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ROLE OF WAREHOUSE LAYOUT DESIGN ON PERFORMANCE OF DISTRIBUTION FIRMS IN KENYA; CASE OF DHL SUPPLY CHAIN

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Abstract

Purpose: *The main objective of this study was to determine role of warehouse layout design on performance of Distribution Firms in Kenya; case of DHL supply chain*

Materials and methods*; This study adopted a descriptive research design, a descriptive research design determines and reports the way things are and it is used whenever the data being collected is to describe persons, organizations, settings or phenomena. The targeted population of this study consisted of DHL supply chain employees in Procurement, warehouse, warehouse category managers, Dispatch Officers, Picking, Consolidation Officers and Transport and Distribution. The study employed a census approach to collect data from the all the respondents mainly involved in the management of warehouse operation hence no sampling techniques was used. To minimize errors the study used test and retest method in order to test reliability of the research instrument. This procedure reveals the questions that are vague that can lead to respondents interpreting them differently hence adjustments accordingly. Validity was also being checked during piloting to ensure all the items to be in the main study are functioning. Moreover, to ensure validity of the questionnaires, content validity was established from the pretest and re-test method that was done before the actual research. The completed questionnaires were edited for completeness and consistency. Pearson coefficient correlation analysis was used to determine the relationship between each of the effects of warehouse simulation on performance of distribution firms. The study employed a multiple Regression analysis to estimate the causal relationships between factors under study. With the aid of Statistical Package for Social Sciences (SPSS), the research performed multiple regressions analysis on primary data to estimate the beta values of factors and F – test statistics to determine their significance at confidence level.*

Results*: The study established that there are several basic principles that apply to warehouse layout design, and running an effective distribution center operation. Without the proper layout and design of your distribution center, no matter the square footage, Distribution Firms will be facing capacity issues, decrease in productivity, and storage inadequacies. Maintain flexibility in the operation and layout.*

Recommendations: *The study recommends that The detailed layout and design of the preferred facility option should include, performance specifications, equipment layout, facility footprint and building design and cost, new building, specification of static and mobile materials handling equipment, high level process design, detailed implementation and warehouse operational costs.*

Keywords*: Warehouse Layout Design, Storage Systems, Space Planning, Location Mapping*

1.0 INTRODUCTION

1.1 Background to the Study

The study analyzed the Role of warehousing simulation on performance of Distribution Firms in Kenya Specifically, this chapter provides information on the global perspective of warehousing simulation on Performance of Distribution Firms and then narrows down to regional and then local perspectives.as well statement of the problem, objectives of the study, research questions justification of the study, and the scope of the study.

Warehouse simulation is the computer-based modeling of a real warehousing system. Simulation enables an organization to analyze and experiment with its warehousing process in a virtual setting, reducing the time and cost requirements associated with physical testing. Storage, docks, conveyors and forklifts (GurríaA,2012).The personnel can quickly be introduced and adjusted within the simulation model, allowing companies the opportunity to determine how best to fully utilize their equipment and maximize efficiency (Huang, 2010).

Warehousing operations via computer simulation is considered an effective and powerful approach to improve the performance or design more efficient warehouse (Lidstrom, 2013). Building a good simulation model that need efficiency in industry has never been greater, with personnel, fuel, and transportation and material costs continuing to rise each year. Simulation provides a way to put a warehouse to the test in a risk-free environment without disturbing the existing warehouse system. It also enables users to determine minimum actual costs without sacrificing the required output (Swiatecki, 2015)

According to Huang (2010), designing and optimizing warehouse layout and operation, or forecasting and adapting to operational needs, simulation modeling enables organization to efficiently and dynamically meet the challenges. Simulation modeling is a powerful method for designing, planning, and optimizing warehouse operations. It is a low-cost and low-risk technique to determine optimal warehouse conditions and operation (Belussi and Hirata, 2013). The flexible capabilities of simulation model give organization the power to model the warehouse as in the real-world, the structure, processes, and the resources. Through simulation, and visualization, organization develops the best warehouse operations for today and the future (Bartholdi and Hackman, 2014).

According to Harold (2010), provides that through warehouse simulation each standard load can fit in a uniformly-sized volume. The film canisters in the image of the Defense Visual Information Center are each stored as part of the contents of the uniformly sized metal boxes (Manahan, 2012). Standard loads simplify the handling of a request of an item. In addition, audits of the accuracy of the inventory of contents are restricted to the contents of an individual metal box, rather than undergoing a top-to-bottom search of the entire facility, for a single item (Swiatecki, 2015).

The warehouse simulation systems operate under computerized control, maintaining an inventory of stored items. (Belussi and Hirata, 2013). Retrieval of items is accomplished by specifying the item type and quantity to be retrieved. The computer determines where in the storage area the item can be retrieved from and schedules the retrieval. (Pearson, 2010). It directs the proper automated storage and retrieval machine (SRM) to the location where the item is stored and directs the machine to deposit the item at a location where it is to be picked up, A system of conveyors and or automated guided vehicles is part of the AS/RS system (Manahan, 2012).

These take loads into and out of the storage area and move them to the manufacturing floor or loading docks. (Lidstrom, 2013). To store items, the pallet or tray is placed at an input station for the system, the information for inventory is entered into a computer terminal and the AS/RS system moves the load to the storage area, determines a suitable location for the item, and stores the load. As items are stored into or retrieved from the racks, the computer updates its inventory accordingly. (Ramaa & Rangaswamy, 2012).

1.1.1 Global Perspective on warehousing simulation

Amazon is an American electronic commerce and cloud computing company based in Seattle, Washington. Amazon has separate retail websites for the United States, the United Kingdom and Ireland, France, Canada, Germany, Italy, Spain, Netherlands, Australia, Brazil, Japan, China, India, and Mexico. According to Manahan (2012), Amazon Warehouses are large and each has hundreds of employees. Employees are responsible for five basic tasks unpacking and inspecting incoming goods, placing goods in storage and recording their location and picking goods from their computer recorded locations to make up an individual shipment; sorting, packing orders and shipping (Swiatecki, 2015).

Amazon simulation systems are of computer that records the location of goods and maps out routes for pickers plays a key role. The employees carry hand-held programmed computers which communicate with the central computer and monitor their rate of progress. A picker may walk several miles a day. In the newer fulfillment centers, items are stored on pods and brought to pickers by robots Kiva Systems (Manahan, 2012).

In the United States, amazon Development of a high level of automation is implementation stage following Amazon's 2012 acquisition of Kiva Systems on a warehouse automation (Manahan, 2012) The automation and simulation of amazon Warehousing enable Logistics Plus dedicated warehousing solutions that are just the right size, in just the right place, for just the right length of time. The organization doesn't pay for space it don't need; we'll find the perfect fit. The simulation helps diagnose amazon warehousing challenges, develop inventory management solutions and then make those solutions work where it matters in the global stores (Lidström, 2013) The warehousing systems enable amazon fulfillment solutions Complete warehousing on Inbound and outbound process with back office support, Inventory management and Basic quality inspection of packaging and card condition as well extensive quality inspection of product.

1.1.2 Regional Perspective on warehousing simulation

Designing and managing fulfillment operations using sophisticated systems, Kuehne + Nagel east Africa minimizes labor costs and maximizes visibility to inventory and order status. Through generalized warehouse simulator system (GWSS) is constructed to facilitate the construction and operation of simulation models of complex warehouse systems design for Leader in innovative cargo management concepts and Global Cargo iQ Phase certification (Mohamed and Azizan 2015).

Computer simulation systems are now relied on for a broad spectrum of duties, including picking, warehouse planning, warehousing, product design, manufacturing and inventory control. (Beers, 2014). An inventory control system is a set of hardware and software based tools that automate the process of tracking inventory Christopher (2016), states that The kinds of inventory tracked with an inventory control system include almost any type of quantifiable good, including food, clothing, books, equipment, and any other item that consumers, retailers, or wholesalers may purchase. Modern inventory control systems are almost exclusively based on barcode technology (Mohamed & Azizan 2015).

Christopher (2016) states that Kuehne + Nagel east Africa Though barcodes are initially developed to automate the process of grocery store checkout, their ability to encode a wide variety of alphabetic and numeric symbols makes them ideal for encoding merchandise for inventory applications. Inventory control systems work in real-time using wireless technology to transmit information to a central computer system as transactions occur in the warehouse (Beers, 2014).

The integration of simulated model and warehouse automation in Kuehne + Nagel east Africa predicts the net requirements for time periods. Also the obsolete items are identified according to Christopher (2016), The model are used for shipping planning as well as the evaluation of on the shelf inventories The model is interactive it allows the user to vary inputs from a portable terminal and identify and critical parameters of the model (Mohamed and Azizan 2015).

The inventory management within a warehouse of Kuehne + Nagel east Africa involves much planning and organization. The flow of materials through the warehouse and the method of movement are important. Warehouse activities include receiving, putting away, storing, order picking, packaging and pricing, sorting, and shipping. (Mohamed & Azizan 2015). Then, packaging takes place, if necessary, and codes are placed on the product for pricing and inventory scanning. Christopher (2016), states that the products are sorted according to delivery destination within the hospital and then shipped. Bar code tracking systems, an RFID system read the information on a tag without requiring line of sight or a particular orientation. This means that RFID systems can be largely automated, reducing the need for manual scanning. (Beers, 2014).

1.1.3 Local Perspective on warehousing simulation

Car and General is a leading supplier of generators, motorbikes, tuktuks, laundry equipment, lawn mowers, scooters, marine engines, construction equipment and a wide range of power generation, automotive and engineering products in East Africa for 75 years. Car and General is headquartered in Nairobi with branches in Mombasa, Kisumu, Nakuru, Kitengela and Eldoret.

Car and General Limited Kenya runs a central warehouse which receives parts in mixed lots, decants these into storage boxes, stores these boxed parts in an automated warehouse, and supplies to customers on demand. (Mangan *et al.,* 2016). Many different parts are held in stock at any one time. Some of these parts are small and cheap (for example, nuts and bolts). Others are large and very expensive (for example, replacement engines). Car and General Limited Kenya has grown from one which solely supplied parts for vehicles manufactured by the parent company to one offering a comprehensive parts service. (Mangan *et al.,* 2016). It has changed from a cost center into an independent profit center. During this transition in its business it became necessary to transform the warehouse into a highly automated operation which could offer a fast and reliable service. Only by offering such a service could Car and General Limited Kenya expect to be viable (Mohamed and Azizan 2015).

According to Johnston, and Cheng (2012), the first stage in this modernization involved the automation of the storage areas by the introduction of computer-controlled cranes to deposit and pick items from shelved storage areas. This first stage required several computer simulations in order to develop, amongst other things, suitable rules to control the cranes. Careful planning led to a successful automated picking and storage operation (Mangan et al., 2016).

A subsequent stage of Car and General Limited Kenya development, which is described as the replanning of the goods inwards area. Like the rest of the warehouse, this needs to cope with a much higher throughput than

envisaged some years back. This involved the development of a simulation model based on a simple microcomputer, the Apple II. According to Johnston, and Cheng (2012), though far from ideal for such purposes, it is possible to develop a usable simulation model on an Apple II. That enables the designers of the goods inwards area to experiment with various possible options and to demonstrate these to interested parties (Mangan et al., 2016).

According to Johnston, and Cheng (2012), Warehouse simulation in Car and General Limited Kenya ensured Accurate, up-to-date inventory , reduced costly inventory errors, improve ability to meet customer demands, and lower your operational costs, the right inventory control software program in Car and General Limited Kenya is indispensable business resource (Mohamed and Azizan 2015).

1.1.4 Overview of DHL Kenya limited

DHL is an international courier, parcel and express mail services. Deutsche Post DHL is the world's largest logistics company operating around the world, DHL Kenya limited facilities are designed to meet the needs of Organizations of any size. Currently DHL Kenya limited provide warehousing services to leading manufacturers and retailers of medical supplies, consumer products, industrial equipment, chemicals and technology (Cai & Yang 2010).

Through sharing of DHL's resources, such as space, labor, equipment and transportation, customers benefit from synergies that considerably reduce supply chain costs. This environment returns significant value to a small business requiring distribution operations without long term lease or capital commitments, or a large enterprise handling a new acquisition, product launches or seasonal overflow. (Cai & Yang 2010).The Warehouse Management System (WMS) records all events and actions in the receipt, handling, storage of products and orders in a warehouse environment The WMS also accurately records the location of inventory whilst stored in the warehouse (Beers, 2014).

Zhou and Li (2010) states that WMS manages all critical processes in the warehouse, and is also an important support for varied transport and distribution concepts (planning, time controlling, booking of transport capacity, communication with customs and other authorities. Cross-dock operations are facilities where shipments are received from one mode of transport and transferred to another mode, or where shipments complete one leg of a journey prior to commencement of another journey. Shipments are consolidated or deconsolidated. Product received into the facility is not taken into inventory (Beers, 2014).

Warehousing Solutions improve inventory efficiency and accelerate DHL supply chain response to changing customer demand. Our experts design, implement, and operate flexible warehousing and distribution solutions tailored to your business needs. They analyze every point in your supply chain to determine the optimal solution (Cai & Yang 2010).

1.2 Statement of the Problem

Warehouses are a key aspect of modern supply chains and play a vital role in the success, or failure, of Distribution Firms in Kenya as well in DHL Kenya limited. Warehousing operations via computer simulation has been considered an effective and powerful approach to improve the performance or design more efficient warehouse.

When designing a warehouse system, simulating storage methods and handling equipment alternatives are available. Kumar (2014) the main issues facing Kenya warehouse and Distribution Firms' designer are to select

the best storage method. block stacking, deep lane storage, automatic storage and retrieval systems to choose the appropriate handling equipment and to determine the warehouse layout (configuration) The general design depends on a trade-off between different costs which includes cost of hind, building, equipment, labour , maintenance and services (Wathe, 2015).

According to Wathe, (2015) states that 75% of Warehouses run at a capacity of less than 40% due to poor designs and layout out what this means that Distribution Firms paying at-least 40% of your cost for free to the warehouse due to underutilized assets. Labor costs are typically the largest expense in the Kenya warehouse and Distribution Firms' and in many operations, such as third-party logistics providers (3PLs), it can account for up to 50% of a warehouse's total operating costs. Warehouses running at 1% of operating cost to sale with warehouses running at 10% operating cost to sale, has an impact on customer service levels and on the pricing strategy of the products handled (Wathe, 2015) This leads to Difficulty in tracking inventory results in shipping and delivery delays caused by orders not being replenished on time or items being unavailable when they're needed. Picking problems also arise when pickers rely on inaccurate information, leading to inefficient processes (Baker, 2011) The transportation and delivery of goods can account for as much as 15% of the total price goods and in extreme cases even as much as 50%. It is therefore important that a business has as efficient a transport system as possible. With proper planning and management, as much as 30% could be saved on those transportation costs.

According to Kumar (2014) with poor implementation of warehouse systems and automation process the accuracy of your physical inventory does not match that of listed items in the database. The disparity occurs in any large distribution center where a high rate of inaccuracy in inventories lead to unexpected backorders, customer dissatisfaction and ultimately higher overall costs (Gurría, 2012) it is hence against this background that this study was undertaken with a main purpose of establishing the influence of warehousing simulation on performance of Distribution Firms in Kenya

1.3 Objectives of the Study

1.3.1 General Objective of the Study

The main objective of this study was to determine the Role of warehouse layout design on performance of Distribution Firms in Kenya; case of DHL supply chain.

1.3.2 Specific Objectives

The study was guided by the following specific objectives:

i. To determine the influence of Storage Systems on performance of distribution firms in Kenya.

ii. To evaluate the influence of Space Planning on performance of distribution firms in Kenya.

iii. To analyze the effect of Location Mapping on performance of distribution firms in Kenya.

LITERATURE REVIEW

2.1 Introduction

The literature is used in describing the general context within which measurement of Performance of Distribution Firms is undertaken. The researcher also sought to draw insights from previous studies in the field of Warehouse simulation and identify the gaps which have not been addressed by those studies. The chapter

further includes researchers' critique on the various theories supporting the study, drawn summary and research gaps which justify the researchers' choice of the topic.

2.2 Theoretical reviews

A theory is a contemplative and rational type of abstract or generalizing thinking or the result of such thinking Depending on the context, the results might for example include generalized explanation of how nature works (Huang, 2010) the theoretical literature review helps establish what theories already exist, the relationship between them, to what degree the existing theories have been investigated, and to develop new hypotheses to be tested. Often, this form is used to help establish a lack of appropriate theories or reveal that current theories are inadequate for explaining new or emerging research problems (Huang, 2010)

2.2.1 Institutional Theory

The study was based on Institutional Theory in determining influence of Warehouse Layout Design on performance of distribution firms. According to Oliveira and Martins (2011) institutional theory emphasizes that institutional environments are crucial in shaping organizational structure and actions on the Warehouse Layout Design and inventory process. The theory stipulates that organizational decisions are not driven purely by rational goals of efficiency, pallet rack system and developing the optimal warehouse layout design, Institutions are transported by cultures, structures, and routines and operate at multiple levels. (Jennings & Zandbergen, 2005). The theory claims that firms become more similar due to isomorphic pressures and pressures for legitimacy. This implies that firms in the same field tend to become homologous over time, as competitive and customer pressures motivate them to copy industry leaders. Rather than making a purely internally driven decision to adopt e-commerce, firms focus on Material Handling Systems apart from competition the fact to understand that every business, and therefore every warehouse been unique with tailor our rack systems design process to each individual operational lay outs

2.2.2 Warehouse Layout Design

According to Kumar (2014), defines that Warehouse Layout Design are essential to the success of organisation business when moving into a new facility or distribution center. No matter the space, if the warehouse is not optimized or laid out correctly probably organisation incur losses in productivity, experience space capacity issues, and be forced to deal with storage inadequacies (Harold ,2010). When deciding on the internal and external layout of a warehouse, there are possible scenarios that necessitate a different assignment of space. These are the installation of new warehouses, the extension of existing facilities, and the reorganization of those currently operating (Gil-Saura et al 2011). Warehouse designers have to work with a space in which certain factors limit the surface area available. This is why the layout has to be carefully planned.

Azizi (2014) argues that designing of pallet rack system and developing the optimal warehouse layout design, warehouse experts need to make business decisions concerning operation. (Beers, 2014) states that assessing current space and determines organization need to upsize, downsize or simply make better use of the space you're in right now. Space planning isn't always easy, and in fact involves business decisions and careful analysis of current operations, as well as planned growth (Mohamed & Azizan 2015).

Wathe (2015) defines that Warehouse design when it comes to storage and material handling, space is money. To achieve maximum space efficiency, organisation need to put in place pallet racking system laid out in a way that makes the best possible use of the available floor and vertical space in the warehouse (Gil-Saura et al 2011). The systems design experts should leverage the latest Computer Aided Design (CAD) technology to

design a warehouse layout that maximizes the amount of product you can store in any given space. Warehouse layout and design work synergistically to create a warehouse system that is both scalable and able to meet the demands of your current operations (Wathe and Warioand 2015)

2.2.3 Performance of Distribution Firms

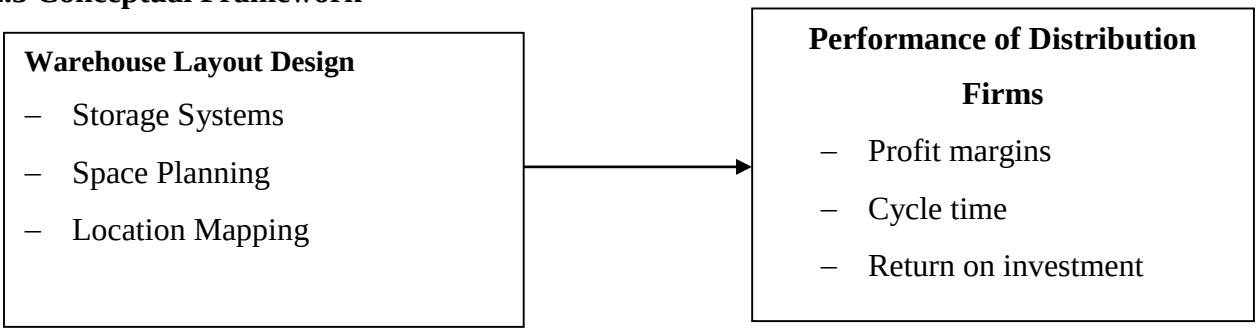
Johnston and Cheng (2012) states that Warehouse automation systems support warehouse staff in performing the processes required to handle all of the major and many minor warehouse tasks such as receiving, inspection and acceptance, put-away, internal replenishment to picking positions, picking, packing, order assembly on the shipping dock, documentation, and shipping (loading onto carrier vehicles). A warehouse management system helps in directing and validating each step, capturing and recording all inventory movement, and status changes to the data file (Huang, 2010).

The warehouse department is charged with releasing materials to a supply base, ensuring that the materials are delivered on time to the company using the correct carrier (GurríaA,2012). Materials management enables organisation accomplishing on time delivery to the customer, on time delivery from the supply base, attaining a freight, budget, inventory shrink management, and inventory accuracy. The materials department is also charged with the responsibility of managing new launches (Keller, 2014).

Lidström (2013) the cost per line item picked shipped is a good starting metric to help organisation get a handle on the expenses incurred to ship a single item. This metric takes into account the total warehouse costs and divides it by the total number of items shipped. In addition to tracking shipment and delivery status, you should also measure order picking accuracy (Manahan, 2012). An inaccurate order result in inventory being put back on shelves, increasing shipping time per average order, rate of return. Lean distribution center practices eliminate waste and streamline order-picking processes and help maintain a high order accuracy rate (Keller, 2014). Timing and accuracy play a big role in shipping and should be on routinely measured and reviewed. These KPIs include picking labor costs, orders picked per hour, cycle times per hour (GurríaA, 2012).

Cai Yang (2010) warehouse automation enables warehouse operators predict early increasing inventory levels against dropping sales rates. Conversely, it can help prevent back orders by identifying sales influxes and potential for an increase in buying to help satisfy a spike in demand (Keller, 2014).

2.3 Conceptual Framework



3.0 METHODOLOGY

This study adopted a descriptive research design, a descriptive research design determines and reports the way things are and it is used whenever the data being collected is to describe persons, organizations, settings or phenomena. The targeted population of this study consisted of DHL supply chain employees in Procurement, warehouse, warehouse category managers, Dispatch Officers, Picking, Consolidation Officers and Transport

and Distribution. The study employed a census approach to collect data from the all the respondents mainly involved in the management of warehouse operation hence no sampling techniques was used. To minimize errors the study used test and retest method in order to test reliability of the research instrument. This procedure reveals the questions that are vague that can lead to respondents interpreting them differently hence adjustments accordingly. Validity was also being checked during piloting to ensure all the items to be in the main study are functioning. Moreover, to ensure validity of the questionnaires, content validity was established from the pretest and re-test method that was done before the actual research. The completed questionnaires were edited for completeness and consistency. Pearson coefficient correlation analysis was used to determine the relationship between each of the effects of warehouse simulation on performance of distribution firms. The study employed a multiple Regression analysis to estimate the causal relationships between factors under study. With the aid of Statistical Package for Social Sciences (SPSS), the research performed multiple regressions analysis on primary data to estimate the beta values of factors and F – test statistics to determine their significance at confidence level.

RESEARCH FINDINGS ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter entails the analysis and discussion of the data that was collected during the survey. The research findings are based on the questions that were asked to the participants through a questionnaire distributed to the selected sample. The main aim of the study was to analyze the Role of warehousing simulation on performance of Distribution Firms in Kenya; case of DHL supply chain.

4.2 Response Rate

As indicated in Table 1, the findings indicated that out of the 89 respondents 77 respondents responded returned fully filled questionnaires for analysis. This constitute to 86% of the response rate. This commendable response rate was made a reality after the researcher made personal calls and visits to remind the respondent to fill-in and return the questionnaires. Mugenda and Mugenda (2012) indicated that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and above is excellent. Therefore, the response rate of 86% was excellent for the study.

Table 1: Response Rate

Category	Frequency	Percentage
Questionnaires Distributed	89	100
Questionnaires Completed	77	86
Uncompleted Questionnaires	12	14

4.3 Background Information of the Respondents

4.3.1 Gender of the Respondents

The respondents were requested to indicate their gender. From the findings in Figure 1, Majority 64% were male while 36% were female. This implied that there were more male than female respondents involved in the study. The finding of this study agree with Mohamed& Azizan, (2015) that The aim of much of gender

observation in a research is to make observations in a research setting that reflects what would be observed among different people, in different settings, under different treatment conditions, and using alternative measurements

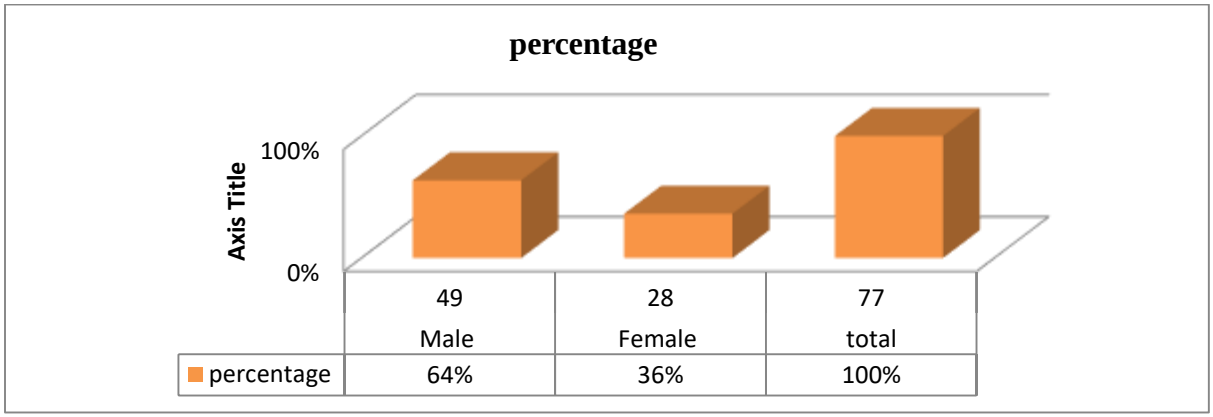


Figure 1: Gender of the Respondents

4.3.2 Level of Education

As indicated in Table 2 the study sought the respondent's level of education, from the findings,32% of the respondents working in DHL had Diploma qualification 37% of the respondents had attained degree level education, 19% of the respondents attained masters level of education while 12% of the respondents had attained PhD level of education. This implied that the respondents were qualified attaining experience and knowledge in a field, and understood the objectives of the study as well as offering relevant information regarding effects of warehousing simulation on performance of Distribution Firms The findings concurred with Lidström (2013) that education level enable Gaining new skills can help enhance technical and artistic skills, where individuals can also develop the critical thinking, communication, and teamwork.

Table 2 Level of Education

Education level	Frequency	Percent
Diploma level	25	32
Degree	29	37
Masters	15	19
PhD	8	12
Total	**77**	**100**

4.3.3 Respondent's years of service

Respondents were requested to indicate the number of years they have been in service at the Distribution Firms. From the findings as indicated in Table 3, majority of the respondents indicated that they had been in service at the Distribution Firms for over 9 years, 6-8 years, 3-5 years and 0-2 years as indicated by as indicated by 49%, 27%, 15% and 9% of the respondents. This clearly indicated that the information on effects of warehouse simulation was collected from respondents who had been in the Distribution Firms for a long period of time .the finding in this study Gil-Saura & Ruiz-Molina (2011), concurred with those of that employee years of

service increased productivity and motivation the act of recognizing desired Behavior increases the repetition of the desired Behavior, and therefore productivity.

Table 3 Respondent's years of service

Years	Frequency	Percentages
9-above	38	49
6-8 years	20	27
3-5years	12	15
0-2years	7	9
Total	77	100

4.3.4 Job Category

As summed up in the table 4. below, the study further obtained the job designation of the respondents picked from the respondents involved in warehouse management. The respondents were requested to indicate their job category. From the findings in Table 4 which showed that the percentage of staff working in Procurement were 14 %, Warehouse Officer were 23 %, Warehouse Category Managers 13%, Dispatch Officers 12 %, Picking, Consolidation Officers 24% and those in Transport And Distribution were 14 %.This implied that data was collected from staffs who were majorly involved in the daily warehouse operations and were in capacity to provide the required information based on warehouse simulation to measure distribution performance. The findings in this study are in line with Daugherty (2011), stated that electing the right team can make the difference between success and failure. The process is more complex than merely selecting the best personnel. Issues such as communication between client representatives and implementation team leaders, personal chemistry are critical to the success of a warehouse management system installation.

Table 4: Job Category

Category	Frequency	Percentages
Procurement	11	14
Warehouse Officer	17	23
Warehouse Category Managers	10	13
Dispatch Officers	9	12
Picking, Consolidation Officers	19	24
Transport And Distribution	11	14
Total	**77**	**100**

4.4 Descriptive Analysis

Descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data (Creswell, 2013).

4.4.1 Warehouse Layout Design

The respondents were asked to indicate the influence of Warehouse Layout Design on performance of Distribution Firms in Kenya. A scale of 1 to 5 where; 1= SD - Strongly Disagree 2=D - Disagree, 3=N - Neutral, 4=A - Agree and 5= SA - Strongly Agree. Mean and standard deviation were calculated for ease of comparison and generalization of findings. From the finding the respondents established that Ensure that vertical space

as well as individual location cubic capacity is fully utilized Maximize cube as well as ground level square feet which with a mean score of 3.99 and standard deviation of 0.97,the respondents to a great extent agreed that Group functionally related items together by Grouping fast-moving items together, physically similar items together to save spacing during picking which was supported by mean of 3.88 and standard deviation of 1.14.

the study further contributed that Develop a process flow chart that tracks a receipt through the put away process and an order from replenishment to shipping contributed to strategic layouts with a mean score of 4.13 and standard deviation of 1.15.the study found that organisation should use masking tape to outline major work areas and carry things through it, roll pallet jacks around during layout planning with a mean score of 3.84 and standard deviation 0.93.from the finding of the study it was established that proper layout of the warehouse contributed to the strategic warehouse planning as well contributing to warehouse capacity utilization .the finding of this study are in line with those of Gil-Saura & Ruiz-Molina, (2011) that The layout of your warehouse is the foundation of the efficiency or lack thereof in your operations. From inventory management to order fulfillment, your warehouse layout design will either streamline your business processes or slow them down.

Table 5: Space Planning

Statement	Min	Max	Mean	StD
Relatively heavy items should be assigned to locations low to the ground to minimize the effort and risk of heavy lifting	1.00	4.00	3.95	1.03
Group functionally related items together by Grouping fast-moving items together, physically similar items together	2.00	5.00	3.88	1.14
Does your organisation use masking tape to outline major work areas and carry things through it, roll pallet jacks around,	3.00	5.00	4.32	0.96
Ensure that vertical space as well as individual location cubic capacity is fully utilized. Maximize cube as well as ground level square feet.	1.00	4.00	3.99	0.97
Do the warehouse layouts allow showing the path and number of times the product is touched?	2.00	4.00	3.84	0.93
Develop a process flow chart that tracks a receipt through the put away process and an order from replenishment to shipping,	1.00	5.00	4.13	1.15

Location Mapping

The study sought the respondents response on the level at which they agreed with the given statements that relate to the influence of Location Mapping on performance of Distribution Firms in Kenya and results presented on figure 2 A Likert scale of 1-5 was used where strongly agree=5, agree=4, not sure=3, disagree=2, and strongly disagree=1. From the finding, majority of the respondents indicated that the layout of the warehouse locations influences the picking and reserve storage logic of your Warehouse Management System (WMS) with 35.06% of the respondents strongly agreeing, 45.45% of the respondents agreeing and 11.69% of the respondents were neutral to statement with only 2.60% of the respondents disagreeing .the further indicated that Forecasting the stock profiles and access requirements are key factors to consider before any re-planning of your warehouse space can begin with 41.56% of the respondents strongly agreeing ,and 11.69% of the respondents been neutral only 3.90% of the respondents disagreed.

The study found out that when the warehouse is mapped, barcodes allow WMS users to quickly complete tasks by scanning the appropriate location directed by the system, with 19.48% of the respondents strongly agreeing, 64.94% of the respondents agreeing and only 7.79% of the respondents disagreed .the study revealed that Warehouse location mapping involves identifying and naming all product shelving positions, work areas, and travel paths within your facility with 42.86% of the respondents strongly agreeing , 42.86% of the respondents agreeing with only 1.30% of the respondents disagreeing .from finding of the study it can be stated that location mapping enable easy product identification by the use of different automated warehouse management systems. The findings in this study are in line with those of Chan & Zhang, (2011) that Mapping all warehouse locations allows automated systems to create the most efficient pick paths and reserve storage options to boost productivity across multiple task areas: receiving/put away, fulfillment, and replenishment, to name a few.

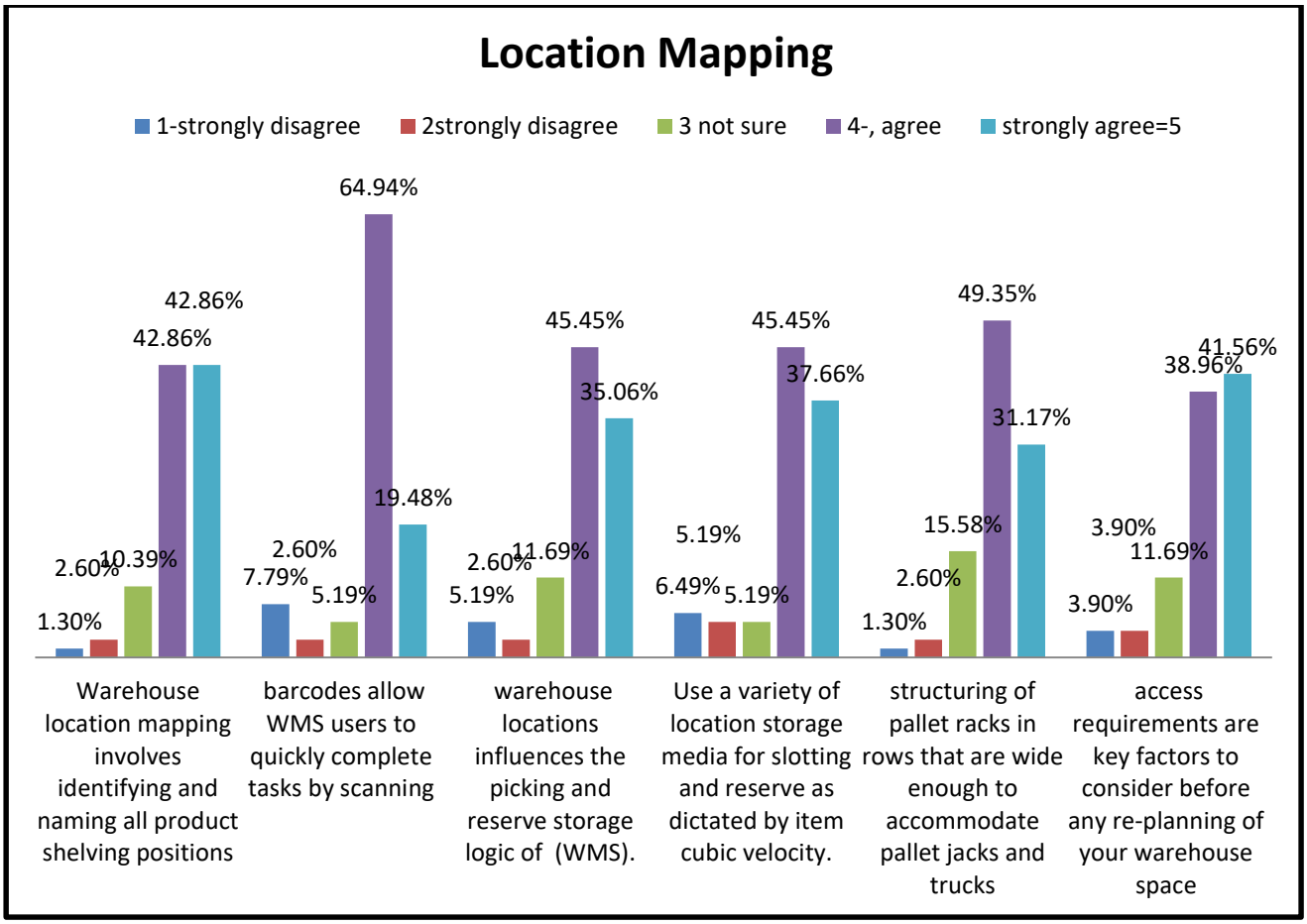


Figure 2: Location Mapping

4.4.2 Regression Analysis

The study conducted regression analysis to determine the Role of Warehouse Layout Design on performance of Distribution Firms in Kenya.The study results are shown in the subsequent sections. The Multiple regression analysis ($y = B0+ B1X1+ \varepsilon$) was run with performance of Distribution Firms as the dependent factor and Warehouse Layout Design as the predictor variable. Table 6 shows that the coefficient of determination R2 is 0.699 This means that the combined influence of the predictor variables (Storage Systems , Space Planning , Location Mapping, explains 69.9% of the Performance of Distribution Firms

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.836[a]	.699	.687	.535

a. Dependent Variable: Performance of Distribution Firms
b. Predictors: (Constant), Storage Systems, Space Planning, Location Mapping

4.4.3 Beta Coefficients

The established regression equation was

$Y= 1.625+ 0.980X_1+0.200X_2+ 0.494X_3 +e$

From regression results in Table 7, the 1.625 represented the constant which predicted value of Performance of Distribution Firms when all influences of warehouse layout design were constant at zero (0). The implication is that when warehouse layout design effect is constant, performance of Distribution Firms in Kenya; case of DHL supply chain be at 1.625

The study found that Storage Systems has significance positive influence in Performance of Distribution Firms as indicated by β_1=0.980, p=0.000<0.05, t=7.066. The implication is that a unit increase in Storage Systems would led to a significant increase in Performance of Distribution Firms by β1=0.980. From coefficient results the study found that Space Planning, has a significance positive influence on Performance of Distribution Firms as indicated by β_2= 0.200, p=0.002<0.05, t=1.655. The implication was that a unit increase in Space Planning would results into increase in Performance of Distribution Firms by β2= 1.655

From the regression coefficient findings, the study revealed that Location Mapping would have a significant positive influence Performance of Distribution Firms as indicated by β_3=0.494, p = 0.000<0.05, t=1.4.789. The implication is that an increase in Location Mapping would lead to an increase in Performance of Distribution Firms. The findings concurred with Pearson (2010); there are warehouses with different working areas, depending on the types of product and their consumption. They normally have intermediate handling areas and can require various operations that in turn need flows of a certain and at times great complexity

Table 7: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.625	.203		8.004	.000
	Storage Systems	.980	.139	1.215	7.066	.000
	Space Planning	.200	.121	.244	1.655	.002
	Location Mapping	.494	.103	.664	4.789	.000

a. Dependent Variable: Performance of Distribution Firms
b. Predictors: (Constant), Storage Systems, Space Planning, Location Mapping,

From the regression findings, the regression equation becomes:

$Y= 1.625+ 0.980X_1+0.200X_2+ 0.494X_3 +e$

The model is given as follows;

Where:-

Y= Performance of Distribution Firms

β_0=constant

X_1= Storage Systems

X_2= Space Planning

X_3= Location Mapping

ε=Error Term

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter describes the summary of the study, conclusions and recommendations of the study based by the study to determine the Role of warehousing simulation on performance of Distribution Firms in Kenya; case of DHL supply chain.

5.2 Warehouse Layout Design and performance

The study established that there are several basic principles that apply to warehouse layout design, and running an effective distribution center operation. Without the proper layout and design of your distribution center, no matter the square footage, Distribution Firms will be facing capacity issues, decrease in productivity, and storage inadequacies. Maintain flexibility in the operation and layout. Planning for unknown future changes to the business or fulfillment model is a necessity to avoid unnecessary costs to make unplanned changes to the facility and operation. Distribution Firms should develop a layout or process that is inflexible or not scalable. Whenever possible, the use of a simple transfer conveyor system improves operating efficiencies by reducing handlings and walk time.

5.3 Conclusion

The study concludes that in the design of a warehouse/storage building should consider the overall structure, size and dimension, features of departments, selection of its strategic operation, and equipment to be used in the storage process. During the overall design, material flow patterns, functions of each department reception, selection, storage, sorting, and shipping, and the relationships flow that should exist among its sections is determined. Activities of receiving and pick up, Pick up/Packing are considered relevant given the cost implications involved and these are influenced and affected by the type of warehouse design considered

5.4 Recommendations

The study recommends that The detailed layout and design of the preferred facility option should include, performance specifications, equipment layout, facility footprint and building design and cost, new building, specification of static and mobile materials handling equipment, high level process design, detailed implementation and warehouse operational costs.

REFERENCES

Amazon Plans to Open A Logistic Center In Israel". Bizisrael.com. November 27, 2017. Archived from the original on December 1, 2017.

Azizi, S., Kapak, S. J., and Tarhandeh, F. (2014). Physical Distribution Service Quality through Iranian Convenience Stores Retailers Perspectives: a Mixed Method Approach. Iranian Journal of Management Studies, 7(1), 121

Baker, P. (2011) "An Exploratory Framework of the Role of Inventory and Warehousing in International Supply Chains", The International Journal of Logistics Management.

Bartholdi III and Hackman, (2014) The Role of Inventory and Warehousing in International Supply Chains.

Beers, C., and Zand, F. (2014). Rand D cooperation, partner diversity, and innovation performance: an empirical analysis. Journal of Product Innovation Management, 31(2), 292-312.

Belussi L. F. F. and Hirata N. S. T. (2013) "Fast component-based QR code detection in arbitrarily acquired images," Journal of Mathematical Imaging and Vision, vol. 45, no. 3, pp. 277–292.

Cai, S., Jun, M., and Yang, Z. (2010). Implementing supply chain information integration in China: the role of institutional forces and trust. Journal of Operations Management, 28(3), 257-268.

Chan, F. T., and Zhang, T. (2011). The impact of Collaborative Transportation Management on supply chain performance: A simulation approach. Expert Systems with Applications, 38(3), 2319-2329.

Chen, H., Ellinger, A. E., and Tian, Y. (2011). Manufacturer–supplier guanxi strategy: An examination of contingent environmental factors. Industrial Marketing Management, 40(4), 550-560.

Christopher, M. (2016). Logistics and supply chain management. Pearson UK.

Creswell J. W. (2013), "Review of the Literature". Research Design. Qualitative, Quantitative, and Mixed Method Approaches (4th ed.). Thousand Oaks, California: SAGE Publications. ISBN 9781452226101.

Daugherty, P. J. (2011). Review of logistics and supply chain relationship literature and suggested research agenda. International Journal of Physical Distribution and Logistics Management, 41(1), 16-31.

Eric H. Grosse, Shane M. Dixon, W. Patrick Neumann, Christoph H. Glock. (2016) Using qualitative interviewing to examine human factors in warehouse order picking: technical note. International Journal of Logistics Systems and Management 23:4, 499-518

Fawcett, S. E., Wallin, C., Allred, C., Fawcett, A. M., and Magnan, G. M. (2011). Information technology as an enabler of supply chain collaboration: a dynamic-capabilities perspective. Journal of Supply Chain Management, 47(1), 38-59.

Gil-Saura, I., and Ruiz-Molina, M. E. (2011). Logistics service quality and buyer–customer relationships: the moderating role of technology in B2B and B2C contexts. The service industries journal, 31(7), 1109-1123

Gupta, Mahesh, and Snyder (2011) Comparing TOC with MRP and JIT: a literature review.International Journal of Production Research 47.13 (2011): 3705-3739.

GurríaA. (2012), The Emergence of Global Value Chains: What Do They Mean for Business. G20 - Trade and Investment Promotion Summit. Mexico City: OECD.

Harold (2010) Study on implementation of warehouse management system

Huang M. (2010) Study on general use of warehouse management system software in Singapore.

Johnston, W. J., Khalil, S., Jain, M., and Cheng, J. M. S. (2012). Determinants of joint action in international channels of distribution: The moderating role of psychic distance. Journal of International Marketing, 20(3), 34-49.

Keller S. B. and Keller B. C. (2014) Definitive Guide to Warehousing, Managing the Storage and Handling of Materials and Products in the Supply Chain. Kenya Manufacturers and Exporters Directory, 2014; the 10th Edition.

Kumar (2014) Warehouse – Layout Planning and Part Feeding Methods. Yes Dee Publishing Pvt Ltd. ISBN 9789380381381.

Lidström J. (2013) is advanced technical functionality enough? – Value creation in a complex warehouse management system investment.

Manahan, Kim. (2012) "Construction on Amazon warehouse to start by next month - Middletown, DE". Middletown Transcript. Archived from the original on May 29, 2012.

Mangan, J., Lalwani, C., and Lalwani, C. L. (2016). Global logistics and supply chain management. John Wiley and Sons.

Mohamed, B., and Azizan, N. A. (2015). Perceived service quality's effect on patient satisfaction and behavioural compliance. International journal of health care quality assurance, 28(3), 300-

Mugenda, O., M. & Mugenda, A. G. (2012). Research Methods: Quantitative and Qualitative Approaches. Nairobi, Acts Press

Pearson S. (2010) WMS metamorphosis; the mature technology has evolved with enhanced functionality, better integration and new methods of delivery and use. The five trends driving the evolution of WMS", Modern Materials Handling.

Ramaa A., Subramanya K. N. and Rangaswamy T.M. (2012) Impact of warehouse management system in a supply chain, International Journal of Computer Applications.

Swiatecki, Chad (, 2015). "E-commerce giant to hire 1,000 in new San Marcos facility". Austin Business Journal. Archived from the original on August 22, 2015.

Wathe, Warioand Arasa (2015) Influence of Inventory Management on Performance of Manufacturing Firms in Kenya.

Zhou J. J., Liu Y. F. and Li P. (2010), "Research on binarization of QR code image," in Proceedings of the International Conference on Multimedia Technology (ICMT '10), pp. 1–4, Ningbo, China.