aisles and Storage Policies, found out that picker travel time is significantly affected by the placement of cross aisles in the warehouses. In their study; warehouses with random storage the use of cross aisle does result in less travel time than those warehouses that do not have cross aisles. In addition warehouses with across-aisle with evenly spaced cross aisles perform better than those warehouses with random storage and evenly spaced cross aisles. Third, within-aisle storage performs statistically better than across-aisle and random storage. More important is that within-aisle storage with no cross aisles, performs statistically better than across-aisle storage with cross aisles. The use of cross aisles does statistically reduce picker travel for within-aisle storage compared to warehouses with no cross aisles (Petersen and Aase, 2017).

2.1.1.2. Layout of picking area

The layout problem for a pick area concerns the determination of the number of blocks, the number of aisles in the pick zone, the length and width of the aisles in a block, and the position of the depot. The common goal is to find a best warehouse layout design with respect to some certain objective functions among the layouts, which fit a given set of constraints and requirements. The most common objective function is the travel distance, the number of aisles in

the pick zone, which has large impact on the pick and passes order picking system performance. The depot position at the zone influences the travel time of order pickers in the picking process (Yu, 2012).

According to Henn, et al, 2013, the implementation of an appropriate layout and a corresponding routing scheme is crucial for the efficient operation of an order picking warehouse. Wrong decisions cannot be changed immediately and therefore have a long term negative effect on profitability and customer service.

Henn et al, 2013, compared three different layout types and corresponding routing strategies for order picking warehouses and found out that which layout type provides the shortest expected tour length for different numbers of picks per tour and different assumptions concerning the demand distribution. So, the two block layout is superior for small number of picks, the single block layout is superior for large number of picks and the U-shaped layout has proven to be the best layout type for a wide range of medium sized numbers of picks and demand distribution. This layout requires significantly less space than the single block layout does (Henn et al, 2013).

2.1.2. Warehouse performance

Performance refers to the way in which work is done. There can be a good performance or a poor one (Liviu, Ana-Maria and Emil, 2009). As stated by Frazelle, warehousing is one of the factors which are responsible for business competitiveness. Businesses compete on the basis of financial, productivity, quality and cycle time performance. So it is important to hold warehousing accountable for these activities to go smooth. There are four quality indicators for warehouse performance two of which for inbound handling and the other to for the outbound handling of products, these indicators are: Put away accuracy (the percent of items put away correctly), Inventory accuracy (the percent of warehouse locations without inventory discrepancies), Picking accuracy (the percent of order lines picked without errors) and Shipping accuracy (the percent of order lines shipped without errors) (Frazelle, 2002).

Dr. Vipul Chalotra in his study identified that four factors affect warehouse performance and these factors are long lead time, poor warehouse layout, irregular deliveries, and improper forecasting of demand (Venul, 2013). Yu and De Koster in their study discussed the concept of dynamic storage, which can improve order throughput and reduce labor cost simultaneously due

to shorter travel in picking tours (Yu and De Koster, 2010). According to these two studies warehouse performance is affected if the storage practice is not as efficient as supply chain system expects. In behind order picking is affected by those factors stated by these two studies, in return order picking itself affects the warehouse performance all the times.

2.1.3. Why warehouse

A warehouse is a point in the supply chain where raw materials, work in process (WIP) or finished goods are stored for varied length of time. Warehouses can be used to add value to the supply chain in two basic ways: Storage (allows products to be available where and when it is needed) and Transport economies (allows products to be collected, stored and distributed efficiently). Warehouses only add value if the benefits of storing products in a warehouse is enough to offset the additional cost to be associated with carrying and inventory. Other potential benefit associated with storage include the following: Time bridging, which allows products to be available when it is needed; Processing, where for some products storage can be considered as a processing operation because the product undergoes a required change during storage; and Securing (Michael, 2015).

2.2. Empirical Review

2.2.1. Picking Quality

According to Tobias Rammelmeier, Stefan Galka, and Willibald A. Günthner, Active prevention of picking orders by employing pick-by-vision, picking process as one of the key operations of a warehouse, the logistic service and plays a great role in the customer satisfaction. In this study the researchers found out that the error rate in warehouses which perform conventional order picking is 0.26% in every order, which is comprised of different types of picking errors, like miss pick, wrong quantity, omission error, and condition error.

Tobias Rammelmeier, Stefan Galka, and Willibald A. Günthner, in their study identified that there are the effect of picking errors depends on time of their detection; `the first one is when the error is detected by the pickers themselves, according to them this type of error may not have customer relevance but it may have expense in terms of time and cost for their correction. The second type of error is when the error is detected while in an internal control that is when the outgoing inventory is inspected, this error is more laborious and it could lead to restocking the

wrongly picked items and generation of new order for the correct item. The third type of error is when the error is detected after the items leave the warehouse, are in the hands of the customer and are detected by the customer themselves, these type of picking errors may lead to complaint and the cost in managing these complains in short term. In the long term this can lead to loss of image and customer. On the other side there might be errors that might not be detected; these types of errors may have disastrous effect which may be explained by machine damages, loss of human life and endangering health.

2.2.2. Warehouse Space Utilization

Mingfei Yu and De Koster in their study on Enhancing Performance in order picking process by dynamic Storage system identified that dynamic storage system can substantially improve throughput and reduce labor cost at the same time, when compared to warehouses with conventional order picking system.

According to Petersen, C.G. and Aase, G.R. (2017) even and uneven placement of cross aisles in a warehouse with class based storage does not have statistical difference, but the addition of cross aisles does significantly reduce picker travel time than in warehouses without cross aisle.

2.2.3. Picking Time

Broulias, Marcoulaki and Chondrocoukis (2005) in their study on Warehouse Management for Improved Order Picking Performance: An Application Case Study from the Wood Industry, tried to measure the time taken by each activity in the picking process. In their study they divided the picking process in to four different activities; the first is the travel time required for the picker to reach the pick point, second, the search time required for the products to be found, third, the retrieval time required for the products to be retrieved, and fourth, the return time required for the picker to transport the product to the order point. And from their measurement they found out that the total time taken by all activities when they measured is 5.69min/m^3 and after modifications the total time taken by all activities became 2.86 min/m^3 which is 49.7% time reductions. And this result was cumulative from all activities because the time taken by an individual activity is reduced. The modifications were introduction of warehouse management system, improvement of the picking policies, application of optimal routing policies, changing

the location of fast moving products in the warehouse and extending the storage space to reduce the storage depth from four to two.

2.3. Conceptual Framework

Several types of indicators are developed for the measurement of different aspects of supply chain and its components, so I used indicators developed by Edward Frazelle (2002) for the measurement of warehouse performance which are directly associated to my type of study. The indicators are order picking quality which is measured by the order picking accuracy in quantity, item, expiry, and batch number. The other indicator was order picking time which can be measured by the four activities of the order picking process; the first is the travel time required for the picker to reach the pick point, second, the search time required for the products to be found, third, the retrieval time required for the products to be retrieved, and fourth, the return time required for the picker to transport the product to the order point, as it is stated by Broulias, Marcoulaki and Chondrocoukis (2005). The third indicator is order picking productivity which can be measured by units moved per person hour and storage space utilization as it has been stated by Edward Frazelle (2002). From this it is hypothesized that order picking practice affects the performance of warehouse performance.

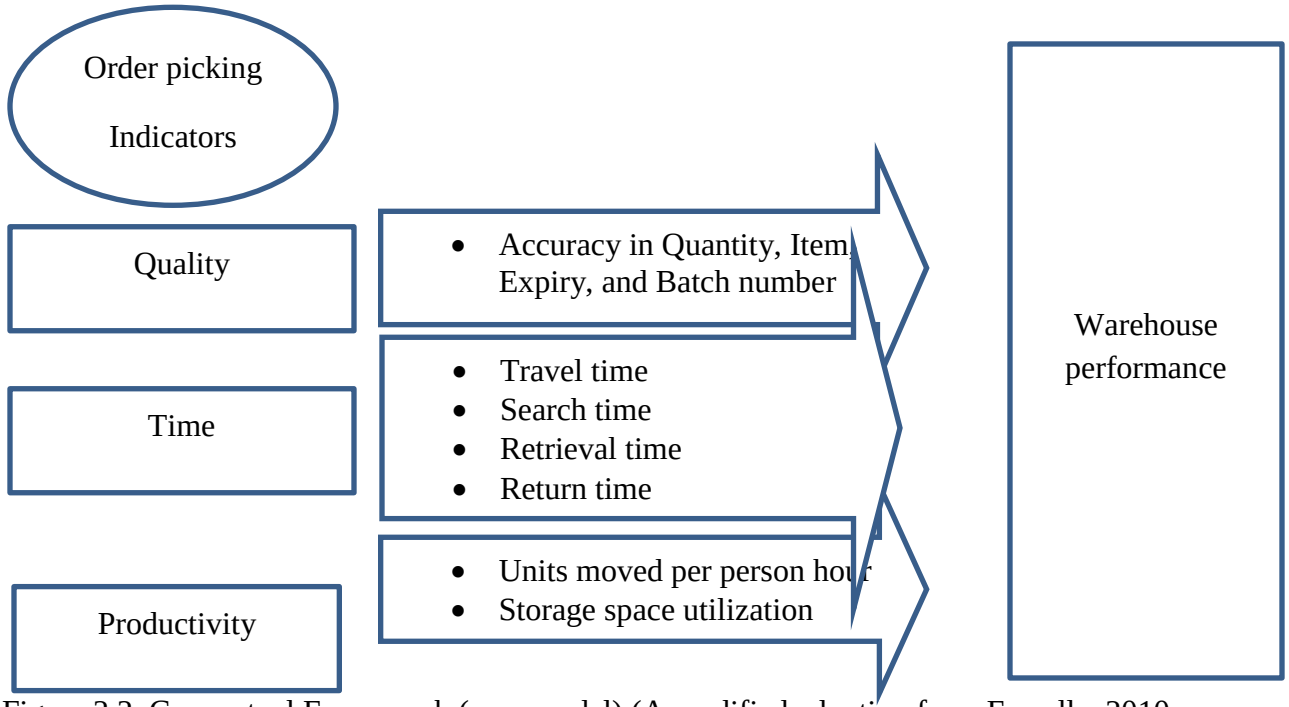

Figure 2.2. Conceptual Framework (own model) (A modified adoption from Frazelle, 2010

CHAPTER THREE

METHODOLOGY

3.1. Description of the study area

This study focused on effects of order picking practice in warehouses of Pharmaceuticals Fund and Supply Agency Addis Ababa branch using the perspective of employees. The main aim of the warehouse is to serve the health facilities of Addis Ababa and surrounding regions (Oromia, Amhara, and SNNP). For this to happen the agency asks all facilities every year to present their forecast for the coming fiscal year standing from the consumption of the year they are at, at the point of the report. So according to the request from the health facilities the agency buys Pharmaceuticals and Medical Supplies from different suppliers, be it international or local suppliers.

All the Pharmaceuticals and Medical Supplies bought from the suppliers stated before are stored in the warehouses the agency specified for this purpose until the facilities come and take their share. These warehouses also store Pharmaceuticals and Medical Supplies bought by aid organizations for the purpose of prevention and treatment of diseases like HIV/AIDS, Malaria, TB, Leprosy, STI, Neglected tropical diseases and for programs like Immunization and Family health.

As a result warehouses are playing a pivotal role in the agency as the agency itself is a big participator in the logistic and supply management of Pharmaceuticals and Medical Supplies all over the country. So determining the effects of order picking in the warehouses is very significant in relation with the fact that these warehouses are main sources of Pharmaceuticals and Medical Supplies for prevention or treatment of diseases in the country.

3.2. Research Approach

There are three types of research approaches; Quantitative, Qualitative and Mixed research approaches (Clark et al, 2008). For this particular study the researcher used both the quantitative qualitative research approaches, focusing more on quantitative approach. Quantitative research approach is a means for testing objective theories by examining the relationship among variables

(Creswell, 2008). These variables, in turn, can be measured, typically on instruments, so that numbered data can be analyzed using statistical procedures.

Quantitative research methods attempt to maximize objectivity, replicability, and generalizability of findings, and typically interested in prediction. Integral to this approach is the expectation that a researcher will set aside his or her experiences, perceptions and biases to ensure objectivity in the conduct of the study and the conclusions that are drawn (Michel R. Harwell, 2011)

Qualitative research methods focus on discovering and understanding the experiences, perspectives, and thoughts of participants. That is, qualitative research method explores meaning, purpose or reality. Qualitative research is usually described as allowing a detailed exploration of a topic of interest in which information is collected by a researcher through case studies, ethnographic work, interviews and so on (Michel R. Harwell, 2011).

3.3. Research Design

Identifying a research design is important because it communicates information about key features of the study (Michel R. Harwel, 2011). This study was conducted in warehouses of PFSA Addis Ababa Branch which are located in three sub-cities of Addis Ababa city (Nifas Silk, Akaki Kality and Yeka). And it was conducted starting from February till April.

The participants of this study were warehouse managers, warehouse operators, and storage and distribution officers. These subjects were presented with questionnaires to answer according to the instructions given.

The research design for this particular study was a case study method of research design. The researcher used this method because the data gathered from the participants was described in detail in relation to the purpose of the study and it is a fit for studies like this which are conducted on a single organization with small number of subjects of study as this type of research design is for studying small geographical areas or a very limited number of individuals as subjects of study. Case studies, in their true essence, explore and investigate contemporary real life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships (Fletcher R, et al (1997).

3.4. Unit of Analysis

Unit of analysis is the entity that is being analyzed in a scientific research. Determining and being cognizant of the unit of analysis of a research has pivotal role in any research endeavor. The unit of analysis of studies may be classified in to fewer categories or levels; individual level, group level, organizational level and social artifacts and social interaction level. It may not seem very significant to do so, but it, in fact, may help to see the hierarchical relations between the units of analysis possibilities that one can choose of, for his/her study (Serkan, 2010). So the unit of analysis for this particular study is the employees of the Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch who are working in the warehouses.

3.5. Population and Sample

The study area, as stated earlier was organization's warehouses where the staffs that have participated in the study are small in number. As a result the whole workers of the whole warehouses and those who have direct relationship with the warehouses have participated in the study which are; warehouse managers, warehouse operators, and Store and Distribution Officers have participated in the study, generally considering the whole practice of order picking, while considering the population. This means that the sampling technique is census method with the population number of sixty one subjects.

3.6. Data sources and types

Data is the means by which we present our findings in a research. Without which our research can be a waste of time. The data sources for this particular study were primary data which I, the researcher, have got from respondents of the study, by questionnaires. Because primary data constitute undoubtedly the purest data as these kinds of data are first hand and unfiltered (Salkind, 2010). The data types was of a quantitative type and some qualitative data are also available, as the research, itself, is both qualitative and quantitative, focusing on quantitative research.

3.7. Data collection procedures

3.7.1. Instrument development

Data was collected, as stated earlier, by using questionnaires which aim to gather all the information in regard to the study's aim, which is answering the proposed questions by measuring the measurement items that are quality, time and productivity based on five points Likert scale, which range from strongly disagree to strongly agree and additional quantitative questions.

The respondents were requested to select their choice of the scale based on their knowledge of the warehouse they are working in. having said this the questionnaire was developed on the basis of the research questions so that it can answer those questions as correctly as possible.

So as it has been explained the developed data collection instrument/questionnaire was disseminated among the respondents and data gathered from the respondents was used to be analyzed as a result of the study.

3.7.2. Instrument validity

Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are (Golafshani, N., 2003). It also is the strength of our conclusions, inferences or propositions. It involves the degree to which the researcher supposed to measure, or more simply, the accuracy of the measurement (Adams J., 2007). A pilot study was conducted to make the validity of the data collection questionnaire (instrument) a certainty before the actual data collection tool was dispatched to the responders.

3.7.3. Instrument Reliability

Reliability estimates the consistency of the measurement or more simply, the degree to which an instrument measures the same way each time it is used under the same conditions with the same subjects. Reliability is essentially about consistency. That is, if we measure something many times and the result is always the same, then we can say that our measurement is reliable (Adams J., 2007).

3.7.3.1. Reliability Test

Internal consistency of the items constituting the data gathering elements is checked by using Cronbach's alpha. As a result the resulting Cronbach's Alpha value of the items is put in the following table.

Table 3.1. Cronbach's Alpha

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
0.805	0.802	15

Source; Survey result 2018

As can be seen from the above table, the Cronbach's Alpha value is 0.805, which indicates a high level of internal consistency for this specific study. This is said because the least acceptable Cronbach's Alpha is 0.7 (Cronbach, 1951).

3.8. Variables and Measurement

For this specific study the variables were order picking and warehouse performance, in which we measured the effect of order picking practice on the warehouse performance of Pharmaceuticals Fund and Supply Agency Addis Ababa branch based on the perspective of the employees. In between these two variables the indicators for order picking which we measured were quality, time, and productivity. Which intern measured each indicator with intermediate indicators, so measured quality with order picking quantity, item, expiry, and batch number, the second indicator was time which we measured by travel time, searching time, retrieval time, and return time. The third indictor was productivity which we measured by units moved per person hour and space utilization of the warehouses which can be measured by other related intermediate indicators

3.9. Ethical consideration

In any research ethical consideration is vital, without which any research may be effective. For this specific research the participants are human subjects, so that ethical consideration is a must

and have to be taken with great care. The subjects while answering the questionnaires has to be assured that their identity will not be exposed whatsoever, before this there should not be a questionnaire part that asks the participants to put their names and the like, that exposes their identity. They were informed prior to take part in the answering of the questionnaires. And they also were informed about the aim of the study that is for partial fulfillment in Master of Art degree in Logistics & Supply Chain Management

Furthermore, the facility (Pharmaceuticals Fund and Supply Agency) was informed in advance about the study; where, when and how the study would be conducted.

3.10. Data Analysis

Data analysis is one of the essential parts of a research, as it is the data analysis that tells the output of the research we are working on. When working on data analysis a researcher should try not to be biased on what he/she is working on. Having this at hand the data analysis of this study was based on the replies from the study subjects, and these data was analyzed and interpreted using the available statistical method, IBM Statistics SPSS version 20 for this matter. As a result frequency tables, percentages and descriptive statistics such as mean and standard deviation of the respondents were used. And finally from this the detail interpretation and discussion of the results of the statistical analysis was provided.

CHAPTER FOUR

DATA ANALYSIS, RESULT AND DISCUSSION

4.1. Introduction

Data analysis, Result and Discussion is one of the main parts of a research paper, because the findings of the research are put in front so that anyone can read them. So this chapter is about answering the research questions one by one using the available data analysis tools, IBM SPSS version 20 for this matter. The data analysis begins with analysis of demographic information of the respondents followed by the main questionnaires which are intended to answer the research questions.

4.2. Demographic Information of the Respondent

As indicated in the preceding section of this study, the participants of this study were all warehouse managers, Storage and Distribution Officers and warehouse operatives. As these staffs are small in number all of them were taken in to participate in the study, in number they were sixty one (61), out of which fifty five (55) only filled and returned the questionnaire which makes the response rate 90.2%. The demographic information of the respondents is presented in the following table 4.1.

Table 4.1. Demographic Information of the Respondents

Variable	Choice	Frequency	Percent
Sex	Male	3	5.5
	Female	52	94.5
	Total	55	100
Age	18-25	18	32.7
	26-34	28	50.9
	35-44	5	9.1
	Above 45	4	7.3
	Total	55	100
Educational Status	Below college Diploma	28	50.9
	College Diploma	11	20

	University Degree	14	25.5
	Second Degree	2	3.5
	PHD and Above	0	0
	Total	55	100
	Storage and Distribution Officer	13	23.6
	Warehouse Manager	11	20.0
	Warehouse Operator	31	56.4
Current Position	Total	55	100
	Below one year	11	20.0
	1-5 years	25	45.5
	6-10 years	14	25.5
	Above 10 years	5	9.1
Year of Service	Total	55	100

Source; Survey result 2018

As it is indicated in the above table males dominate the respondents registering 52 (94.5%) of the respondents while females were 3(5.5%), the gender gap as such may be is because of the fact that the warehouse operatives work on jobs which may require physical appearance and strength, as they are the majority of the respondents. When we look at the age of the respondents the majority of the respondents were at the age of 26-35 with the frequency of 28 (50.9%) followed by respondents with the age of 18-24 which are eighteen (18) in number and account for 32.7%. Those with the age of 36-44 were 5 (9.1%), the least number of workers lie at the age of 45 and above which are four (4) in frequency and account for 7.3% of the respondents.

When we talk about educational status of the respondents, the first category in number was taken by those warehouse operators who have educational background of below college diploma and account for 28(50.9%), followed by those having university degree 14 (25.5%). The remaining are those with college diploma and second degree having frequency of 11(20%) and 2 (3.5%) respectively.

Considering the current position of the respondents the majority were warehouse operators registering 31 (56.4%) for this the questionnaire for these group of respondents was interpreted in to Amharic for their easy answering, followed by storage and distribution officers 13 (23.6%) and warehouse managers with the frequency of 11(20%).

With regard to the year of service for the respondents, the first rank is taken by those respondents with service year of 1-5 years with the frequency of 25 (45.5%), the next are those with the service year of 5-10 years with the frequency of 14 (25.5%), followed by those having the service year of below one year and those with the service year of greater than 10 years with the frequency of 11(20%) and 5 (9.1%).

4.3. Descriptive Analysis

Descriptive analysis was conducted in an attempt to answer the research questions and is used in to examine the mean and standard deviations of each of the measurement entities on the questionnaires which the respondents answered.

4.3.1. First research question

What is the level of order picking practice in the warehouses of Pharmaceuticals Fund and Supply Agency Addis Ababa Branch in relation with warehouse performance?

When we start from the first research question which deals with the status of order picking practice in the warehouses of Pharmaceuticals Fund and Supply Agency; Addis Ababa Branch. So this question can be answered by the three indicators of order picking which are quality, time and productivity. This question is tried to be measured to know the fact that there are customer complaints in the warehouses of the Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch. So this research question helps us to identify those complaints are for real from the perspective of the employees; the warehouse managers, warehouse operatives and storage and distribution officers.

Table 4.2. Mean and standard deviation of quality indicator for order picking

Quality indicator measurement entities	Mean	Standard deviation
While picking after receiving order from customers, most of the time errors arise in expiry date of the	2.65	1.34

products to be picked		
While picking after order received order from customers, most of the time the errors arise in batch No. of the products to be picked	3.13	1.19
While picking after receiving order from customers, most of the time errors arise in quantity of the products to be picked	2.78	1.33
While picking after receiving order from customers, most of the time errors arise in picking the wrong type of the item to be picked	2.42	1.24

Source; Survey result 2018

The mean values of the quality indicator measurement entities range from 2.42 to 3.13 with the standard deviation which range from 1.19 to 1.34. The lowest mean value is 2.42 and is of the picking error occurring due to wrong type of item to be picked followed by 2.65 which belong to order picking error which could occur due to expiry date of the product to be picked, the third one is 2.78 which is of the order picking error which could occur due to the quantity of items to be picked and the last one is 3.13, which is the mean value of order picking error which might have occurred due to batch number of the items to be picked.

The values of the mean of each of the quality measurement entities indicate that most of the time errors occur due to the fact that the warehouse operatives and the warehouse managers themselves put not too much attention on the batch number of the items to be picked in most order picking activities, but in reality if attention is not given to the batch number of each and every item in the warehouse it might bring a devastating. Because it is by batch number that we know if there is any mishap in the manufacturing of items specially pharmaceuticals which directly is used for the treatment or prevention of diseases that it goes to the system of individuals.

When we look at the mean for occurrence of error due to picking a wrong type of an item which is not listed in the picking order, it is 2.42. This tells us that the respondents of this question more or less agreed up on the fact that this kind of error is less likely to occur in their warehouse. But for the others the mean value lies in the middle, which tells us that they, the respondents, almost half of them agreed on the measurement entities, that errors occur and also almost half of them disagreed on the occurrence of errors due to the measurement entities. As a whole, this tells us that the order picking practice of Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch is not satisfactory.

Table 4.3. Time Measurement Entities

Time indicator measurement entities	Mean	Standard deviation
Mostly when order picking, the time taken by picking process is appropriate and it is in the best interest of customers	2.38	1.25
Mostly order picking takes the most of the time available as compared to other warehouse operations	3.7	1.24

Source; Survey result, 2018

The mean values for each of the measurement entities for time indicator measurement are 2.38 and 3.71. From the response it can be understood that the time taken by picking process is not appropriate and it was not in the best interest of customers who were served in the warehouses of PFSA, AA Branch. As the mean value for this measurement entity is 2.38, which is in the side of disagreeing to what is put in the questionnaire. This notion is strengthened by the mean value of time indicator measurement entity; time taken by order picking is higher as compared to other warehouse activities, which is 3.71, this mean value tells that the response from the respondents lies in the side of agreeing the fact that order picking takes more time as compared to other warehouse activities. What we can understand from this is that, the performance of the warehouses is being affected much because; they are not performing in the best interest of their customers and order picking is taking longer than any activity in the warehouse.

To look deeply inside the time indicator I tried to measure which time indicator takes the highest time from the total time taken by order picking.

Table 4.4. Time indicators

Time measurement indicators	Frequency	Percent
Travel time	15	27.3
Searching time	28	50.9
Retrieval time	10	18.2
Return time	2	3.6

Total	55	100

Source: Survey result, 2018

The majority of the respondents responded that the largest time share is taken by searching time with the frequency of 28 (50.9%), followed by travel time with the frequency of 15 (27.3%). The third time indicator that the respondents selected to take third longest time is retrieval time with the frequency of 10 (18.2%), return time being the last entity to take the smallest time as it is only selected by 2 respondents accounting 3.6%. It can be understood from this data that the agency (PFSA) has done little in making the warehouses easy for order picking letting it to take the smallest time to process order picking as this warehouse operation is the largest contributor to the better warehouse performance.

Table 4.5. Productivity Indicator

Productivity indicator measurement entities	Mean	Standard deviation
It is better to give one order picker multiple orders than giving him/her single order to process	2.64	1.46
The layout of the warehouse is comfortable for order picking	3.22	1.54
The warehouse is using its space efficiently and so that it stored the line of items as it should store.	2.87	1.33
Our customers think our picking practice is one of a kind	3.29	1.29
In our warehouse the warehouse operators are given batch of orders to pick at a moment	2.84	1.39
In our warehouse the pickers/warehouse operatives are given a single order to pick at a moment	3.34	1.29
In the warehouse the pharmaceuticals and medical supplies are stored properly according to appropriate bin location	3.22	1.47
The storage of pharmaceuticals and medical supplies are easy for order picking process	3.04	1.33
In the warehouse the order pickers are assigned to a specific location in the warehouse to pick items from that specific location only	2.40	1.44

Source: Survey result, 2018

The mean values of each of productivity measurement entities are between 2.4 and 3.34 with a little bit higher standard deviation (variation), which could be because of the variety of the respondents with educational status and location where the warehouses are located. The lowest mean value is registered by the measurement entity which is about assignment of warehouse operatives (pickers) to specific location in the warehouse to pick from that specific location only. So the result indicates that in most of the warehouses this kind of practice is not available, which may prevent the warehouse operatives to perform higher in what they do. This is said because specializing in specific location for picking helps the operatives to specialize the location making their job easy and contribute to the performance of the warehouse they are working in.

The next lowest mean value is of the measurement entity which states that it is better to give a warehouse operative (Picker) a single order than giving multiple orders. On this measurement entity most of the respondents agreed up on the fact that it is not necessary to give multiple orders for a warehouse operative, because this kind of practice may bring about errors and mixing of order from an organization to orders from other organizations leading to failure in maintaining the performance of the warehouse.

The other mean value of the measurement entity is 2.84 which stand for one of the measures of productivity of warehouse operatives, giving batch of orders to a warehouse operative (picker) than a single order. This measurement entity is similar to giving multiple orders but, this activity is different, because giving batch of orders is giving more than one order for the same customer, so that the picking process takes less time. But, as indicated in the response and as we can see from the mean value of this specific measurement entity that much of the respondents did not agree on this measurement entity. This is similar to giving multiple orders, because as the number of orders a warehouse operative processes increases the time to process all those orders increases leading to a dis-satisfied customer and the ultimate result may be an affected warehouse performance.

The warehouses are using their space efficiently and they store line of items as they should store is another productivity measurement entity and it scored a mean value of 2.87. This may indicate the majority of the warehouses are not using their space efficiently and storing line of items as they should. This indicates the warehouses of PFSA, AA Branch are not performing very well in accordance with space utilization.

The remaining measurement entities have a mean value of 3.04 to 3.34. From the mean values of these measurement entities for productivity the warehouses are moderately comfortable for the process of order picking or a little bit more comfortable for order picking practice.

4.4. Second research question

Which order picking indicator mostly affects the warehouse performance of Pharmaceuticals Fund and Supply Agency Addis Ababa Branch from the perspective of the employees?

Table 4.6. Order picking indicators

Variable	Frequency	Percent
Quality Indicator	18	32.7
Time Indicator	27	49.1
Productivity Indicator	9	16.4
All	1	1.8
Total	55	100

Source: Survey result, 2018

As can be seen from the above table the majority of the response is taken by time indicator registering 27(49.1%), the second response is taken by quality indicator registering 18 (32.7%), followed by productivity indicator with the response rate of 9 (16.4%) and one respondent responded that all of the indicators equally affect the warehouse performance.

From this we can understand that time indicator takes the lions share in affecting warehouse performance, because as time taken by order picking is longer, the warehouse performance is affected in a negative direction, and the customers of the warehouse get frustrated and frustrated as they stay longer waiting for their order being processed

In the second position the performance of the warehouse is affected by quality indicator which we have measured with the absence of error due to expiry date, error due to batch number, error due to quantity of the items to be picked and error due to identity of item to be picked, this indicator accounts for 32.7% of the respondents' response. In the third position lies productivity indicator with the frequency of 9 (16.4%), which we have measured by units moved per person and space utilization of the warehouse.

4.5. Third research question

What are the challenges faced by warehouse managers and operators in practicing efficient order picking?

Table 4.7. Challenges faced by warehouse managers and warehouse operatives

Challenges	Frequency	Percent
The layout of the warehouse is not comfortable for picking	11	20.0
I am give multiple orders at the same time	4	7.3
I have to travel a long distance to pick what is listed on the pick list	5	9.1
There are no sufficient picking aid materials in the warehouse	12	21.8
The warehouse management system is weak	3	5.5
All	1	1.8
The layout of the warehouse is not comfortable for picking and I am given multiple order at the same time	2	3.6
The layout of the warehouse is not comfortable for picking, I am given multiple order at the same time and I have to travel a long distance to pick what is listed on the pick list	1	1.8
The layout of the warehouse is not comfortable for picking, I have to travel a long distance to pick what is listed on the pick list and There are no sufficient picking aid materials in the warehouse	4	7.3
The layout of the warehouse is not comfortable for order picking, I am given multiple orders at the same time and There are no sufficient picking aid materials in the warehouse.	1	1.8
I am give multiple orders at the same time and There are no sufficient picking aid materials in the warehouse	2	3.6
I am given multiple orders at the same time and I have to travel a long distance to pick what is listed on the pick list	1	1.8
The layout of the warehouse is not comfortable for picking, There are no sufficient picking aid materials in the warehouse and the warehouse management system is weak	2	3.6

The layout of the warehouse is not comfortable for picking, I am given multiple orders at the same time, I have to travel a long distance to pick what is listed on the pick list and there are no sufficient man power for the picking process	1	1.8
The layout of the warehouse is not comfortable for order picking, I am given multiple orders at the same time and the warehouse management system is weak	1	1.8
The layout of the warehouse is not comfortable for order picking and I have to travel a long distance to pick what is listed on the pick list	1	1.8
There are no sufficient picking aid materials in the warehouse and the warehouse management system is weak	1	1.8
The layout of the warehouse is not comfortable for order picking and there are no sufficient picking aid materials in the warehouse	1	1.8
I am given multiple orders at the same time, I have to travel a long distance to pick what is listed on the pick list and there are no sufficient man power for the picking process	1	1.8
Total	55	100.0

Source: Survey result, 2018

As can be seen from the above table the challenges the warehouse managers and warehouse operatives face while doing their job related to order picking are; the layout of the warehouse being not comfortable for order picking being the most frequently faced problem by warehouse managers and warehouse operators. This measurement tool is mentioned eleven (11) times in the response by the respondents which is 20% in frequency alone and this measurement entity is mentioned nine times in combination with other measurement entities. This makes this problem the most frequent faced problem by the workers. The second most frequently mentioned measurement entity is unavailability of sufficient order picking aid materials in the warehouse with the frequency of 12 (21.8%) compared to all the responses and this measurement entity is mentioned six times, making the whole frequency 18 times. Followed by travelling a long distance to a picking location to pick what is listed on the pick list which is mentioned 5 (9.1%) alone and is mentioned six times in combination with other measurement entities making the cumulative frequency eleven (11) times, The fourth mostly faced problem was being given

multiple orders which was mentioned 4 (7.3%) alone and is mentioned six times in combination with other measurement entities making the cumulative frequency to be ten (10) times and the least problem that was faced by warehouse managers and warehouse operatives was that the warehouse management system being weak with the frequency of 3(5.5%) alone and is mentioned three times in combination with other measurement entities making the cumulative frequency six times.

In combination the mostly faced problems are the layout of the warehouse being not comfortable for picking, traveling a long distance to pick what is listed on the pick list and unavailability of sufficient picking aid materials in the warehouse. These combination of problems registered a frequency of 4 (7.3%) followed by being given multiple orders at the same time and unavailability of sufficient picking aid materials in the warehouse with the frequency of 2 (3.6%) and with this equal frequency; the layout of the warehouse being not comfortable for picking, unavailability of sufficient picking aid materials in the warehouse and the warehouse management system being weak are mentioned by the respondents. The other combinations are mentioned only once.

4.6. Discussion

As the results show performance of warehouses of the Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch were affected by the quality of the order picking practice. The results showed that errors arise mainly due to the batch numbers of the items picked, the time taken by order picking practice is higher as compared to other warehouse operatives and when we see the space utilization of the warehouses; the layout of the warehouses are not comfortable for order picking. This study can be backed up by study done by Tobias Rammelmeier, Stefen Galka and Willibald A. Gunthner which identified that there were errors while picking which are miss pick, wrong quantity, omission error, and condition error. According to their study these errors have different scale of effect on the performance of warehouses depending on when they are discovered.

Brulias, Marcoulaki and Chondrocoukis in their study on warehouse management for improved order picking performance: An application case study from the wood industry tried to measure the time taken by order picking process by dividing order picking process in to four sub

processes, which are traveling to the picking area, searching the items to be picked, retrieving the items and returning to the depot area. And they measured the time taken by these activities and found out that the total time it takes to pick an order was 5.69min/m^3, after modification the total time was managed to be reduced by 49.7%. This tells us that the time order picking takes in an ordinary warehouse is high and showed that it can be reduced significantly if actions are taken.

And when we look at warehouse space utilization, Mingfei Yu and De Koster in their study on enhancing performance in order picking process by dynamic storage system identified that dynamic storage system can substantially improve throughput and can reduce labor cost at the same time. In addition to this study Petersen, C.G. and Aese, G.R identified that placement of cross aisles does significantly reduce picker travel time than in warehouses without cross aisle.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary

The purpose of this study was to determine the effect of order picking practice on warehouse performance of Pharmaceuticals Fund and Supply Agency, Addis Ababa branch based on the perspectives of employees of the agency. The study was conducted in six warehouses of PFSA, AA Branch. Two general warehouses, one warehouse dedicated for locally manufactured pharmaceuticals and medical supplies, one warehouse for foreign products and one cold room for storage of vaccines and those pharmaceuticals which require special storage condition.

It was planned to collect response from 61 individuals which corporates storage and distribution officers, warehouse managers and warehouse operatives, but the collected response was 55 individuals, making the response rate to be 91.2%.

Out of these respondents the majority were males constituting 52 (94.5%) of the total respondents the remaining are females with only 3 (5.5%) of the respondents. More than half of the respondents, 50.9% are in the age gap of 26-34 and almost half of the respondents, 45.5% have been in the PFSA, AA Branch which can tell the fact that they have enough experience on what they are doing.

As it has been seen in the result analysis the agency (PFSA, AA Branch) has a little less attention for its warehouses, even if warehousing is one of its core processes. When we look at the mean values of quality indicator, apart from errors due to batch numbers, the other measurement entities registered moderated occurrence of error. As any kind of error influences performances, any type of error occurrence should not be acceptable. But errors due to batch numbers is the least sought after indicator of quality failure, as it registered the highest mean value as compared to the other measurement entities. And when we look at the productivity indicator the warehouses are not comfortable for order picking and the space utilization also is not as expected. These all let the practice of order picking in the warehouses of Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch a little bit weak.

As of order picking indicators mostly affecting warehouse performance, time indicator affects the most, order picking takes much of the time available as compared to the other warehouse operations.

5.2. Conclusion

This paper was conducted in an attempt to reveal the effect of order picking practice in the warehouse performance of Pharmaceuticals Fund and Supply Agency, Addis Ababa branch and emphasized on measuring order picking practice using three indicators; quality, time and productivity for this matter from the perspective of the employees.

The following conclusion was drawn depending on the data analysis findings of the study

The specific objectives of the study were; to determine the status of order picking practice in the warehouses of PFSA, AA Branch, the other specific objective of the study was to determine which order picking indicator mostly affects the warehouse performance based on the perspective of the employees and the third one is to identify the challenges faced by the warehouse managers and warehouse operatives.

In this study, when trying to determine the status of order picking practice in the warehouses of PFSA, AA Branch, I as the researcher used three indicators of order picking as I believed they can measure the status of order picking. Having this at hand, only one of the measurement entities of quality indicator registered the lowest mean value according to the response from the responders. This can indicate that errors may occur in the other three measurement entities; expiry date, batch number and quantity. Especially the mean value of error due to batch number is the highest, this may tell that both the warehouse managers and warehouse operatives give less attention to the batch number of products while picking. But if we see the value of batch numbers especially in pharmaceuticals, it is one of the most important elements of logistics and supply chain management of pharmaceuticals.

When we look at the time indicator measurement entities, the time taken by order picking is higher and is not in the best interest of the customers. This surely affects the performance of warehouses, as they increase customer complaints and loss of trust. Out of the whole time taken by order picking searching time is the largest when compared to the other three time indicators,

this may tell the fact that the majority of warehouses are not comfortable for order picking, as a result takes much time.

The other indicator measured with is productivity indicator which we measured it with units moved per person hour and utilization of warehousing space. From here we found out that the least mean value is for assignment of warehouse operatives in a specific location in the warehouse so that they go and pick from that specific location. This tell us that most of the warehouses do not use this policy, but using this policy may help the warehouse manager and the warehouse operative to perform picking in swift time decreasing customer grievances.

The second objective of the study was to determine which order picking indicator mostly affects warehouse performance based on the perspective of the employees. So from the response we found out that time indicator mostly affects warehouse performance, this can be strengthened by the aforementioned idea that order picking takes much time as compared to the other warehouse practices.

The last objective of the study was to identify the challenges faced by both warehouse managers and warehouse operatives, as it can be seen from the response that the lay out of the warehouse being not comfortable for order picking, making the warehouses not comfortable for order picking practices. The second most mentioned problem faced by both warehouse managers and warehouse operatives is the unavailability of sufficient order picking aid materials, making life very hard for order pickers.

5.3. Recommendations

Pharmaceuticals Fund and Supply Agency, Addis Ababa Branch should try and fix to address the mediocre order picking practice in the warehouses, as warehousing is one of the core processes of the agency.

As it was tried to address in the previous sections one of the major failures of the warehouses was order picking error due to batch numbers of products that are dispatched to the health facilities and to the public at last. This error is very dangerous when there are quality and packaging problems and when the administrative body tries to recall the products so that it won’t go to the public. But when there is no care taken during picking and dispatching the products and

there is much error in batch number of the products, the where about of the product would not be known when needed. So the agency should take steps to reduce or remove such problems.

The agency also needs to work on reducing the time taken by order picking, because the time taken by order picking is longer when compared to time taken by other activities and for this the customers are not happy by the order picking activity of the warehouse which can be interpreted to not being happy by the whole warehouse performance. In addition to this I tried to measure which time measuring indicator takes much time from the whole time taken by the order picking activity itself. So, there were four time measuring indicators put forward for the respondents to select from. As a result most of the respondents selected the most time consuming activity in the order picking activity and that activity is searching time. This phenomenon may be triggered by the lack of good layout of the warehouses. This is said because the inappropriate warehouse layout is the major problem faced by both warehouse managers and warehouse operators. So, in addition to trying to reduce time taken by order picking, the agency also needs to work on fixing the layout of the warehouses.

When we look at the productivity indicator, one of the failures is unavailability of giving a warehouse operative a specific location from which the picker picks the items. So I recommend the agency to give specific picking location for warehouse operatives, which makes the picking practice easy, as the warehouse operatives specialize on specific location making the picking practice easy and fast.

Apart from the above mentioned recommendations, I, the researcher recommend that other researchers work on researches like this taking in to account the warehouses themselves not the employees. As the results of this specific study tells only the effect of order picking practice on warehouse performance in the perspective of the employees. So, taking the warehouses into account may give the real picture which is by far better than looking in to the perspective of the employees.

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Appendix

QUESTIONNAIRE

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE GRADUATE STUDIES UNIT OF LOGISTICS OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Dear respondents;

I am a graduate student in Addis Ababa University School of Commerce Unit of Logistics and Supply Chain Management. I am writing a thesis entitled **"Effect of Order Picking Practices on Warehouse Performance; A case of Pharmaceuticals Fund and Supply Agency Addis Ababa Branch – Employees' Perspective"** for the partial fulfillment of Masters of Art Degree in Logistics & Supply Chain management

The purpose of this questionnaire is to gather data for the proposed study, so you are kindly requested to answer the questions as honestly as possible so that this thesis is successful and able to reach the proposed objectives. Your participation in this questionnaire is fully voluntary and if you fill you don't want to participate, your stance is entirely respected. I confirm that the information you give on this questionnaire is entirely confidential and your information is never shared to anyone or anything. I want to thank you in advance for participating in my questionnaire.

Best Regards

Manayeh Wubalem

Note;

- There is no need to state your identity
- Indicate your answer with the check mark (√) in the space provided
- If you need further explanation, please don't hesitate to contact me through my phone +251913720875 or by email: manwfw2@gmail.com

Section I: Respondents Profile

1. Sex M ☐ F ☐
2. Age 18-25 ☐ 26-35 ☐ 35-45 ☐ Above 45 years ☐
3. Educational Status
   Below college diploma ☐ College diploma ☐ University Degree ☐
   Second Degree ☐ PHD and above ☐
4. Current Position _____
5. Year of service on the current position
   Below 1 year ☐ 1-5 years ☐ 4- 10 years ☐ Above 10years ☐

Section II: Main Questionnaire

6. Please indicate your choice by putting the check mark (√) on the appropriate, 1= Strongly dis agree, 2= Disagree, 3=Neutral, 4=Agree, 5=strongly agree

S.N	Measurement tools	Score					Remarks
		1	2	3	4	5	
Quality Indicators							
6.1	While picking after receiving order from customers, most of the time errors arise in expiry date of the products to be picked						
6.2	While picking after order received order from customers, most of the time the errors arise in batch No. of the products to be picked						
6.3	While picking after receiving order from customers, most of the time errors arise in quantity of the products						

	to be picked						
6.4	While picking after receiving order from customers, most of the time errors arise in picking the wrong type of the item to be picked						
Time Indicators							
6.5	Mostly when order picking, the time taken by picking process is appropriate and it is in the best interest of customers						
6.6	Mostly order picking takes the most of the time available as compared to other warehouse operations						
Productivity Indicators							
6.7	It is better to give one order picker multiple orders than giving him/her single order to process						
6.8	The layout of the warehouse is confortable for order picking						
6.9	The warehouse is using its space efficiently and so that it stored the line of items as it should store.						
6.10	Our customers think our picking practice is one of a kind						
6.11	In our warehouse the warehouse operators are given batch of orders to pick at a moment						

6.12	In our warehouse the pickers/warehouse operatives are given a single order to pick at a moment						
6.13	In the warehouse the pharmaceuticals and medical supplies are stored properly according to appropriate bin location						
6.14	The storage of pharmaceuticals and medical supplies are easy for order picking process						
6.15	In the warehouse the order pickers are assigned to a specific location in the warehouse to pick items from that specific location only						

6.16. What are the challenges you face while you are doing your job in relation with order picking?

a. The layout of the warehouse is not comfortable for picking
b. I am given multiple orders at the same time
c. I have to travel a long distance to pick what is listed on the pick list
d. There are no sufficient picking aid materials in the warehouse
e. There is no sufficient man power for the picking the process
f. The warehouse management system is weak
g. Others, specify _____

6.17. Which order picking indicator do you believe mostly affects warehouse performance

a. Quality indicator
b. Time indicator
c. Productivity indicator
d. All

6.18. Out of the four time indicator measurement entities the most time taken you believe is by;

a. Travel time
b. Searching time
c. Retrieval time
d. Return time