RELATIONSHIP BETWEEN INFORMATION TECHNOLOGY ADOPTION AND WAREHOUSE OPERATIONS AT SONY SUGAR COMPANY, KENYA

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ABSTRACT

The world is growing in technology and most industries are adopting the use of ICT in their operations. Information technology involves development, maintenance and use of computer systems software and networks for processing and distribution of data. Most industries used manual systems that were not efficient and effective. The currently existing competition between the sugar industries has pushed for the development of new technologies in their operations to make them satisfy their customers. A principle requirement for controlling the warehouse is harnessing the power of technology to maximize a facility's potential. A few studies have attempted to investigate the extent of warehouse information technology adoption by industries in the country. However; there is limited literature on the effect of information technology adoption on warehouse operations therefore, the purpose of this study was to analyze the relationship of information technology adoption on warehouse operations of Sony Sugar Company. Specific objectives of the study were; to determine the level of use of ICT on warehouse operations; to investigate the benefits of information and communications technology on warehouse operations of Sony Sugar Company; to establish the effects of information and communication technology on warehousing operations at Sony Sugar Company Ltd and to find out challenges that influence the adoption and use of ICT applications on warehouse operations at Sony Sugar Company Ltd. The research design that was used in the study was descriptive and correlation design, the total target population from the company's registry were 500 of employees and a sample size of 150 was selected to participate. Stratified random sampling was used to divide the sample size into two strata of Sony sugar company warehouse management and warehouse staff. Primary data were collected using questionnaires and secondary data from books and journals from library and industry brochures. Data was analyzed using regression and correlation techniques. The study established that the utilisation of ICT systems at Sony warehousing operations was positive. The study findings showed that they utilised internet system more often in warehousing operations than others as shown by the mean of 4.2 and bar coding and scanning which was at a mean of 3.6. The study established that there existed a significant positive but weak effect of ICT adoption and warehousing operations at Sony Sugar. The study findings are significant to procurement practitioners who want to know more on effects of information technology and may use the findings as a point of reference. The management of company find it important for assessing the level of service delivery to their clients. It will also be important to the shareholders in knowing how best they can maintain and advance the use of information technology in the warehouse operations. The researcher suggested further studies on the role of automation of warehouse on employees' performance in organization, the impact of ICT use in warehousing operations on financial performance of the company.

CHAPTER ONE

INTRODUCTION

This section presents the background information of the study, the problem statement, purpose of the study, research objectives, justification of the study, limitation of the study and conceptual framework.

1.1 Background of the Study

Warehouses are essential components of any supply chain. In a warehouse, items are handled in order to level out the variability and imbalances of the material flow caused by factors such as seasonality in demand, production scheduling, transportation, and consolidation of items (Gao *et al.,* 2007). Inventories in warehouses are capital-intensive assets that require storage areas, handling equipment, and information systems. In addition, warehouse operations are repetitive, labour intensive activities. The capital and operating costs of warehouses represent about 20-25% of the logistics costs (Frazelle, 2002, Baker&Canessa, 2009). Therefore, improvements in the planning and control of warehousing systems can contribute to the success of any supply chain.

A warehouse is typically divided into functional areas that are designed to facilitate the material flow (Tompkins *et al.,* 2003). The main warehouse areas are outlined in the following: receiving area, reserve and forward storage area, and shipping area. Operations in the receiving area include the processing (i.e., unloading) of carriers, item identification, and quantity and quality inspection. Received items are then moved to a storage area or directly to the shipping area. The storage area is often divided into a reserve and a forward storage area. The reserve storage area covers

typically distant and heavily accessible locations, e.g., the uppermost part of a rack, and is used to ensure the replenishment for the forward storage area. Customer demand is primarily satisfied from the forward storage area, where the items are typically stored in convenient size and the storage locations are easily accessible. In the shipping area, items are sorted, consolidated and loaded on the carriers. While this is a general material flow in a warehouse, the actual material flow depends mainly on the role of the particular warehouse in the supply chain.

Specialized warehouses are established to fulfil the different requirements, e.g., production warehouse, distribution warehouse, and cross-dock. The main function of a production warehouse is buffering and storage, it supplies raw or semi-finished material for production and may prepare finished items for shipment; the typical objective is the minimization of operation and investment costs given the storage capacity and response time (Rouwenhorst *et al.*, 2000).

Karimi and Namusonge (2014) observe that warehouse management systems (WMS) have been available since the earliest computer systems and were allowed simple storage location functionality. They add that the implementation of a WMS is often complex. Project planning is critical to the success of any WMS implementation. They therefore note that there still remains the challenge of adoption and implementation of the system whilst still operating the warehouse.

Alan (2006) noted that with the continuing changes in technology and equipment, warehousing logistics is an increasingly competitive aspect of the supply chain. The competitive pressure mean there is an ongoing demand to achieve more efficiency

with every cubic foot of warehouse space. Vendors are utilizing new software and other tools to provide a heightened level of service with each step in the warehouse process. There are many components in working to achieve the highest level of efficiency when dealing with warehousing logistics. The process involves establishing realistic objectives and managing changes in a realistic manner.

Eliminating wasteful or inefficient elements of daily procedures is an ongoing process that involves the entire warehouse team. Diligent review of the standard operating procedures and a consistent approach to efficiency are essential parts of achieving a lean operation. This is especially important in a growing organization; supply chain typically focuses on the application of warehouse management system (WMS) technology on automation of the outbound finished goods process. Warehouse management system (WMS) is designed to automate, integrate and track all activities performed within the facilities. The activities include services such as receiving, put away, picking and packing and shipping. Roodbergen and Vis (2009) have therefore posited that the effectiveness of e-Portal applications within the WMS environment needs further investigation.

With many sugar industries embracing the information technology systems in operations, there is still inefficiency in service delivery especially in the warehouses where trucks wait for long before they are served in the receiving of goods and at dispatch. Scavarda et al., (2012) studies how information technology revolution has affected distribution operations, providing many benefits from labour productivity gains to accuracy and improved inventory turns. They argued that warehouse management is the critical part of any business and in order to manage efficiently we

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need IT systems and tools. In order to deliver targeted warehouse objectives and transform warehouse into profit centre, it is essential to understand warehouse objectives and make use of the people, strength, processes and technology to achieve the same. A warehouse management system provides the information necessary to manage and control the flow of the product in a warehouse from receiving to shipping. However, they failed to demonstrate how the integration of bar coding technology, radio frequencies communications equipment, hardware and software in the warehouse management system benefits warehousing operations.

1.2 Statement of the Problem

The majority of warehousing problems occur because of lack of control of inventory operations and management. To become dynamic, successful and consistent, an organization must control its warehouse operations. A principle requirement for controlling the warehouse is harnessing the power of technology to maximize a facility's potential. Furthermore, the road to organizational excellence goes through warehouse door. The key to a company's success is customer satisfaction. Customer satisfaction is largely based upon the ability to control warehouse. Does the company experience efficiency due to adoption of IT in warehouse operations?

A WMS will allow companies to control and optimize a warehouse's operating efficiency, therefore, a key to achieving customer satisfaction an assuring the company's long term success is the proper implementation and utilization of quality WMS. With the right WMS in place a warehouse is on trucks to stay highly competitive in a future that will only become more demanding. Supply chain excellence depends not only on the warehouse but its warehousing technology. Most

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sugar industries still have the manual way of loading and off loading the tracks that cause many delays in delivery of goods, the experience of over stayed goods in the warehouse because of failure to use the space well. Initially companies used manual systems that were not efficient and effective and currently there is development of technology in operations thus the study ought to analyze the effect of information technology adoption on warehouse operations of Sony Sugar Company.

1.3 Objective of the Study

The main objective of the study is to analyze the relationship of information technology adoption on warehouse operation. Specifically study sought;

1.   To determine the level of ICT applications on warehouse operations of Sony Sugar company

2.   To investigate the benefits of information and communications technology to warehouse operations of Sony Sugar Company

3.   To establish the relationship between information and communication technology on warehousing operations at Sony Sugar Company

4.   To find out challenges that influence the adoption and use of ICT applications on warehouse operations at Sony Sugar Company Ltd

1.4 Research Questions

1.   What is the level at which ICT applications are used on warehouse operations at Sony Sugar Company Ltd?

2.   What are the benefits of ICT application use to warehousing operations at Sony Sugar Company Ltd?

3. What is the relationship between ICT systems and applications on warehouse operations at Sony Sugar Company Ltd?

4. What are the challenges experienced in utilisation of ICT systems on warehousing operations at Sony Sugar Company Ltd?

1.5 Significance of the Study

A warehouse management system provides the information necessary to manage and control the flow of products in a warehouse from receiving to shipping. In the current world there is more of information technology in most operations that were being done manually .Most companies have settled for computerized work that make the work efficient and easy to control, it is on this account that the researcher find it necessary to propose such a study to assess the effects of warehouse management systems at Sony Sugar Company.

The findings of the study was not only to Sony Sugar Company but to future scholars in this field in other industries as reference materials. The suppliers were to benefit on being enlightened of the technologies that were to used during the delivery of goods, how they can get the requisitions of goods and how best they can get their payments. The management team was to evaluate and asses how easy it was to use the technology which improves the efficiency of work in the warehouse. The warehouse workers who were to increase their efficiency level when the technologies were adopted thus higher turnover. The study was also to help the policy makers of sugar board of what improvement to make in sugar industry warehouse in relation to information technology.

1.6 Scope of the Study

The study investigated the relationship between information communication technology and warehousing operations. The study centred on finding out the ICT systems and applications that were used, the benefits of ICT systems and applications, effects of ICT application use and barriers to ICT systems adoption at Sony Sugar. The respondents for the study were employees working in the sugar firm. Questionnaire was used as the instrument for data collection. Data was collected within a period of one month.

1.7 Conceptual Framework

Independent Variable   **Dependent Variable**

INFORMATION AND COMMUNICATION TECHNOLIGY
-Electronic data interchange
-E- portal
-Radio frequency and bar coding
_Internet

→

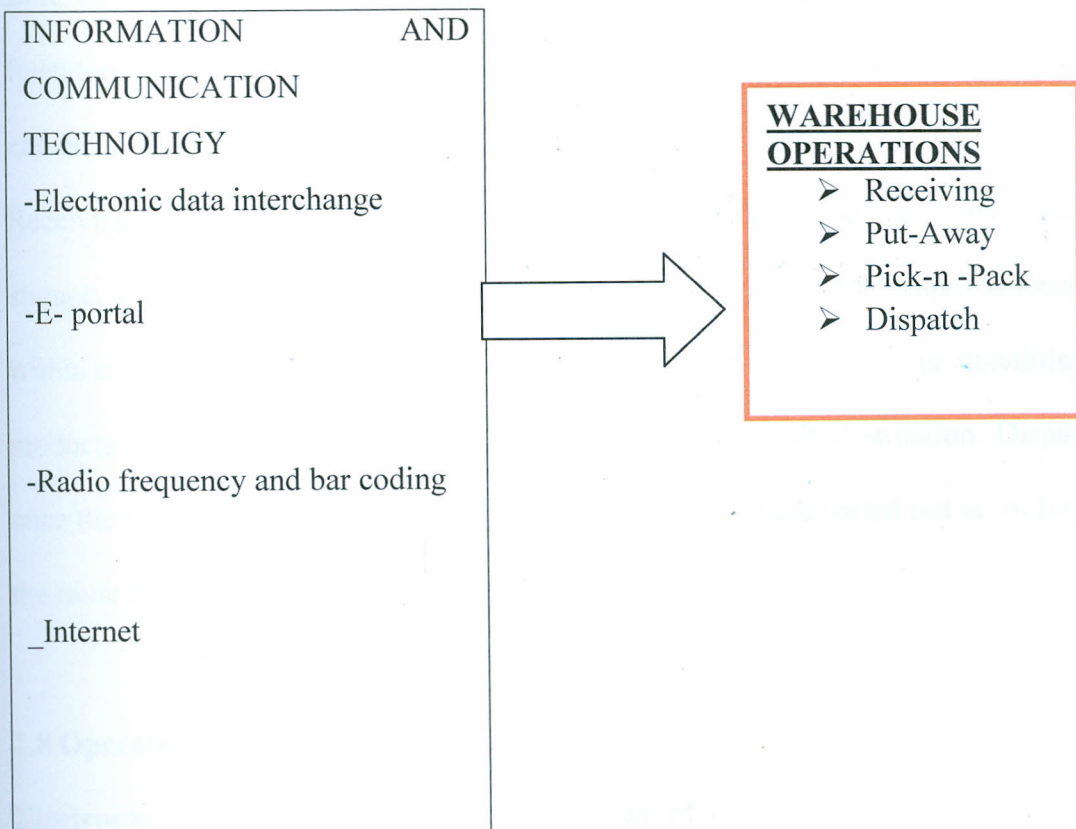| **WAREHOUSE OPERATIONS** |
| :--- |
| ➢ Receiving |
| ➢ Put-Away |
| ➢ Pick-n -Pack |
| ➢ Dispatch |

Figure 1.1 Conceptual framework on the effect of information technology on warehouse operation

Source: Self-conceptualization (2014)

Information technology is the use of computer software on operations. Warehouse management system is a software application that supports the day- to- day operations in a warehouse that controls the movement and storage of materials in a warehouse. Electronic Data Interchange (EDI) is the exchanging of documents electronically in a safe environment. E-portal provides customers with real time information anytime anywhere, as E-portal is integrated with WMS; clients can manage their orders, view inventory pay invoices. Radio frequency and bar-coding (RFB)-capture transition and store information in real time. When an inventory arrives and it's carried out in WMS. Inventory management system- is software for tracking inventory levels, orders, sales and delivery.

Receiving- is the inspection of goods that arrive in the warehouse and preparation for storage. Put Away- is the tagging and matching goods to their appropriate location within a warehouse. Pick and pack- it entails processing small and large quantities of products often track loads, picking the right product for each destination. Dispatch- once the items are picked and moved to dispatch area they are sorted out according to the route for delivery by transport department.

1.8 Operational Definition of Terms

Electronic Data Interchange: involves a way of conducting inter-organizational transactions electronically. It also refers to the inter-company computer-to-

computer communication of standard business transactions in a standard format that permits the receiver to perform the intended transaction.

Information communication technology: refers to technological systems that support exchange of information both within and between organisations.

Inventory management system: It is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods.

Supply chain management: It is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers.

Warehouse management: is defined as the the material flow in a warehouse. At first, items arrive and received in the facility. Then the item is either forwarded to the shipping area or allocated in a storage location.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section will cover the previous research on warehouse technology; electronic data interchange, E-portal and radio frequency and bar coding and the conclusion of the various researches.

2.2 Theoretical Literature

Different theories have been forwarded to explain the concept of management by different researchers. According to the behavioural theory, management refers to the rule of game within the society/organization which configure individual behaviours, in so doing reducing the uncertainty of risks and transaction costs linked with each individual action (Karimi & Namusonge, 2014). Management science theorists like Herbert and Newman, define management as the application of sophisticated quantitative mathematical techniques for solving managerial problems. Under this theory, an Organization is considered a decision making unit and the main job of a manager is to make decisions and solve problems. It therefore assumes a mathematical model which is a representation of real life situation.

Elsewhere, the term management refers to activities involved in the four general functions of a manager which recur throughout the Organization and are highly integrated. These activities are planning, co-coordinating, leading and controlling. It is therefore universal and focuses more on leadership skills. The management of the

warehouse function at Sony Sugar lies with the warehouse manage and employees working under him/her.

2.2.1 Warehouse Technologies

Innovations are streamlining the supply chain and increasing the efficiency of today's technologies. Every warehouse stands to benefit from the latest warehousing solutions mix, the old and the new software and information technology enhancement (Nasir 2008). Jolayemi and Olorunniwo (2010) note that warehouse operator's work in industrial trading and forwarding companies as well in other logistics service providers. They demonstrate that their scope of work covers all activities related to the transfer and storage of goods and that they accept goods and check the delivery on the basis of the accompanying documentation, transport and forward goods to the company destination, unpack goods sort and place them into storage as required and in an efficient manner, among many other responsibilities.

Ayers (2003) observed that depositors are the customers of the warehouse who engage and rely on the service of a warehouse they transfer their goods from manufacturing plant and other shipping origins to the warehouse for future shipment to their customers. He further noted that the common contract and private carriers-operators who at the direction of depositor haul the goods to and from the warehouse, many warehouses either run their own truck fleets or are closely affiliated with local regional trucking companies.

2.2.2 Electronic Data Interchange

According to Kantor and Burrow (1996), electronic data interchange (EDI) is an electronic communication method that provides standards for exchanging data via any

electronic means. By adhering to the same standard, two different companies, even in two different countries, can electronically exchange documents (such as purchase orders, invoices, shipping notices, and many others). It also refers specifically to a family of standards. In 1996, the National Institute of Standards and Technology defined electronic data interchange as "the computer-to-computer interchange of strictly formatted messages that represent documents other than monetary instruments.

EDI implies a sequence of messages between two parties, either of whom may serve as originator or recipient. The formatted data representing the documents may be transmitted from originator to recipient via telecommunications or physically transported on electronic storage media. It distinguishes mere electronic communication or data exchange, specifying that in EDI, the usual processing of received messages is by computer only.

Human intervention in the processing of a received message is typically intended only for error conditions, for quality review, and for special situations. For example, the transmission of binary or textual data is not EDI as defined here unless the data are treated as one or more data elements of an EDI méssage and are not normally intended for human interpretation as part of online data processing (Kantor & Barrow, 1996). EDI and other similar technologies save a company money by providing an alternative to, or replacing, information flows that require a great deal of human interaction and paper documents. Even when paper documents are maintained in parallel with EDI exchange, e.g. printed shipping manifests, electronic exchange and

the use of data from that exchange reduces the handling costs of sorting, distributing, organizing, and searching paper documents.

EDI and similar technologies allow a company to take advantage of the benefits of storing and manipulating data electronically without the cost of manual entry. Another advantage of EDI is the opportunity to reduce or eliminate manual data entry errors, such as shipping and billing errors, because EDI eliminates the need to rekey documents on the destination side. One very important advantage of EDI over paper documents is the speed in which the trading partner receives and incorporates the information into their system thus greatly reducing cycle times. For this reason, EDI can be an important component of just-in-time production systems (Kantor & Burrow, 1996).

According to the Aberdeen Report (2008), "A Comparison of Supplier Enablement around the World", only 34% of purchase orders are transmitted electronically in North America. In EMEA, 36% of orders are transmitted electronically and in APAC, 41% of orders are transmitted electronically. They also report that the average paper requisition to order costs a company $37.45 in North America, $42.90 in EMEA and $23.90 in APAC. With an EDI requisition to order costs are reduced to $23.83 in North America, $34.05 in EMEA and $14.78 in APAC.

Forrester (2011) found that EDI continues to prove its worth as an electronic message data format. Forrester (2011) research stated that the annual volume of global EDI transactions exceeds 20 billion per year and is still growing. For buyers that handle numerous transactions, using EDI can result in millions of dollars of annual savings due to early payment discounts. From a financial perspective alone, there are

impressive benefits from implementing EDI. Exchanging documents electronically improves transaction speed and visibility while decreasing the amount of money you spend on manual processes. However, cost savings is far from the only benefit of using EDI.

Vollmer (2011) also posits that automating paper-based tasks allows your staff to concentrate on higher-value tasks and provides them with the tools to be more productive. Quick processing of accurate business documents leads to less re-working of orders, fewer stock outs and fewer cancelled orders. Automating the exchange of data between applications across a supply chain can ensure that business-critical data is sent on time and can be tracked in real time.

Sellers benefit from improved cash flow and reduced order-to-cash cycles. Shortening the order processing and delivery times means that organizations can reduce their inventory levels, Enables real-time visibility into transaction status. This in turn enables faster decision-making and improved responsiveness to changing customer and market demands, and allows businesses to adopt a demand-driven business model rather than a supply-driven one, shortens the lead times for product enhancements and new product delivery, streamlines your ability to enter new territories and markets. EDI provides a common business language that facilitates business partner on boarding anywhere in the world, promotes corporate social responsibility and sustainability by replacing paper-based processes with electronic alternatives. This will both save you money and reduce your CO_2 emissions.

Wang (2009) states that an EDI message contains a string of data elements, each of which represents a singular fact, such as a price, product model number, and so forth, separated by delimiter. The entire string is called a data segment. One or more data segments framed by a header and trailer form a transaction set, which is the EDI unit of transmission. A transaction set often consists of what would usually be contained in a typical business document or form. When sending an EDI documents both parties or trading partners must adhere to the same set of rules. These standards define where and how the information from the document will be found. Translation software processes the information differently for sent and received messages and performs a complete audit of each step to ensure information is sent or received in EDI format. When the translator on the receiving computer reads a document, it knows where to find the buyer's company name, order number, purchase items and price, for example. This information is then sent to the receiver's order entry system without necessitating manual order entry.

EDI applies to documents such as purchase orders, invoices, shipping notices and commission sales reports, as well as other important or classified information. For example, an insurance company can verify that an applicant has a driver's license through an EDI exchange. EDI is primarily used by large companies to have a uniform processing system, enabling efficiency. Cost, speed, accuracy and efficiency are the major benefits of EDI. The system is expensive to implement and usually requires help from a consultant that specializes in the field.

2.2.3 E-portal

Terry (2008) define an enterprise information portal (e-portal) as a single gateway through which to gain access to all the information, data, systems, and processes used

by stakeholders of an organization. Stakeholders of an organization may include employees, customers, investors, or business partners (suppliers, distributors, resellers, agents, franchisees and so on). He observes that user's experience of the e-portal must be uniquely tailored to his or her individual needs, and the user can access the e-portal via the corporate intranet (typically employees only), extranets, or the Internet. Although IT spending is down considerably, spending on e-portal software continues to be relatively high.

Ultimately, Huang (2007) comments that the aim for business is always increased return on investment. On e-business systems, employing e-portals (whether indirectly or directly) can lead to reduced EDI costs, postal costs, and travel costs to meetings, as well as reduced administration/paper costs. It can also come from reduced error rates (because decisions are made based on more up-to-date information) and reduced staffing costs (because customers can take advantage of self-service features and so on). The challenge of the e-portal is to reduce information overload by presenting only the information the user requires, preferably at the time when the user requires it.

2.2.4 Radio Frequency Identification

Roodbergen and Vis (2009) view Radio-frequency identification (RFID) as the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. They note that the tags contain electronically stored information while some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag does not necessarily need to be

within line of sight of the reader, and may be embedded in the tracked object. Radio frequency identification (RFID) is one method for Automatic Identification and Data Capture (AIDC). (Angell, 2006) studied how radio-frequency identification system uses tags, or labels attached to the objects to be identified. However both studies failed to demonstrate specifically how a Sugar manufacturing company can benefit from these technologies.

2.2.5 Warehouse Operations

Warehousing plays a vital role in the entire supply chain of an enterprise. If the enterprise cannot guarantee purchase, delivery and effective control of the safety stock, it results in the increase of administrative expenses, and the decrease of the quality and level of service, which affects the competitiveness of the enterprise. To establish a sound information system architecture, and to realize the information of storage have become the basic matters of modern enterprise management, which make a lot of contributions to the enterprise information sharing, the increase of the turnover rate of storage, reduction of inventory and enterprise logistics cost, the realization of the uninterrupted, timely and seamless connection, and operate each aspect of warehousing smoothly and co-ordinately (Nasir 2008).

The current storage management is in the state of artificial or semi-automatic, which brings low efficiency, while cannot realize information-based, paperless operation absolutely. Traditional simple static storage management is unable to ensure the efficient use of corporate resources. Warehouse and inventory control operations nowadays are very complicated, so a manual recording leads to a time-consuming, laborious and error-prone, and huge loss on business (Gua *et al.,* 2010).The

application of information technology in warehousing and logistics system is definitely meaningful to reduce logistics costs effectively. In order to achieve the maximum benefit with the smallest cost, the enterprises have to find a way of optimizing the allocation of logistics resources and implementing a reasonable decision-making. This is vital for both enterprise logistics and logistics enterprises.

Lots of problems need to be solved by using information technology e.g. storage configuration, goods packing and containerization, goods allocation in shelves and cargo space, the formulation of the work plan, arrangement of personnel, decision-making of inventory, demand cost prediction, system control etc. Some intelligent means are considered to be useful and significant for the logistics and warehouse system to get the optimization of decision-making and top utilization of the resources (Minh-chang, 2009).To enhance the competitiveness of logistics enterprises from a perspective of the competitiveness, enterprises are often very concerned traditionally about some single governance aspects of the activities, but after the formation of the supply chain system, especially after the prosperous development of the third-party logistics enterprises, this competition is no longer limited within a single field, but throughout the entire logistics process. By applying information technology, the competition ability of a logistics business could be improved tremendously for warehousing.

International logistics activities improved efficiency through enhancing up the facilities of the automated warehousing years ago. In other words, in the case of underdeveloped information, many logistics technical means depend on the facility capacity. Nevertheless, along with the development and application of information

technology, especially after the formation of the supply chain system, information processing, and the ability of governance determines the response capability of the whole supply chain. The logistics competition has shifted from the original concern about the level of logistics facilities to information governance capacity and technical level (Norman, 2014).

Ataay (2006) said that WMS is a management system with many functions such as comprehensive management, inventory management, quality control, and real-time inventory management, which focuses on the effective control and track the whole process of warehouse business and logistics management, to realize the enterprise storage information management perfectly. The overall system is divided into storage management module (SMM), entering management module (EMM), delivery of cargo from storage module and database management module (DCSDMM). Warehouse feedback and analysis system (WFAS) is also an important part of this system. The transmission format of the information, such as external information transmission and information exchange format within the system should adopt EDI during receipts and delivery. It helps speed up the rate of the information flow (Ataay, 2006).

The system uses Barcode management system; it controls the whole process of implementation of various aspects. Barcode management system manages goods cargo space, batch, and shelf life, distribution and bar code label serial number. It regulates the operations of the entire receipt, delivery and replenishment set of goods. Another function of this system is producing statistical reports according to customer demand. Introducing the barcode into the system can remove the steps of hand-written

notes and sent the information to the room and resolve the ills of treasury stale lag. Goods can be tracked through the bar-code systems, no matter where the goods are flowing. The combination of barcode technology and information technology helps the enterprise rational and efficient use of warehouse space, providing customers with the best service in a fast, accurate, low-cost way (Ataay, 2006).

The warehouse management process is inevitably associated with procurements and sales so initial information collection which is to analyze customer database is the first stage of the system procedures, which establishes a bar code for each product, prints the barcode which includes commodity's name, quantity, specifications, bar code serial number, the date of inbound and outbound (Ataay, 2006). Purchase management.

When entering the goods to the storage, a printed barcode label is used by a scanner to input relative information into the system, and the inventory data is changed automatically according to the purchase receipt (Benson, 2006). Warehouse management- In the system of warehouse management, the inventory increases automatically after taking delivery, when sales outbound, inventory system reduces by itself. Anytime except when stock-in or stock-out, the inventory cannot be changed, so parity transfer is unable to affect the entire inventory changes and the administrator could check the inventory of a particular model at any moment. Sales management- When the products get out of the warehouse, administrator uses scanner to get the data of the items on the storehouse column directly, while the total inventory is reduced automatically at the same time.

DMs seem to provide specific solutions to specific business challenges. In principle, DW can meet information needs and provide strategic business opportunities to enhance or transform products, services, business relationships, markets, and work processes. The conceptual and practical understandings of the underlying evolutionary nature of organizational IT governance arrangements become critically important in establishing appropriate IT decision rights in managing effective use of IT. Many IS researchers suggest that three primary modes of IT governance, including centralized, decentralized, and hybrid, can be used to arrange key IT activities. These three modes vary to the extent in which centralized IS, divisional IS, and line management are vested with authority for the key IT activities. Key IT activities refer to IT infrastructure, IT use, and project management. Thus, this study seeks to explain whether or not the outcome of differences in DW topology could be explained by differences in IT governance arrangements (Roy & Sivakumar, 2007).

In today's highly competitive business environment, DWG technology can enable the discovery, exploration, and sharing of important business trends and dependencies that otherwise would go unnoticed. In this context, the question of whether DW architecture is to be implemented using an enterprise-wide DW or a divisional DM, is interesting but difficult to answer. This proposal seeks to explain whether the outcome differences in DW topology can be explained by differences in patterns of IT related authority. A potential relationship between the patterns of authority for key IT activities and the choice of data warehouse topology is investigated by utilizing enriched information from each of the scenarios of multiple contingencies. Therefore, this proposal examines whether the IT governance arrangement lends itself to successful implementation of the data warehouse (Roy & Sivakumar 2007). We

expect that organizations with centralized IT-related authority to implement an enterprise-wide DW architecture in order to build and sustain a lateral organization capacity across the corporation. Organizations with decentralized IT-related authority, on the other hand, are likely to implement a divisional DM architecture in order to build and sustain a lateral organization capacity across business units (Roy & Sivakumar, 2007).

2.3 Empirical Literature

Ayres (2003) studied warehouse operations and concluded that when an organization finds it has storage space concerns it can benefit from looking at two different but related elements of specialization. These include the storage capacity of the building itself that is directly a function of the physical aspect of the layout, the width of the aisles, the storage methods, the type of storage aids and how well the storage capacity is being utilized that is directly as a result of how these resources are managed. However, this study did not factor in the effects of EDI technologies on the warehouse operations.

Norman (2014) on the other hand observed that when running out of warehouse space businesses have much options to consider including expanding your warehouse, building a new capacity. They introduced operational concepts that can be implemented to better utilize your space, remove excess inventory, if a facility is squeezed for space don't overlook the obvious there are many reasons for keeping excess inventory (customer satisfaction). They further noted that selecting the right equipment is a basic principle to preserving warehouse space when evaluating and selecting the most space efficient storage equipment. In spite of the detailed study on

warehouse operations, no mention of specific E-Portal technologies and other applications are mentioned and how they can affect warehouse operations.

Obogne and Lidasan (2005) examined the impact of Information and Communication technology (ICT) on urban logistics system in Metro Manila, Philippines. They conducted a survey to 114 companies with focus on ICT logistics users on their use of ICT by getting the types of ICT use, the application areas, the barriers and future applications from ICT use by the private sectors. The study established that the impact level on ICT use by private firms in Metro Manila was on moderate level and majority of the tested variables showed that no significant differences on the level of impacts on ICT use between firm types and sizes. Government perception and awareness was also considered to know if there are existing policies and initiatives that focus on monitoring the use of ICT in logistics.

Karimi and Namusonge (2014) conducted a research on factors affecting warehousing management. The specific objective was; to determine the effect of information technology on warehouse management. The researcher used descriptive research design taking Jomo Kenyatta University of Agriculture and Technology as a case for this study. The target population was 930 and a sample size of 50. The sampling design adopted was stratified random sampling. Data collection was done by use of questionnaires and informal interviews. Majority of respondents (75%) noted that the organization had managed to implement warehouse management system.

2.4 Summary of the Gaps in Literature

Guet *et al.,* (2007) studied the role of warehouses in supply chains, while Frazelle (2002) and Bakers and Canessa (2009) focused warehouse operating costs. These

studies were very useful to the management of warehouses by demonstrating how the planning and control of related information technologies contributes to the success of supply chains. They however did not spell out how electronic data interchange affects warehouse operations.

While Tompkins (2010) studied how structuring of warehouse operations can contribute to the satisfaction of customers, Karimi and Namusonge (2014) shifted the focus to the study of warehouse management systems. They noted the myriad challenges of adoption and implementation of the systems due to the project implementation complexities implicit. Almost on similar lines, Alan (2006) found that the continuing change in information technologies and equipment also further complicates the increasingly competitive aspects of supply chains. All these studies, although very critical in their respects, did not cover how those technologies relate to warehouse operations in a manufacturing organization.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section presents the study area, research design, target population, population sample, sampling design, instrument, validity and reliability, data collection techniques, data analyses, and ethical considerations used for the research study.

3.2 Research Design

Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure. It is the conceptual structure within which research is conducted and constitutes the blueprint for the collection, measurement and analysis of data (Kothari, 2004). The research design used in the current study was correlation and descriptive in nature where questionnaires were used because it examines a large number of respondents at the same time.

3.3 Study Area

The study was conducted in South Nyanza sugar Company (SONY). The Company was established in 1976 and it is located in South-Western Kenya in Awendo Migori County. The town serves 250,000 cane farmers in ten districts within the cane growing zones of Homa bay, Gucha, Transmara, Kuria, Mogori, Uriri, Rongo, Kisii south, Ndhiwa, Awendo. Migori is a county of Kenya, the town is located 65km South of Kisii and 22km North of Tanzania border with a population of 146,576 (2009 census). This makes the town very congested with people from all occupations who visit the town for various reasons, thus this gives the view that the area adequately addressed the concerns of the study.

3.4 Target population

A population is the entire group of individuals, events or objects having common observable characteristics (Mugenda and Mugenda 1999).The target population will comprise of employees of Sony Sugar Company. Information was collected from the registrar to identify this category of employees. A total of 500 respondents

Table 3.1 Target population

Industry	Target population
Employees	500
Totals	**500**

3.5 Sampling Design

3.5.1 Sample Size

Figures from the Human resource personnel at Sony Sugar Company show the number of employees as 500 (inclusive of the management members). Due to limitations of finances and time, the study was not able to carry out the research number of respondents. To effect this, a sample size was chosen to act as the representative sample of the whole population. According to Mugenda and Mugenda (2003), 30% of the accessible population is sufficient in a study to generate the study sample size, 30% of the entire population was computed to get 150 respondents who were the study sample size.

Table 3.2 sample size

Sample size	Totals
Employees = 30/100*500	150
Totals	**150**

3.5.2 Sampling Procedure

Stratified random sampling was used to divide the Sony Sugar Company management, members of staff into two strata. Simple random sampling was then employed; this ensured equal participation of all staffs in the warehouse department since an investigation of small part of the population gave more detailed information and it's cheaper to collect data.

3.6 Data Collection methods

Instruments for data collection were comprised of primary data where questionnaires were developed for employees. The questionnaires were structured in a way that captured the main objectives of the study. The questionnaire begun by seeking respondents' general information, the other part sought data on particular variables of the study. Secondary data came from the books, journals and internet from library and from industry brochures.

3.7 Validity and Reliability of the Research Instruments

Validity refers to the accuracy and meaningfulness of inferences which are based on the research results (Mugenda & Mugenda 2003). Validity of the research instruments was determined through consultation with university lecturer especially my supervisor. Reliability of research instruments is the measure of the degree to which a research instrument yields consistent results or data after repeated trials. To test the

reliability of the research instrument, test retest method was used. A pilot study was conducted in the same company after two months on the 5% of the total population after which results of the two tests were calculated to get the reliability coefficient.

3.8 Data Analysis

Data collected after administration of the research instrument was sorted out to remove errors, and then the data was analyzed by use of correlation and regression analysis between information technology adoption and warehouse operations (Henn *et al*, 2004)

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of analysis on the influence of information and communication technology on warehousing operations at South Nyanza Sugar Company Limited, Kenya. A total of 111 out of 149 employees agreed to participate in the study signifying a 74.5% response rate. The study analysed quantitative and qualitative data. Quantitative data is presented through descriptive and inferential statistics while qualitative data is presented through narrations.

4.2 Demographic Data

The chapter first section describes the demographic data of respondents based on gender, age, education level, work experience, employment status and work department.

4.2.1 Gender of Respondents

The respondents were asked to indicate their gender profiles. The findings are given in Table 4.1.

Table 4.1 Gender of respondents

Type	Frequency	Percent
Male	70	63.1
Female	41	36.9
Total	**111**	**100.0**

Findings shows that most 70 (63.1%) of workers were male while 41 (36.9%) were females. This shows that majority of employees working in the warehousing

department are males. This is because most of operations require intensive labour and therefore not preferable to females.

4.2.2 Age Bracket

The respondents were asked to indicate their age categories. The results of the analysis are displayed in Figure 4.1 below.
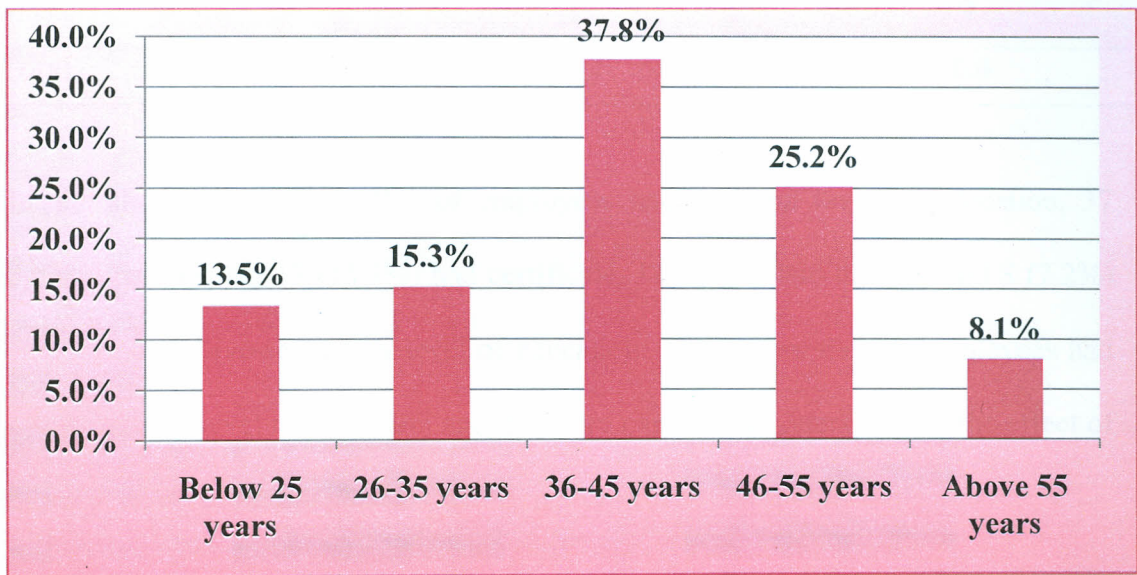

Figure 4.1 Respondents age bracket

Most 42 (37.8%) of employees age bracket ranged between 36-45 years, 28 (25.2%) were aged 46-55 years, 17 (15.3%) were aged within 26-35 years, 15 (13.5%) were aged less than 25 years while only 9 (8.1%) were above 55 years of age. This shows that 71.1% of employees at Sony Sugar warehousing department were aged 36 years and above and therefore could be in a position to provide comparisons on how information technology has transformed their workplace before and after its adoption.

4.2.3 Level of education

The respondents were asked to indicate their level of education. The findings are presented in Table 4.2

Table 4.2 Education level of employees

level	Frequency	Percent
Secondary	8	7.2
Certificate	17	15.3
Diploma	38	34.2
Degree	37	33.3
Masters	11	9.9
Total	**111**	**100.0**

Results shows that 38 (34.2%) of employees had diploma level of education, 37 (33.3%) had degree, 17 (15.3%) had certificate, 11 (9.9%) had masters and 8 (7.2%) were found to have secondary level of education. This shows that all employees had at least tertiary level of education and therefore capable of understanding the effect of information and communication technology on warehouse operations.

4.2.4 Work Experience

The study also sought respondents' opinion on their work experience at the warehousing department at Sony Sugar. The results of analysis are given in Figure 4.2.
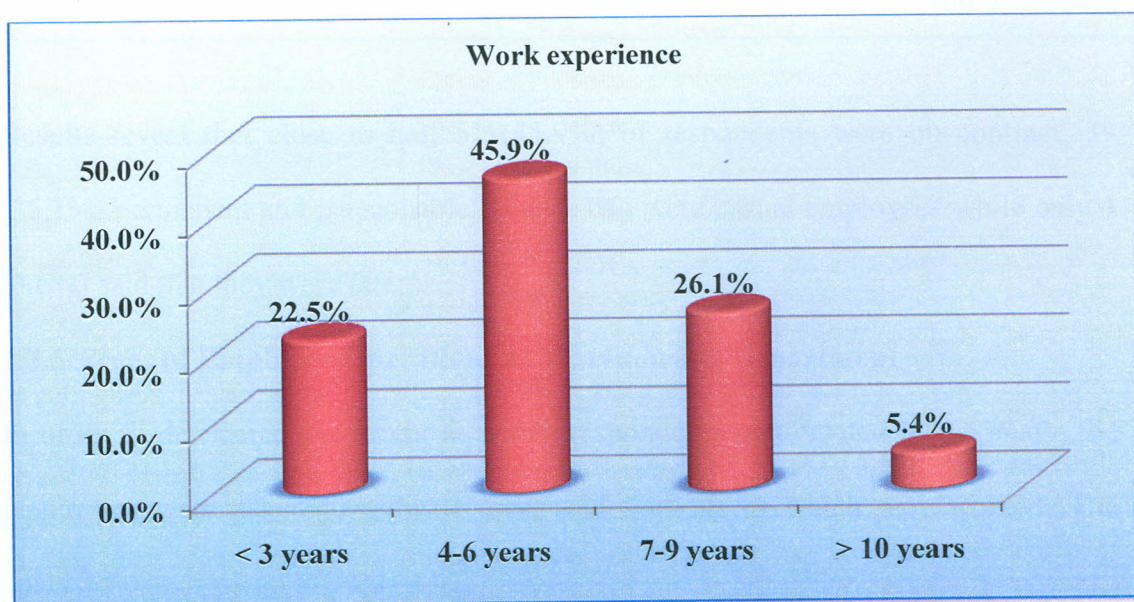

Work experience

Figure 4.2 Respondents work experience

Figure 4.2 findings reveal that 51 (45.9%) of employees have worked for 4-6 years, 29 (26.1%) for 7-9 years, 25 (22.5%) for less than 3 years while only 6 (5.4%) reported to have worked for 10 years and above. From the findings, it is clear that majority of employees have work for a considerable period at Sony Sugar and therefore are in a position to understand how ICT has affected warehousing operations.

4.2.5 Employment Status

The respondents were also asked to indicate their employment status. Results are illustrated in Table 4.3.

Table 4.3 Employment status

Status	Frequency	Percent
Permanent	39	35.1
Contract	51	45.9
Casual	17	15.3
Intern	4	3.6
Total	**111**	**100.0**

Results reveal that close to half 51 (45.9%) of respondents were on contract, 39 (35.1%) permanent and pensionable, 17 (15.3%) were casual employees while only 4 (3.6%) said that they were interns.

4.2.6 Areas of Employee Operations at Warehousing Department

In order to determine the extent to which respondents participated in the study, the employees were asked to indicate areas and sections to which they worked. The analysed data is given in Table 4.4.

Table 4.4 Areas of operations in warehousing department

Sections	Frequency	Percent
Receiving	25	22.5
Storage	49	44.1
Issuing	15	13.5
Dispatch	22	19.8
Total	111	100.0

Results show that 49 (44.1%) of respondents worked in storage section, 25 (22.5%) worked in receiving section, 22 (19.8%) said they operated from dispatch section while 15 (13.5%) worked in issuing section.

4.3 Level of use of ICT Systems and Applications on Warehousing Operations

The first objective of the study was to determine the extent to which Sony Sugar Company Ltd utilised information communication technology applications like; electronic data interchange, radio frequency bar coding on day-to-day warehouse operations. At first, the study sought to know the nature of computer training the employees undertook. Karimi and Namusonge (2014) informs that an understanding of computer operation is essential in a working environment that uses a computerized warehouse management system. Their responses are given in Table 4.5.

Table 4.5 Nature of computer training that respondents undertook

Response	Frequency	Percent
None	13	11.7
Computer packages	86	77.5
Procurement and packages	8	7.2
Computer packages and databases	4	3.6
Total	**111**	**100.0**

Findings show that majority 86 (77.5%) had training on basic computer packages, 8 (7.2%) had computer packages together with procurement training and 4 (3.6%) had training on computer packages and databases. Only 13 (11.7%) said that they did not have any computer certification training course. From the results, it is clear that majority of employees had basic computer knowledge and therefore could be in a position to use ICT applications that are used in warehousing operations. The findings concur with study conducted in Kenya by Karimi and Namusonge (2014) who established that (90%) of respondents indicated they had undergone some form of computer training while a minority (10%) had not. The respondents said that they had acquired knowledge of the basic computer operating system particularly Microsoft Windows System. Further, 60% of the respondents indicated they had been trained on the use of the University's Sage Enterprise Resource Performance (ERP) system.

4.3.1 Employees Level of Computer Proficiency

Furthermore, the respondents were asked to state their level of computer applications competence either as; very high (5), high (4), moderate (3), low (2) and very low (1). The results are presented in Table 4.6.

Table 4.6 Employees level of computer proficiency

	N	Min	Max	Mean	Std. Deviation
What can you say on your level of computer packages skills (operations of computer)?	111	2.00	5.00	3.6757	.83298
Valid N (Listwise)	**111**				

The computed statistics results shows that majority of employees indicated that they had higher proficiency (M=3.67 and SD=0.83) of using computers in their workplaces. This therefore confirms that the respondents could be aware of ICT application used in warehousing operations in their organisation. In similar to the study findings, Obogne and Lidasan (2005) survey revealed that a little more than two-thirds (68%) of the respondents were familiar with the use of ICT in logistic in Manilla Philippines. Surprisingly, the other one-third (32%) of the respondents were not familiar with the use of ICT in logistic and thus, not be able to recognize the new trends of technology mostly used in logistics.

4.3.2 Level of ICT Application Use in Warehousing Operations

To answer the first research question for the study, the study sought to know the availability and utilisation of various ICT applications in warehousing operations at Sony Sugar Company Ltd. Therefore, the respondents were asked to indicate their level of utilisation using the following scale on various ICT applications; always (5), often (4), rarely (2) and never (1). The descriptive analysis results are given in Table 4.7.

Table 4.7 Level of ICT application use in warehousing operations

ICT applications in warehousing operations	N	Min	Max	Mean	Std. Deviation	Utilisation rate
Internet	111	3.00	5.00	4.2162	.81358	
Mobile data communication	111	2.00	5.00	3.9910	.91944	
Bar coding and scanning	111	1.00	5.00	3.6396	1.11022	Often
Automatic picking system	111	1.00	5.00	3.5315	1.22712	
Electronic order system	111	1.00	5.00	3.5225	1.39380	
EDI (Electronic data interchange)	111	1.00	5.00	3.4144	1.45520	
Data warehouse	111	1.00	5.00	3.3694	1.20550	
Electronic commerce	111	1.00	5.00	3.2342	1.48908	
Container storage and planning system	111	1.00	5.00	3.0631	1.20815	
In-vehicle navigation system	111	1.00	5.00	2.9730	1.40428	
Container and equipment control system	111	1.00	5.00	2.9009	1.30701	Sometimes
Geographic information system	111	1.00	5.00	2.8198	1.09709	
Global positioning system (GPS)	111	1.00	5.00	2.7838	1.13141	
On-board data communication	111	1.00	5.00	2.6937	1.02507	
Radio frequency identification	111	1.00	5.00	2.5586	1.27696	
Freight and fleet management	111	1.00	5.00	2.5135	1.11897	
Inmarsat	111	1.00	4.00	2.3153	.97218	**Rarely**
Valid N (Listwise)	**111**					
Average results		1	5	**3.1494**	**1.18559**	**Sometimes**

Composite statistics shows that the utilisation of ICT appliances in warehousing operations was on average (M=3.15 and SD=1.18). This shows that information and communication technology adoption has not yet been fully embraced at Sony Sugar

Company Ltd. However, statistics showed that all of ICT applications were not regularly used in warehousing operations at the organisation. The findings showed that internet was often used ICT appliance with a mean of 4.21 and standard deviation values of 0.81. This showed that majority of employees communicated and exchanged data through use of email. The findings concur with Obogne and Lidasan (2005) who found out that 89 percent of private sector and 100 percent of government authority was aware of the usefulness of internet technology in Manila. It is deducted that the internet is the most widely used ICT based on the survey results wherein both ICT manufacturers and transport/logistics have the same top three responses and similarities of ICT used.

The second item often used was mobile data communication (M=3.99 and SD=0.91). The third item that was found to be often used was bar coding and scanning (M=3.64 and SD=1.11). The last application that the respondents said that they often utilised in warehousing operations was automatic picking system in the factory (M=3.53 and SD=1.13). From the above results, it is evident that the company has not integrated all ICT applications systems in day-to-day operations of the factory. The results of the study further showed that the following systems were used occasionally/sometimes as said by employees; electronic data interchange (M=3.41 and SD=1.45), data warehouse (M=3.37 and SD=1.21), electronic commerce (M=3.23 and SD=1.49), container storage and planning system (M=3.06 and SD=1.20). The findings of the study are in contrast to Obogne and Lidasan (2005) who found out that there was a high percentage of awareness both for the private and government authorities on usage of EDI. Moreover, the authors established that more than half of the

government authority identified it while there is a low percentage rate from the private sector.

Other ICT systems found to be moderately used in at Sony Sugar were; in-vehicle navigation system (M=2.97 and SD=1.40), container equipment control system (M=2.90 and SD=1.30), geographic information system (M=2.82 and SD=1.09), global positioning system (M=2.78 and SD=1.13), ob-board data communication (M=2.69 and SD=1.02), radio frequency identification (M=2.55 and SD=1.27 and lastly freight and fleet management that recorded the lowest means 2.51 and standard deviation on that category. It was established that Inmarsat was rarely used (M=2.31 and SD=0.97) in warehousing operations at Sony Sugar Company Ltd. The findings concur with Obogne and Lidasan (2005) who found the non-utilized technologies as on board data recorder, in-vehicle navigation system, Inmarsat and freight and fleet management.

The researcher summarised the scores obtained in this section to determine the proportion of respondents who had high (>3.5), moderate (<3.5>2.5) and negative (<2.5) utilisation rate of ICT systems in warehousing operations. The results are given in Figure 4.3.
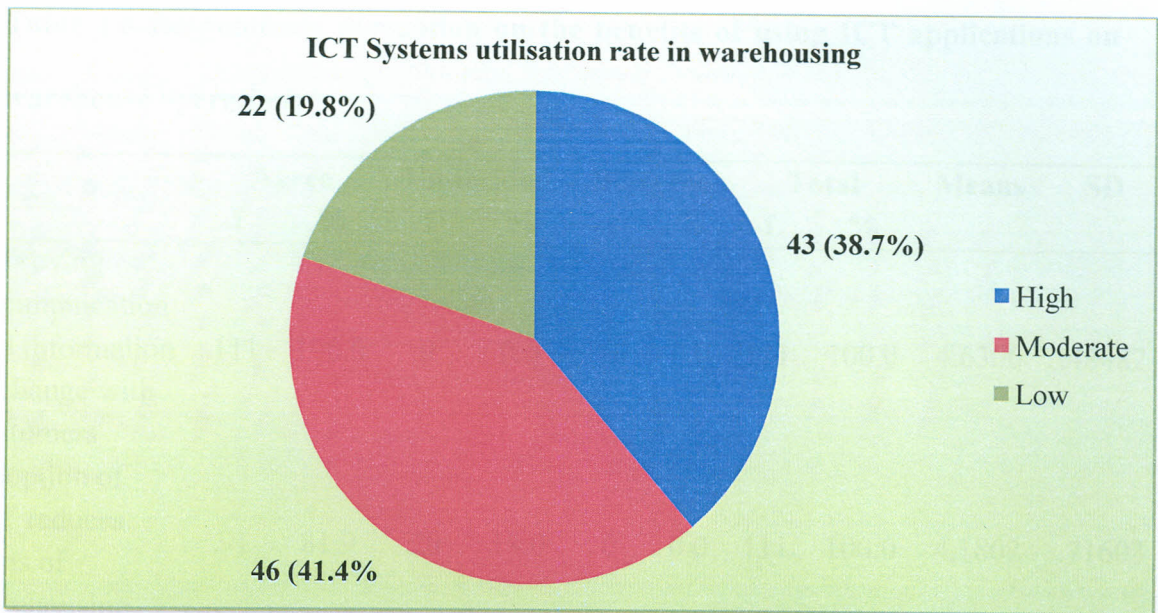
Figure 4.3 ICT systems utilisation on warehousing operations

The results show that only 43 (38.7%) of respondents said that ICT appliances utilisation rate at Sony Sugar was high, 46 (41.4%) said that the utilisation level was moderate while 22 (19.8%) said that the rate was low. This informs that Sony sugar management has work to do to ensure that all ICT applications are installed and used in warehousing operations at their organisation.

4.4 Benefits of ICT Systems and Applications on Warehouse Operations

The second objective of the study was to investigate the benefits of information and communications technology adoption and use on warehouse operations as perceived by employees of the sugar firm. Six statements constructed on a Likert scale of five; strongly agree, agree undecided, disagree and strongly disagree. These scales were further divided into three; agree undecided and disagree to establish the perception of employees towards the benefits associated with utilisation of information and communication technology application on improvement of warehouse operations at Sony Sugar Company Ltd. The results of the analysis are given in Table 4.8.

Table 4.8 Respondents perception on the benefits of using ICT applications on warehouse operations

	Agree		Undecided		Disagree		Total		Means	SD
	f	%	f	%	f	%	f	%		
Improving communication and information exchange with customers	111	100.0	0	0.0	0	0.0	111	100.0	4.6306	.48482
Adoption of ICT reduces costs of warehousing	91	81.9	20	18.0	0	0.0	111	100.0	4.1802	.71603
ICT adoption in warehousing results to improved quality and efficiency in services and operations	101	91.0	10	9.0	0	0.0	111	100.0	4.2613	.61366
ICT adoption has increased revenue and income at Sony	70	63.0	34	30.6	7	6.3	111	100.0	3.8198	.88624
Integration between departments has improved as a result of adoption of ICT at Sony	88	79.3	13	11.7	10	9.0	111	100.0	3.9279	.83896
Planning and system integration has improved after adoption of ICT in warehousing	80	72.0	31	27.9	0	0.0	111	100.0	4.0901	.80396

Results of the study shows that all 111 (100.0%) of respondents agreed that information communication technology use in warehousing operations improves

communication and information exchange with their clients. The mean statistics is 4.63 and standard deviations cores are 0.48 that suggests that the respondents had positive perception on the statement. Secondly, majority 91 (81.9%) of respondents agreed that adoption of ICT reduces costs of warehousing. However, 20 (18.0%) of respondents were undecided. This shows that adoption of ICT applications in warehousing reduces costs associated with paperwork and movement from one place to another. This is seen to be a significant benefit being enjoyed by the organisation.

Thirdly, 101 (91.0%) of employees also agreed that ICT adoption in warehousing operations results to improved quality and efficiency of services. Only 10 (9.0%) remained undecided on the statement. This indicates that quality services are being seen as a result of integration of ICT in warehousing operations at Sony. The findings agrees with Obogne and Lidasan (2005) who established that All respondents for SMEs (79.3%) and LEs (100.6%) agreed on improving quality and efficiency both in services and operation which is also the primary objective of ICT use on logistics business. Similarly, Karimi and Namusonge (2014) found out that ICT adoption increased speed of service at the stores and accuracy of records of stores transactions among other positives.

Fourthly, it is seen that 70 (63.0%) of respondents agreed that ICT adoption has increased revenue and income at Sony, a significant 34 (30.6%) were neutral while 7 (6.3%) disagreed. The mean was 3.81 and standard deviation scores was 0.88 that suggests that despite employees having positive perception towards increased revenue after the adoption of ICT, some employees have not felt the effect. When asked as to whether integration between departments has improved as a result of adoption of ICT

at Sony, 88 (79.3%) agreed, 13 (11.7%) disagreed while 10 (9.0%) disagreed. The

mean value was 3.92 with standard deviation statistics being 0.838 that suggests that

respondents concur with the statement that integration between various departments in

their factor has been improved because of adoption of ICT in warehouse operations.

Lastly, majority 80 (72.0%) of respondents agreed that planning and system

integration has improved after adoption of ICT in warehousing operations with 31

(27.9%) disagreeing with the statement. the computed average means was 4.15 with

standard deviation scores of 0.72 which suggests that almost all of the employees

agreed that ICT application and use in warehousing operations has positive benefits.

Other benefits answered by respondents using open-ended questions are given in

Table 4.9.

Table 4.9 Other benefits of ICT adoption on warehousing operations

Response	Frequency	Percentage
Ease of communication with departments	26	23.4
Easy work	40	36.0
Reduced operation time	16	14.4

Results shows that 40 (36.0%) of respondents perceived that ICT use in warehousing

result to making work easier, 26 (23.4%) observed that it results to ease of

communication across departments while 16 (14.4%) indicated that it reduces

operation time. Most of the firms, regardless of firm types and sizes have indicated

that the reasons for them in acquiring the technology is by assuring that fast

communication among the customers and actors in the supply chain will be attained

by making paperless transactions that can lead to reducing costs and increase in

income and revenue.

4.5 Effects of ICT Systems and Applications on Warehousing Operations

This is the third objective of the research that sought to determine the effect of information and communication technology adoption on warehousing operations at Sony Sugar Company limited, Awendo. At first, through a Likert scale of five; very effective (5), effective (4), moderate (3), ineffective (2) and very ineffective (1), the respondents were asked to give their response. The findings of the analysis are given in Table 4.10.

Tale 4.10 Performance of warehousing operations

Performance	Frequency	Percent
Moderate	18	16.2
Effective	75	67.6
Very effective	18	16.2
Total	**111**	**100.0**

Results show that majority 75 (67.6%) said that their institutional warehousing operations level is effective, 18 (16.2%) said that it was very effective while the same proportion 18 (16.2%) indicated that the level of operations were at moderate level. This shows that the levels of operations are not that low but have improved.

4.5.1 Relationship between ICT Systems Adoption and Warehousing Operations

To check on the relationship that existed between ICT systems adoption and warehousing operations, a Karl Pearson product moment correlation was computed by correlating scores for ICT systems adoption against level of warehouse operations scores at Sony Sugar Company Ltd. The results are presented in Table 4.11.

Table 4.11 Effect of ICT adoption and warehouse operations at Sony Sugar Ltd

Correlations

		ICT Applications utilisation	Level of warehouse operations at Sony
ICT Applications utilisation	Pearson Correlation	1	.258**
	Sig. (2-tailed)		.006
	N	111	111
Level of warehouse operations at Sony	Pearson Correlation	.258**	1
	Sig. (2-tailed)	.006	
	N	111	111
**. Correlation is significant at the 0.05 level (2-tailed).			

The results of the study shows that there exist a positive degree of correlation (r=0.258) between ICT adoption and warehouse operations at Sony Sugar. The correlation also appears to be significant (p=0.006) at the 0.01 level (2-tailed). This interprets that ICT systems and application adoption and use has positive effect on warehouse operations at Sony Sugar Company Ltd. This implies that continuous usage of ICT applications will lead to automatic increase in warehouse operations. The results correspond to Karimi and Namusonge (2014) research that showed that (95%) of respondents indicated that the system effect was positive while a minority (5%) indicated that the effect of the system was negative. This shows adoption and utilisation of ICT systems has positive effect on warehouse operations.

4.6 Barriers to ICT Integration in Warehousing Operations at Sony

Through open-ended question, the respondents were asked to identify barriers to ICT integration in warehousing operations at their organisation. The findings are given in Table 4.12

Table 4.12 barriers to ICT integration in warehousing operations at Sony

Barriers	Frequency	Percentage
Illiteracy on computers by some employees and supervisors	53	47.7
Employees resistance to change	21	18.9
Age difference	16	14.4
Lack of computers in the organisation	13	11.7
Inadequate training	10	9.0
Varying levels of computer training	8	7.2

The main barrier found to be hindering the adoption of ICT systems as reported by 53 (47.7%) of respondents is due to illiteracy on computers by some employees and supervisors at their organisation. Manager interviewed clarified this; he said that despite some employees possessing papers on computer packages, they could not operate computer appliances. The second barrier identified by respondents was 21 (18.9%) employee resistances to change. This is because some employees feared that their jobs could be replaced by the machines to be installed and therefore were at the forefront resisting any change being considered. A significant 16 (14.4%) of respondents said that age difference affected adoption of ICT, 13 (11.7%) said that inadequate computers and other appliances was a challenge, 10 (9.0%) reported that inadequate training affected ICT use in warehousing operations. Lastly, 8 (7.2%) of respondents observed that varying levels of computer training affected ICT adoption by employees at their organisation. Elsewhere, Obogne and Lidasan (2005) found out that problem on cost and financing in acquiring the ICT or high capital which indicates that most firms are lack of financial resources. Sometimes, firms were not aware about the advantages and cost effectiveness of the technology and why it costs

a lot for them to acquire it. Second, no public policy exists as well as environment that is conducive to the efficient use of new ICT by the private firms.

After identifying the barriers presented above, the researcher requested the respondents to suggest solutions to those challenges. The results are given in Table 4.13.

Table 4.13 Solutions to ICT integration on improving warehouse operations at Sony

Solutions	Frequency	Percentage
Teaching on goodness of computers	90	81.1
Providing computers to the organisation	13	11.7
Undertaking computer training and refresher courses for computer	8	7.2
Training should be compulsory for every worker	4	3.6

Results show that almost all 90 (81.1%) of respondents suggested that employee training and teaching on how to use ICT appliances should be prioritised in their organisation to effective warehousing operations goals are achieved. The results further show that 13 (11.7%) of respondents felt that Sony sugar should consider adding more ICT appliances, 8 (7.2%) saw the need for computer refresher courses to be regularly conducted in their organisation while 4 (3.6%) observed that training should be compulsory for every worker in their organisation.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, conclusion, recommendations and suggestions for further research on the influence of information communication technology adoption and use on warehousing operations at South Nyanza Sugar Company Ltd, Kenya.

5.2 Summary of Findings

The study involved participation of 111 employees from Sony Sugar Company and manager in charge of warehousing department. It was established that majority of workers were male since the department is usually labour intensive. Furthermore, the findings of the study revealed that most of the employees at the sugar firm had more than 4 years working experience and therefore appeared to understand warehousing operations well.

The first objective sought that ICT systems and applications utilisation at Sony Sugar was moderate. The common ICT application found to be often used were; internet, mobile data communication, bar-coding, scanning, automatic picking system and electronic order system. Other ICT applications were occasionally used in warehousing operations at the said company.

The second objective sought that ICT systems and application use has positive benefits on warehousing operations at Sony. For instance, they perceived that adoption and utilisation of ICT systems and applications in warehousing operations result to improved information exchange, reduction in operation costs, improved quality services delivery, increased revenues, planning and systems integration. Other benefits of adopting ICT was that it made work easier, improved communication and reduced operation time. Majority of respondents agreed.

The third objective showed that there existed a positive degree of correlation (r=0.258) between ICT systems and applications adoption and warehousing operations at Sony Sugar. This implied that ICT systems utilisation by the company is positive but weak so there is room to improve on enlightening the workers on the use of ICT.

Barriers to ICT Systems and Application Adoption on Warehousing operations found out that inadequate knowledge on how to operate and work on ICT systems by employees of the company limited their utilisation. Majority of respondents agreed that computer illiteracy by some of their colleagues hindered effective use of ICT in their organisation.

5.3 Conclusions

The study has established that ICT is a critical component to effective operations of warehouses in sugar industry. However, the level of application of ICT in warehousing operations at Sony Sugar Company Limited appeared to be at moderate

level. Both employees and managers who participated in the study confirmed this. The study found out that the organisation relied on internet, mobile data communication, bar-coding, scanning and electronic ordering systems often as opposed to other ICT systems. The respondents both had positive perception on the contribution of ICT systems towards warehousing operations at their organisation. It was also established that there is a positive effect of adoption and use of ICT applications on performance and operations of warehouse at Sony Sugar. This implied that regular usage of these systems had significant ($p < 0.01$) effect on warehousing activities. However, the study found out that computer illiteracy as the major obstacle towards successful integration of ICT infrastructure and resource in improving warehousing operations at Sony Sugar Company Ltd in Awendo.

5.4 Recommendations

Based on the findings of the study, the study suggests the following recommendations to be done by management and other stakeholders to improve warehousing operations at Sony:

Management should strive to ensure that all sections in the warehousing department are automated to improve operations, There should be training of employees on how to operate ICT systems and this would result to effective operations at the organisation, The management should conduct change management workshop to create awareness to employees on the benefit of adoption ICT in warehousing activities, There is need for the organisation to purchase current ICT systems and applications to match the global trend in the warehousing.

5.5 Limitations of the Study

Because of confidentiality and the potentiality of self-incrimination, the study found it difficult to gather information from some employees. Some employees were hesitant to participate in answering research questions. Despite this, however, self reports were made as confidential as possible and the anonymity of responses such that participation did not result in adverse personal consequences, enhancing memory recall by focusing questions on recent events, clarifying definitions and using complex questions carefully, and using knowledgeable, sensitive and capable method. Even though these precautions were taken, employees did not respond honestly and they consciously underreported their behaviour that described the degree to which they used ICT systems. Underreporting was indeed a factor in all of the studies reviewed in this research. However, the researcher assured them that the study is purely for academic purposes and their confidentiality was well guarded. Also the researcher adopted principal of data triangulation where the researcher used; questionnaires and thus the above limitations were overcome.

5.6 Suggestions for Further Studies

The study recommends further research to be done on the following areas: The role of automation of warehouses on employees' performance in organisations. The impact of ICT use in warehousing operations on financial performance of organisation

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