

EFFECTS OF INFORMATION COMMUNICATION TECHNOLOGY ON THE PROCUREMENT OF PHARMACEUTICAL DRUGS IN PUBLIC HOSPITALS IN KENYA: A CASE OF KISII COUNTY

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Abstract

The use of information communication technology in organizations has been found to have far reaching effects in meeting customer needs in terms of service provision. It has enhanced communication along the supply chain hence sharing of real-time information. In procurement it has lead to better inventory management techniques, easy communication with internal and external customers and faster order processing. The general objective of this study was to find out the effect of information communication technology on the procurement of pharmaceutical drugs in public hospitals, Kisii County, Kenya. The research design for the study was non-experimental in which a descriptive cross-sectional study was done. The accessible population was all the 114 public hospitals in Kisii County. The study used stratified random sampling to categorize the accessible population into district hospitals, sub-district hospitals, health centers and dispensaries. Simple random sampling was then used in each stratum to select cases for inclusion in the main sample size of twenty percent of the accessible population. Paper-based questionnaires were used to obtain raw data. The data was analyzed using descriptive statistics, that is, frequencies, percentages and means. Findings were presented in tables and figures. The study revealed that inventory management, order processing and information processing and communication are important areas in the procurement of pharmaceutical drugs. Regarding the information processing and communication technologies, it was found out that both the traditional and the modern electronic and internet-based technologies are used in most healthcare facilities. Some district hospital uses the intranet technology for purposes of information sharing internally while others don't. No facility uses the internet-based extranet technology to link with suppliers. But however, all facilities use the public internet to link with their suppliers of pharmaceutical drugs. The modern electronic and internet-based technologies are thought to have brought about some improvements in order placement and tracking, communication and information sharing, gathering of information about quantities and specifications of orders to be made, counting the on-hand inventory and maintenance of appropriate amounts of all type of pharmaceutical drugs. However, the traditional modes of information processing and communication are more used when it comes to inspection of new deliveries than the electronic and internet-based technologies. In regard to the findings of the, it is then necessary to have knowledge of the suppliers side for a much deeper understanding of the whole procurement process of pharmaceutical drugs. Software that can scan the barcodes of pharmaceutical commodities needs to be used by the health facilities to improve on the inspection process rather than using the labor-intensive traditional modes.

INTRODUCTION

Any organization's main objective is to deliver goods and services to the customer at the right place, the right time, of right quantity and quality and at the right price (Baily et al, 2005). Timely procurement enhances effective and efficient performance of the organization in terms of service provision and delivery of goods. This

happens when the procurement function obtains correct and accurate information that is relied on in decision making. In essence, the procurement function is an information processing center and most of the information concerns the management of the flow of goods and services in the supply chain. "Personnel in purchasing...receive, analyze, make decisions and distribute information in order to manage the flow of goods and services in the supply chain" (Saunders, 1997). Saunders further states that many companies have already introduced integrated planning and control systems inside their organizations which include connections with purchasing and supply activities and that communication with other organizations is an essential requirement in purchasing and supply management.

Therefore, information communication technology is essential in data exchange between departments within an organization and also between an organization and its suppliers. Intranet and extranet technologies can facilitate effective sharing of information between points whether internal or external with guaranteed security. For instance an organization can communicate information about status of stock of goods and services offered to its suppliers through Electronic Data Interchange (EDI) technology so that informed decisions can be made in time to mitigate any eventuality. In procurement, these technologies impact on the carrying out of activities which in turn have a major impact on the total performance of the organization as a whole. Fasanghari, (2008) argues that the application of information communication technology in procurement makes it possible for the organization to exploit benefits like reduced cycle time, information sharing between the organization and its suppliers thus a closer buyer-supplier interaction, improved capability in decision making thus reduction in uncertainty and decreased transaction costs. More specifically, he states that procurement applies ICT in three areas. First, ICT is used in communicating with vendors when bargaining and negotiating for prices and terms of agreement. This has eliminated the face to face negotiation with vendors as receipt of queries from vendors, providing vendors with information and the processing of returns on damaged goods are all handled by ICT. Second, ICT is used in order processing applications especially in order placement and order status. Technologies like EDI have reduced the error rates in that errors can be detected more easily and then corrected in time. Lastly, ICT is used in the management of inventory in that it has facilitated easy communication of stock-outs by customers to vendors or the notification of stock-outs by suppliers to their customers. Extranet technologies actually facilitate this two-way communication between buyer and supplier.

Thus, the present day purchasing procedures using the information communication technology has shelved out the inefficiencies brought about by the traditional purchasing procedures as pointed out by Lysons and Farrington, (2006). Therefore, the excessive non-value adding activities, excessive documentation, excessive time spent in processing orders that lead to excessive cost of orders have been minimized by use of ICT. Organizations worldwide therefore are embracing the strategic implications of ICT in the management of procurement process in order to improve their service delivery to customers (Araka, 2011). Service delivery can be improved through enhanced communication in which intranet enables internal communication of service and consumption needs and accuracy of requisitions from various departments. Extranet on the other hand enables buyer- supplier communication about products available and those in short supply, cost of products and delivery schedules. In addition, extranet enables just-in-time information delivery, reduction of information overload, collaboration between workgroups and reduced costs and errors.

In Kenya, especially in public entities, procurement is decentralized to the individual procuring public entity (Public Procurement Oversight Authority, PPOA, 2007) which is a shift from the centralized system in the early years before 2000. These public entities therefore have the authority to carry out procurement activities and in accordance to the legal regulations provided for in the public procurement and disposal act (2006). They are also supposed to manage the procurement processes in order to ensure accountability and hence efficient and effective service delivery to the public. Though procurement decisions lie with the procurement committees of the various entities, much of the activities in procurement are carried out by personnel in the procurement units

in these entities. Thus, to ensure that public entities are effective in service provision, the purchasing/procurement units are central as they collect and process information from the various departments of these entities concerning their consumption and service demands. Therefore if the procurement unit is efficient and effective in carrying out its activities so is the entire entity in service delivery.

To realize the required level of efficiency and effectiveness, the public entities need to incorporate utilization of ICT in the management of activities in various departments. However, according to an assessment conducted by Kiula et al, (2011), a great investment in ICT resources, that is, computers, printers etcetera has been done but utilization doesn't match it. This is also echoed in the survey conducted by Kenya Institute of Supplies Management, KISM, (2008) in which it was found that in public procurement, computers are mainly used in drafting letters, preparing spreadsheets, and compiling tenders but no procurement software is used as a management tool to make the processes more efficient.

Furthermore, public entities that offer critical service like healthcare by hospitals need to equip their procurement units with the kind of ICT system that can manage the high intensity of supplies due to the high demand for services from the citizens. Critical of all is the medical supplies from the government, donors and commercial suppliers. The status of inventory of medical supplies of any kind needs to be managed in such a way that shortages are not experienced at all or at least minimized and costs are reduced so that lives are not at risk.

However, still with the numerous benefits realized by the use of information communication technologies like intranets, extranets and internet in procurement, the public healthcare services in Kenya seem not to benefit as they experience frequent pharmaceutical drugs shortages in their pharmacies (Mulama, 2009). This is evidenced by the streaming of patients (or their caretakers) to commercial chemists outside these hospitals in search for the drugs prescribed to them by their doctors. This is happening in spite of the government instituting a state corporation, Kenya Medical Supplies Agency (KEMSA), to carry the responsibility of procuring, storing and distributing pharmaceuticals to all public health facilities up to the rural dispensary. A report on the assessment of KEMSA conducted by Johnson et al, (2008) indicates that KEMSA has converted all the public health facilities in Kenya to the 'pull system' where individual facilities are supposed to manage their medical supplies inventories and make relevant communication to KEMSA about their stock status in order for the KEMSA management to make the necessary response.

1.1 Statement of the Problem.

Procurement in organizations plays a pivotal role in the performance of an organization as a whole and it applies to both profit and non-profit making organizations (Imbuga et al, 2010). In this era of information communication technology, efficiency and effectiveness have been enhanced in meeting the needs of the customer. Since procurement is about information processing and distribution, the management of the flow of goods and services in the supply chain is enhanced by the use of efficient methods of information processing and communication technologies. This is possible through the sharing of real-time information between suppliers and their customers regarding market conditions in their industry. However, in most of the public hospitals in Kenya, delivery of pharmaceutical drugs, more especially those used to treat and/or manage common diseases like malaria, pneumonia, diarrhea, HIV, tuberculosis, diabetes and hypertension in these facilities has not lived up to the expectations of the citizens (Mulama, 2009). Most patients, who are the customers to these institutions, after obtaining a prescription of medicines from doctors often find themselves in the commercial chemists looking for the prescribed medicines on learning that the medicines are not available in the hospitals' pharmacies where some medicines like anti-malarial drugs are subsidized by the government. The shortages are experienced despite the availability of efficient modes of information processing and

communication technologies like the electronic and internet-based technologies which can enhance real-time information sharing among the supply chain partners. The technologies also improve procurement processes like order placement and tracking. Based on this, the study therefore seeks to investigate the effect of information processing and communication technologies on the procurement of pharmaceutical drugs in public healthcare institutions in Kisii County, Kenya.

General objective of the Study

The general objective of this study was to investigate the effects of information communication technology on the procurement of pharmaceutical drugs in public hospitals in Kisii County, Kenya.

Specific Objectives of the Study

- i. To find out the information processing and communication technologies currently used in the procurement of pharmaceutical drugs in public health facilities.
- ii. To find out the functionalities of the information processing and communication technologies used in public hospitals in the procurement of pharmaceutical drugs.
- iii. To find out effects of the traditional modes and the internet-based and electronic technologies of information processing and communication in the procurement of pharmaceutical drugs.

Significance of the Study

The study would be significant as it intends to seek information regarding the efficient and effective acquisition of essential medicines in public hospitals in Kenya with the use of information communication technology. The information will thus help in improving the process of acquiring medical supplies by the public hospitals from their suppliers like KEMSA. In the long run, delivery of medical services in public hospitals will be improved if shortages of pharmaceutical drugs will at least be minimized.

Scope of the Study

The study focused on utilization of information communication technology by public hospitals in Kenya in the procurement of pharmaceutical drugs for effective and efficient delivery of medical services. The study was limited to the public hospitals in Kisii County.

LITERATURE REVIEW

Introduction.

This study based on the literature, divided into subsections which include; procurement, information communication technology, benefits of using information communication technology in procurement, conceptual framework and the critical literature review.

Procurement

Procurement in organizations has evolved and developed over time. Initially, it used to be a clerical activity appropriately performed close to the point of need of goods or services being acquired with little supplier involvement. According to Baily et al, (2005), procurement is supposed to give organizations a strategic advantage whereby suppliers are closely involved and value addition should displace cost reduction as the primary role. It should also help the organization focus more on the customer by procuring for the organization products that satisfy customer needs and ensures that the organization remains relevant in its service delivery. In the modern organization, procurement is far beyond the primary role of obtaining goods and services in

response to internal needs of the organization. Government health institutions being public organizations are not exempt in the provision of excellent services that meet customer expectations. Provision of medical services is critical and thus efficient and effective procurement and by extension proper management of pharmaceutical drugs inventory is crucial.

According to an assessment on KEMSA conducted by Johnson et al, (2008) all public institutions of health have been converted into a “pull system”. The individual hospitals are to process orders, manage their inventories and communicate to their supplier about their needs. They are also supposed access information from KEMSA concerning the costing and the pharmaceutical drugs that are available for acquisition and which ones are in short supply so that they can arrange for alternative suppliers. Thus mutual communication between suppliers and customer facilities, order processing and inventory management are key to attaining excellent service delivery by these institutions.

The procurement staff in public hospitals needs to understand the medical service requirements of the hospitals and acquire medicines of the right specifications that meet the needs of patients, from the right source, in the right quantity, for delivery at the right time (Handfield, 2011). This can be achieved through the procurement staff getting information from the relevant departments like pharmacy, process it, analyze it and communicate it to suppliers for appropriate decision making. For pharmaceutical drugs to be of the right specifications the procurement department should obtain the best-quality products or services in terms of fitness for use at the least possible cost, should check for the completeness of product specifications from the concerned departments or internal customers before placing orders with suppliers. The relevant departments help the procurement staff acquire information concerning insight into supplier performance, requirements into cost, quality, delivery and cycle time. They also help in forecast and demand planning requirement. For instance the pharmacy department can monitor the pharmaceutical drugs that are of high demand and also those of low demand in order to plan well and avoid stock-outs or stock overloads. Regarding delivery, the procurement department has a practical role in the supply markets convincing suppliers that they must deliver as and when agreed. It should also issue accurate delivery schedules with sufficient time for delivery and without continuously amending the schedules (Handfield, 2011).

To manage and process orders, the procurement process needs to be managed efficiently and effectively. The procurement process comprises a sequential chain of steps leading to the acquisition of supplies and the link in the procurement process is information (Lysons et al, 2006). The steps in the procurement process involve three main phases; First, the identification phase whereby a requisition is issued by the internal customer department like pharmacy. Second, ordering phase whereby the requisition is checked for accuracy in terms of quantity, specifications and delivery schedules. Third, is the post-ordering phase in which orders or delivery of overdue orders are expedited to ensure that delivery dates are met. The supplier then notifies the buyer whether goods have been dispatched or are ready for collection. On receiving the goods, the buyer checks for quantities and inspects for specifications after which a goods received note is completed if satisfactory with the quantities and specifications. If not satisfied complaints are taken-up with the suppliers by the procurement staff. An invoice for the value of goods is then received from the suppliers for comparison with the purchase order and goods received note to check for price variations before payment is done by the accounts department.

Inventory management involves such activities as making inventory orders, stock maintenance and conducting physical count of on-hand inventory. In making inventory orders the sales and movement of stock should be well tracked and then place orders once the current stock hits the re-order level. This ensures that organizations maintain proper amounts of stock and lead times to receive new stock are shortened. Proper maintenance of stock ensures that customer needs are met by determining which products are on high demand and which ones are of low demand to plan well for their management. It is also necessary that a count of the on-hand inventory is conducted so that the sale and movement of products can easily be tracked. The above three area of

procurement can be enhanced incorporating information communication technology in the operations of the organization.

Information processing and communication technologies.

Information processing and communication technologies can range from the traditional modes to the modern internet-based and electronic technologies. The traditional methods include modes like face-to-face communication, telephone call, postal mails, courier services, memos, extension phones and many others. These modes, however traditional, are important depending on the size of organization and the kind relationship and activities carried out between the organization and its customers like suppliers (Segev et al, 1998)

According to Saunders, (1997) the application of ICT, both within and between organization provide opportunities for improvement in the data storage, analysis and communication in many areas of procurement activities. The increased speed of transmission of data can shorten lead-times and bring about improvement in the synchronization of activities at different points in the supply chain. ICT reduces the duplication of data generation and the volumes of paperwork hence reduction in costs. Electronic exchange of information can lead to improvements in both the efficiency and effectiveness of procurement. ICT has opened up possibilities that could not have been available. It has changed what people do and has altered the environment for decision making.

ICT systems can be both internal and external connectivity to an organization. Internal technologies link various points of an organization with restricted access to information. External technologies on the other hand link other organizations like suppliers and partners in the supply chain. Information sharing over these two categories of technology is on the platform of agreement on what to be shared and what not to be shared. The internal and external technologies include intranets, extranets and internet-based technologies.

An intranet is an organization's internal network that uses the Transmission Control Protocol/Internet Protocol (TCP/IP) to allow users to interact with each other across departmental borders (Tetzlaff, 2010). Documents from various departments in an organization can be posted in the company network and accessibility is restricted to authorized employees of the company at various departments. It therefore links various servers, clients, databases and applications. Intranets are applicable in database access for better information about inventory and customers besides interactive communication. Where more than employee handles a file in an organization, intranets can be used to distribute documents. Since intranets have centralized search functions, therefore even if a document is posted at different pages, it can easily be found. Moreover, if intranets are integrated with electronic commerce, order processing can be economized with intranet structure for order fulfillment. When intranets are extended such that external organizations are allowed to have access to specific information, they become extranets.

Extranets are intranets that are accessible by authorized external parties who are not employees of the organization. Such external parties or members may include suppliers, vendors and other supply chain partners. Extranets use TCP/IP protocol to link organizations over the public internet. However, they have protected areas "Virtually Private Networks" (VPN) restricted to the enterprises that own the network. Extranets are therefore private networks that use internet technology and the public telecommunication system to securely share part of the organization's information or operations with its suppliers, vendors, partners and customer. They provide access to needed services in a company for its channel partners without granting access to the organization's entire network. They therefore facilitate communication between enterprise partners even when their physical locations are geographically distant and over secure network. A document posted in the extranet by an employee of one company can be updated by an employee of another company in real-time, therefore making the updated document instantly available. The turnaround time involved is thus drastically reduced as compared to the more traditional sharing mechanism like postal mails. In addition extranets can reduce costs and errors in that they

result in fewer errors, improved comparison shopping, reduced travel and meeting time and cost, reduced administrative and operational costs and eliminating paper publishing costs.

Electronic Data Interchange (EDI) and by extension Electronic Point of Sale (EPOS) are extranets that facilitate sharing of massive data between enterprises. EPOS relays information to suppliers as products are issued or sold thus making the sharing of information real-time. EDI is the transfer of structured information or data by agreed message standards from computer to computer by electronic means, (Noone, 2010). EDI transfers information directly to major suppliers as products are sold via the acquiring organization. EPOS which is a development of EDI allows managers to determine which products are fast-moving thus necessitating continuous replenishment (Bonnie, 2010). Bonnie, (2010) further says that EPOS enables organizations to comply with complex regulations imposed by government agencies. Like in pharmacies and pharmaceutical stores, EPOS allows only approved products for purchase by way of scanning and barcoding.

The traditional intranets and extranets and by extension electronic data interchange systems do not cover full process or are very expensive to set up. Internet and worldwide web (www) applications are very cheap and easy to use. The internet is a global collection of networks that are interconnected using transmission control protocol/internet protocol (TCP/IP) as a networking standard while the worldwide web (www) is a collection of resources, that is, programs, files and services, that are accessed over the internet (Noone, 2010).

The use of internet-based technologies allows organizations to become more flexible in the way they operate. Speed and accuracy of communication brings with it a host of benefits that help improve the effectiveness and efficiency of an organization in service delivery. Interaction of organizations over the internet can lead to data sharing and simplified administrative procedures. Stock management can also be integrated between the suppliers and their customers in order to schedule deliveries. Such technologies include internet-base catalogs and internet-based electronic data interchange. The internet-based catalogs allow buying organizations to browse and place orders online. In addition, they allow suppliers and buyers to immediately track orders electronically.

Internet-based EDI can be less costly than the traditionally leased lines and the value added services regarding network access and data transmission. The special features of the internet that is, ubiquity and connectivity, immediacy and interactivity, universal interface and ease of use allow the development of interactive applications enhanced by a graphical user interface with full multimedia support and thus enable the communication of complex information (Noone, 2010).

Effect of using internet-based and traditional technologies in processing and communicating information on the procurement of drugs.

Application of information communication technology in procurement makes it possible for the organization to exploit benefits like reduced cycle time, real-time information sharing between the organization and its suppliers thus a closer buyer-supplier interaction, improved capability in decision making thus reduction in uncertainty and decreased transaction costs (Fasanghari, 2008). These benefits can be realizable when ICT plays a role in the three areas of procurement so far discussed as subsequently explained.

ICT plays a role in communication between departments within an organization and also between the organization and its suppliers. Between departments within an organization, information on service and consumption demands is easily communicated without the procurement personnel having necessarily to walk from department to department for purposes of collecting data. Intranet technologies allow departments to interact with each other by posting documents in the company network and personnel in the procurement department can access them. This is possible because the intranet uses the internet technology in which a document can be located easily by browsing and using the search engines. Extranets which are extended intranets allow external suppliers to access specific information of the customer organizations. In such case,

like hospitals and their suppliers, information to be shared may range from the pharmaceutical drugs that are available and those that are in short supply, their costing, delivery schedules to dispatch and transportation. On the other hand Electronic Data Interchange (EDI) and by extension Electronic Point of Sale (EPOS) can be used by the buying organization to share real-time information about inventory status. EPOS relays information to the suppliers as products are issued or sold and thus information about inventory levels is accurate and timely. Using the information, the suppliers can therefore respond according to the mutual agreements between them and their customer facilities concerning replenishment of stock. In effect ICT increases compliance and data transaction accuracy as it results in better understanding of requirements and open communication thus improving buyer supplier relationships.

In order processing, ICT can lead to low error rates since errors can be detected more easily and in time and so corrected in time. The electronic data interchange (EDI) technology can be used in this area. Electronic Data Interchange (EDI) is the transfer of structured information/data by agreed message standard from computer to computer by electronic means. As goods are sold, information is transferred directly to major suppliers via the buying organization. There is no need for huge amounts of paper documentation and savings are considerable. The most developed EDI system is the Electronic Point of Sale (EPOS) where information generated by/from retailers can provide valuable real time information to suppliers for quick decision-making purposes like in forecasting demand (Baily et al, 2005). EPOS system allows management team to determine which products are fast-moving products, allowing managers to restock them (Bonnie et al, 2010). EPOS allows businesses to comply with complex regulations imposed by government agencies like in pharmacies and drug stores where only approved products are allowed, as the software scans each barcode and ensures that only products eligible for purchase are permitted (Bonnie et al, 2010).

Finally, ICT can improve inventory management. It facilitates easy communication of stock-outs by customer facilities to the suppliers or notification of stock-outs by suppliers to their customers. With the intranet and extranet technologies an inventory system can be linked directly to the suppliers so that it automatically places orders for products when stock on hand falls below a certain level (Dunning, 2011). Cycle times and error rates are therefore substantially reduced. Inventory systems such as Vendor Managed Inventory are applicable in which inventories replacement decisions are centralized with suppliers (Lysons et al, 2006). The supplier takes the responsibility for the operational management of the inventory within a mutually agreed framework of performance targets which are constantly monitored and updated to create an environment of continuous replenishment. Electronic inventory systems can track the sale or movement of products in real-time format, ordering inventory automatically when current stock hits the predetermined minimum levels. This allows organizations to maintain the proper amount of stock by placing orders immediately ensuring short amounts of lead-times to receive new inventory. In addition, ICT allows organizations to properly order and maintain several types of products, like different kinds of pharmaceutical drugs, to ensure that consumer demand is met. Also, it allows for tracking of sold or moved inventory thus making it easier to conduct physical count of on-hand inventory.

According to Lysons and Farrington (2006), the traditional modes of information processing and communication serve merely as documentation of a chain of events or provide a logistical trail. As such much inefficiency arises. Inefficiencies caused by the traditional modes include; excessive documentation, a sequence of non-value-adding clerical activities, excessive time in order processing and excessive cost of purely transactional activities.

Conceptual Framework

Information processing and communication technologies play an important role in the procurement of pharmaceutical drugs in public hospitals in Kenya.

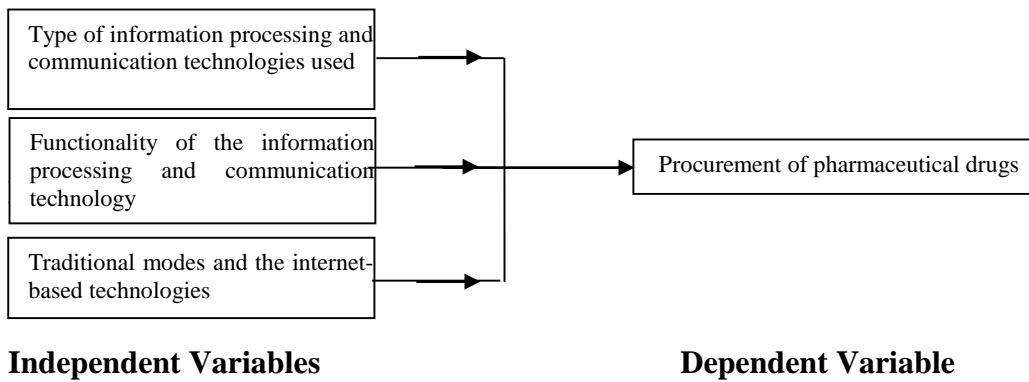


Figure 1: Conceptual Framework

When utilized in carrying out procurement activities, the internet-based technologies improve communication among the supply chain partners, order processing and inventory management thus efficiency and effectiveness. This in effect enables health care facilities adapt ‘a state-of-the-art’ medical service provision policy hence meeting customer needs. The quality of services offered lead to customer satisfaction and value for their money. From figure 2.1, it is evident that the type of information processing and communication technologies as well as their functionalities and the internet-based and traditional modes affect the efficiency and effectiveness in the procurement of pharmaceutical drugs in health care facilities. Modern modes improve communication of information between the supply chain partners and also between the various departmental units within the organization itself. Open communication among the supply chain partners leads to a closer buyer-supplier working relationship. Modern ICT can allow flow of documents from one point to another, order processing is greatly improved right from requisitioning to receiving of consignments as it leads to better understanding of requirements. In inventory management, ICT can enable an organization to maintain appropriate amounts of different kinds of pharmaceutical drugs as it can track the fast-moving ones and place orders automatically once the drugs have issued or sold. In addition, ICT tracks the sold and/ or moved inventory thus the on-hand inventory can easily be counted. In general, application of ICT in procurement ensures continuity in the supply of pharmaceutical drugs in public hospitals to avoid unnecessary stock-outs thus an improvement in the procurement of pharmaceutical drugs.

Knowledge gap

A number of studies have been conducted in the area of procurement. For example; Abonyo, (2007) Investigating into corrupt practices that affect purchasing and supply procedures and standards in private hospitals in Nairobi. The study ignores the applications of ICT in the management of purchasing procedures and how this can enhance efficient and effective procurement of medicines in hospitals. Information processing and communication as an important aspect of purchasing is covered by this study. Kamau, (2007) Causes of poor performance in purchasing department, a case study at Kenya vehicle manufacturers Ltd. He does not look at how ICT can improve the efficiency and effectiveness of the purchasing function. Kande, (2007) An investigation of various methods of supplier management used by government organizations in Kenya. A case study of National Hospital Insurance Fund. The study ignores to look at the how information processing and communication technologies affect supplier management in government organizations especially in public healthcare institutions. Though the above are all looking at procurement, effects if information processing and communication technologies on procurement have not been directly studied. The study therefore specifically intends to look at

the effects of information processing and communication technologies on the procurement of pharmaceutical drugs in public healthcare facilities in Kisii County.

METHODOLOGY

Introduction

The methodology adopted consisted of the research design, target and accessible population, sample and sampling technique, data collection methods and procedures and data analysis and presentation methods.

Research Design

The research design that was used was non-experimental in which a descriptive cross-sectional study was done. This was informed of the goal of the study which was to find out the effects of utilizing information communication technologies on the procurement of pharmaceutical drugs in public hospitals in Kisii County, Kenya. According to Belli, (2008), in descriptive cross-sectional studies data is collected at one point in time and used to describe some phenomenon or document its characteristics. The researcher therefore collected data across all the categories of public hospitals at once. The results were then be compared and used to describe the direct effects of these technologies on procurement of pharmaceutical drugs.

3.3 Target and Accessible Population

According to Mugenda and Mugenda, (1999), the target population should have some common observable characteristics that differentiate them from other populations. The study therefore targeted all the public hospitals in Kenya. The accessible population was all the 114 public hospitals in Kisii County. The hospitals range from district hospitals to dispensaries. The accessible population was chosen because it was the most representative of the target population (Mugenda and Mugenda, 1999) and the cases in this accessible population had some common characteristics like obtaining their medical supplies from a single source, KEMSA. The population was therefore appropriate for the study.

Sample and Sampling Techniques

Since the research design for this study was non-experimental, the study used a sample size of twenty percent of the accessible population (Mugenda and Mugenda, 1999). The sampling technique for the study was stratified random sampling to obtain a representative sample. The accessible population was stratified into district hospitals, sub-district hospitals, health centers and dispensaries. In each stratum, simple random sampling was used to select cases for inclusion in the sample size for the study, (Mugenda and Mugenda, 1999). However where cases were few in some stratum, all of them were considered in the main sample for better representation.

Data Collection

This section of data collection looks at the data collection instruments; their reliability and validity, and data collection procedure.

Data Collection Instruments

The researcher used structured questionnaires to collect raw data. This selection was informed by the objectives of the study which were intended to investigate the effects of information processing and communication technologies on the procurement of pharmaceutical drugs in public hospitals in Kisii County, Kenya. The instrument was organized into content sub-sections each of which represented a specific objective of this study

thus enabling respondents to make sense out of the questionnaire without spending too much time (Mugenda and Mugenda, 1999).

Reliability and Validity of research instruments

For reliability, the researcher used test-retest (Mugenda and Mugenda, 1999) on the sample for piloting. The subjects of the pilot sample were encouraged to make comments and suggestions concerning instructions, clarity of questions and relevance. The outcomes of the test-retest on the pilot sample were then used to improve the instrument so that all responses for the study were captured. In enhancing the content validity of the instrument, the researcher worked with experts (Mugenda and Mugenda, 1999) and peer-review mechanism to test the instrument.

3.5.2 Data collection procedure

In collecting data, the researchers undertook the following sequence of events. First, the researchers used simple random sampling to select subjects that could provide the required information. The subjects were supposed to have knowledge and experience in the procurement of pharmaceutical drugs from KEMSA and other suppliers. In addition, the subjects were supposed to be those who understand how information processing and communication technologies they use affect the procurement of pharmaceutical drugs in their facility. Second, the researchers sought permission from the cases and subjects from whom data was to be collected so that access to the institutions and the respondents to provide data was guaranteed. Third, the researchers concentrated on collecting information that was to provide data that related to the objectives of the study. Last, the researchers recorded the data in questionnaires which enlisted questions with possible responses.

Data Analysis and Presentation

The obtained data was analyzed using descriptive statistics. Percentages were used to determine the respondents who participated most in the study. They were also used to determine representation of participants in each stratum. Frequencies and percentages were used to analyze data on the modes and functionalities of the information processing and communication technologies used in the procurement of drugs in public hospitals. Means were used to analyze data on the effects of the modes of information processing and communication used by public hospitals on the procurement of pharmaceutical drugs. The results processed using SPSS and then presented in form of tables and bar graphs.

RESULTS AND DISCUSSIONS

Introduction.

This chapter looks at the findings of the research carried out on the effects of information communication technology on the procurement of pharmaceutical drugs in public hospitals in Kisii County, Kenya. The results are presented in tables and bar graphs. Since the sampling technique used was stratified random sampling followed by simple random sampling in each stratum, the research findings are then based on each stratum. The strata included district hospitals, sub-district hospitals, health centers and dispensaries.

Respondents of the study.

The respondents who participated in the study were pharmacists, nursing officers, clinical officers and procurement officers. The willingness of one to participate in the study depended on whether the respondent is the one who is in charge or involved in the procurement of pharmaceutical drugs for that facility. In most of the facilities studied, pharmacists were in charge of procurement of pharmaceutical drugs. However in dispensaries,

nursing officers were in charge of this function. The percentages of participants across all the facilities studied are as shown in figure 2.

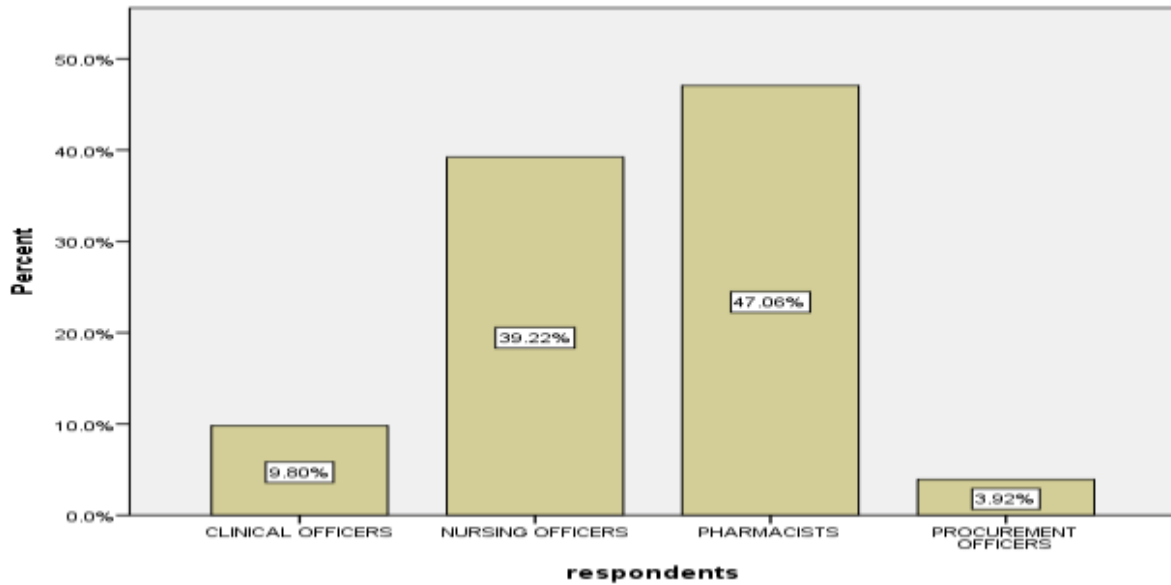


Figure 2. Percentages of respondents who participated in the study

Most of the participants were pharmacists (47.06%) especially in the categories of district hospitals, sub-district hospitals and health centers. Nursing officers (39.22%) featured at the dispensaries. Other respondents who filled the questionnaire are clinical officers (9.80%) and procurement officers (3.92%). From figure 2, pharmacists were majority of the respondents involved in the study followed by nursing officers and then clinical officers across all the four categories of health facilities studied. Procurement officers were few compared to the number participants involved in the study. Therefore, pharmacists were majority of the respondents in the study who would give the relevant information concerning the procurement of pharmaceutical drugs in public health facilities.

The number of participants varied in the four categories of health facilities depending on the sample size from each stratum. Percentages of participants from each stratum are as shown in figure 3.

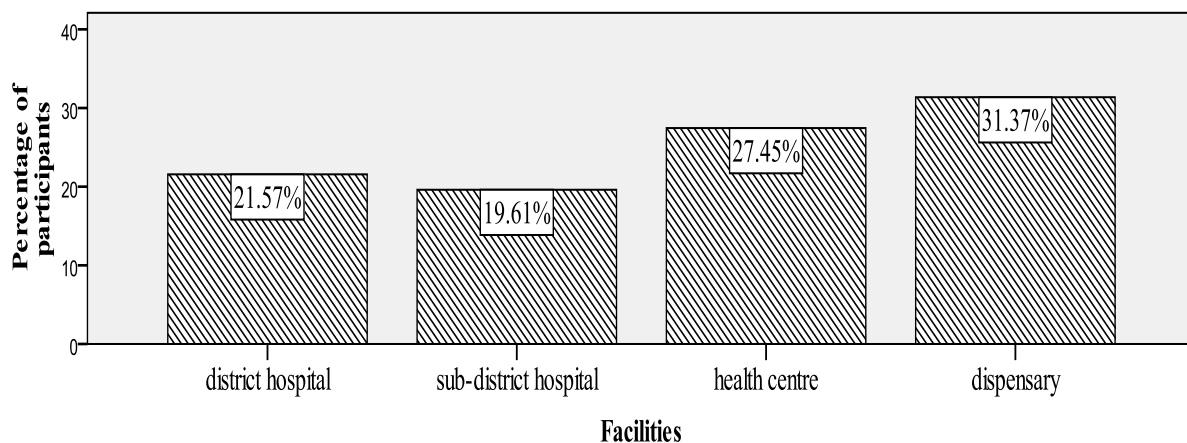


Figure 3 percentages of participants representing each stratum.

A large number of participants were from dispensaries (31.37%), followed by participants from the health centres (27.45%). 21.57% of the participants indicated they were from district hospitals while the remaining

19.61% belonged to sub-district hospitals. The variation was mainly due the number of facilities sampled from each stratum. The numbers of facilities in each stratum were dispensaries (16), health centres (14), sub-district hospitals (6) and district hospitals (6). Therefore, more participants were from dispensaries which had the highest number of facilities in the study.

Procurement of pharmaceutical drugs.

The first section on the procurement of pharmaceutical drugs required respondents to rate the areas of procurement, that is, management of stock of pharmaceutical drugs, processing of orders and communicating internally among departments and externally with suppliers, according to the level of importance. The range was from extremely unimportant to extremely important. Across all the categories of the health facilities studied, these areas were rated as either important or extremely important.

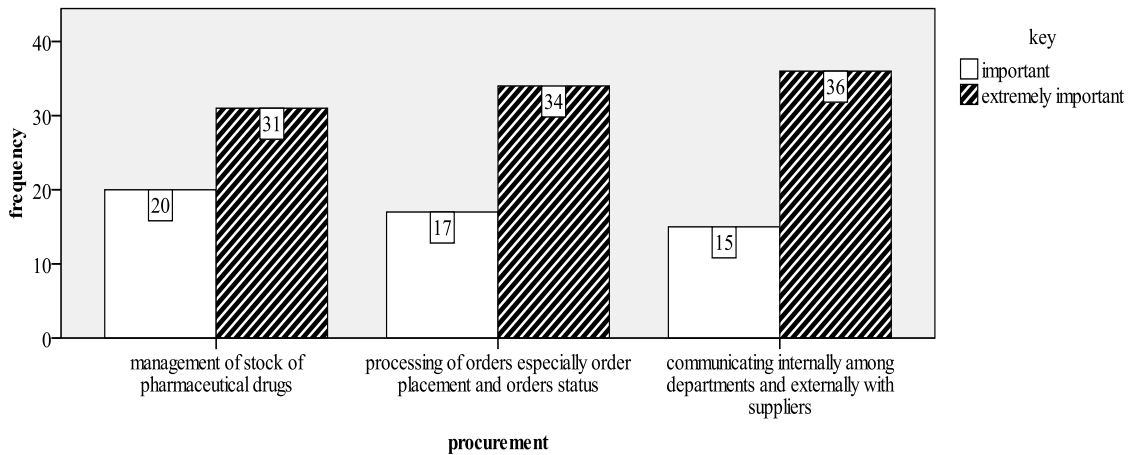


Figure 4. Frequencies on the rating of procurement areas

The three areas of procurement were rated as either extremely important or important (see figure 4). Consequently, extremely unimportant, unimportant or somewhat important were not indicated by respondents. This therefore means that the areas are of great importance when it comes to procurement of pharmaceutical drugs in public hospitals.

The second part on the procurement of pharmaceutical drugs required respondents to identify some of the activities carried out while undertaking the three areas of procurement rated in the first part. Participants were required to check the activities they undertake while carrying out procurement of pharmaceutical drugs. The results obtained were as in table 4.1 which shows the frequency and percentage for each activity in each of the four categories of the public health facilities.

Table 1. Procurement activities; frequencies and percentages in each stratum

| | Facilities | | | |
|--|--------------------|------------------------|----------------|--------------|
| | district hospitals | sub-district hospitals | health centers | dispensaries |
| | frequency | frequency | frequency | frequency |
| | / percent | / percent | percent | percent |

| | | | | |
|--|--------------|------------|--------------|--------------|
| we count the on-hand inventory | 10 90.91% | 9 90% | 12 85.71% | 16 100% |
| we make new orders once the on-hand inventory has reached the pre-determined minimum levels | 7 63.64% | 6 60% | 7 50% | 7 43.75% |
| we maintain appropriate amounts of stock for all procurement types of pharmaceutical drugs | 11 100% | 9 90% | 14 100% | 16 100% |
| an order is initiated by the person in charge of the store of drugs by giving specifications and delivery schedules | 9 81.82% | 8 80% | 12 85.71% | 8 50% |
| a check for quantities, specifications and delivery schedules is done before posting orders to suppliers. | 10 90.91% | 10 100% | 13 92.87% | 15 93.75% |
| orders are tracked to know the order status thus ensure delivery schedules are met | 10 90.91% | 10 100% | 11 78.57% | 10 62.5% |
| Inspection to verify the quantities and specifications is done on receiving the consignment of drugs from suppliers. | 10 90.91% | 10 100% | 13 92.87% | 16 100% |

In district hospitals, all the procurement activities were indicated by at least 80% of the participants in this category of facilities except in ‘making new orders once the on-hand inventory has reached the pre-determined minimum levels’ where 63.64% of the participants in this category of district hospitals consider it a procurement activity undertaken. In sub-district hospitals, the same observation is made as in the district hospitals. Each of the procurement activities was indicated by at least 80% of the participants in this category of sub-district hospitals except in ‘making new orders once the on-hand inventory has reached the pre-determined minimum levels’ where 60% of the participants checked it as a procurement activity. Health centers followed the same trend with each of the activities indicated by at least 78% of the respondents in this category of health facilities except ‘making new orders once the on-hand inventory has reached pre-determined minimum levels’ with 50% of the respondents considering it as a procurement activity. Results from dispensaries also yielded the same observation as the rest of the other categories of health facilities. Only 43.75% of the respondents in dispensaries checked ‘making new orders once the on-hand stock has reached pre-determined minimum levels’. In each of the remaining activities, at least 50% of the respondents considered them. Though the percentages vary, the results therefore show that on average all the procurement activities indicated in table 1 are carried out in all the health facilities studied across the four strata.

Information processing and communication technologies.

This section contained three parts; the modes of information processing and communication, description of the modes of information processing and communication and the functionalities of the modes of information processing and communication.

Modes of information processing and communication technologies currently used

Under the modes of information processing and communication participants were required to check the ones they currently use from a list of three. The results obtained were as in table 2.

Table 2 Information processing and communication technologies

| | | FACILITY | | | |
|-----|--|----------------------|------------------------|----------------------|----------------------|
| | | district hospitals | sub-district hospitals | health centres | dispensaries |
| | | Frequency/percentage | Frequency/percentage | Frequency/percentage | Frequency/percentage |
| | Only the traditional modes of information processing and communication like written documents | 0 0% | 0 0% | 0 0% | 0 0% |
| ICT | Only modern internet-based and electronic technologies. | 2 18.18% | 0 0% | 0 0% | 0 0% |
| | Both the traditional modes of information processing and communication and the modern internet-based and electronic modes. | 9 81.82% | 10 100% | 14 100% | 16 100% |

The use of the traditional modes as the only means of information processing and communication was not indicated by the participants in all the facilities studied across the four strata. 18.18% of the participants in district hospitals indicated that they use the modern internet-based and electronic technologies. In all the other remaining categories of health facilities, the use of the internet-based technologies as the only mode of information processing and communication was not indicated. Both the traditional modes and the internet-based technologies are popular in all the facilities in each stratum as the percentages of respondents indicate in table 2. However, 81.82% of the respondents in district hospitals indicated that they use both the traditional modes of communication and the internet-based and electronic technologies. On examining the questionnaires, it was found that the two respondents who indicated that they use the modern internet-based technologies in district hospitals were from the same facility. Therefore it is one out of the six district hospitals studied use the internet-based technologies in processing and communicating information both internally among departments and externally with suppliers. In general, both the traditional modes and the internet-based electronic technologies are used to complement one another in processing and communicating information concerning the procurement of pharmaceutical drugs in public hospitals since both were indicated to be used by respondents in the facilities studied.

Description of the modern internet-based technologies

Respondents were required to check all the descriptions of the internet-based and electronic technologies they currently use from a list of four. The results were as shown in table 3

Table 3 description of the internet-based and electronic technologies

| | FACILITY | | | |
|---|--------------------|------------------------|-------------------|-------------------|
| | district hospitals | sub-district hospitals | health centres | dispensaries |
| | Frequency/percent | Frequency/percent | Frequency/percent | Frequency/percent |
| Hospital departments are connected using a private network in which employees access documents from other departments | 18.18% | 0% | 0% | 0% |
| Description of the modern internet-based and electronic technologies | | | | |
| Hospital departments are connected using the public internet | 0% | 0% | 0% | 0% |
| The hospital and its suppliers of drugs are connected using a private network in which documents are shared | 0% | 0% | 0% | 0% |
| The hospital and its suppliers of drugs are connected using the public internet | 100% | 100% | 100% | 100% |

In district hospitals, 18.18% of the respondents described their internet-based technologies as having various departments in the hospital linked using a private network through which employees can access documents posted from other departments. The rest of the respondents did not check this description. From these results therefore, only 18.18% of the respondents in district hospitals use the intranet technologies to process and communicate information when procuring for pharmaceutical drugs while the rest, including those from other categories of the facilities studied, do not use this technology. In all the four categories of health facilities studied, 100% of the respondents in each stratum described the internet-based technologies as having the hospital and its suppliers of pharmaceutical drugs linked using the public internet. Therefore the use of the public internet in processing and communicating information is popular in all the health facilities studied across all the four strata. It is also worthy to note that none of the participants in the health facilities studied described the internet-based technologies as having various departments within the hospital being linked using the public internet. The same observation was made in describing the internet-based technologies as having the hospital and its suppliers on pharmaceutical drugs linked using a private network through which documents can be shared. This is an indication that extranet technologies are not used in processing and communicating information regarding the procurement of pharmaceutical drugs. Also, the use of the public internet to link different departments is not used even in large facilities like district hospitals.

Functionalities of the internet-based and electronic technologies

This part required the participants to check all the functionalities of the internet-based and electronic technologies they described in the previous part. Table 4 shows the results obtained.

Table 4. Functionalities of the internet-based and electronic technologies

| | | FACILITIES | | | |
|---|---|--------------------|------------------------|-------------------|-------------------|
| | | district hospitals | sub-district hospitals | health centres | dispensaries |
| | | frequency/percent | frequency/percent | frequency/percent | frequency/percent |
| Functionalities of Modern internet-based technologies to patients | We generate and transfer reports on the sale and/or movement of drugs to other departments and externally to suppliers | 18.18% | 30% | 0% | 0% |
| | We place orders with suppliers automatically by transmitting data to them as drugs are sold or issued | 0% | 0% | 0% | 0% |
| | We access information from our suppliers concerning the drugs that are available with them and/or those in short supply | 63% | 70% | 42.86% | 56.25% |
| | We place orders on-line | 81.82% | 80% | 71.43% | 62.5% |
| | We track orders to know their status | 81.82% | 80% | 64.29% | 56.25% |

Since the only descriptions given by participants concerning their respective internet-based technologies were the use of the public internet to link with the suppliers of pharmaceutical drugs and use of a private network to link all the departments, the functionalities discussed in this part then regard the two technologies described. As seen in table 4 participants in district hospitals (at least 63%) indicated each of the following three functions. The functions are; accessing information from suppliers concerning the drugs that are available with them and/or those in short supply, placing orders on-line and tracking orders in order to know the status of the orders placed. These three functions are only possible where the internet technology is used. The same observation is made in the other categories of facilities concerning the three functions mentioned though the percentages vary. Probably because all the facilities in all the categories do not have a private network linking them with their suppliers, it is therefore not possible to place orders with suppliers automatically as drugs are sold or issued to patients. This would be the reason why this function was not indicated as a function of their technologies by any participant across all the facilities. 18.18% of the respondents in district hospitals use the internet-based technologies to generate and transfer reports on the sale and/ or movement of drugs to other departments and suppliers while 30% of the respondents in sub-district hospitals do the same using electronic systems. However, health centres and dispensaries do not use the technologies for this function. This is an indication that electronic technologies are not popular when it comes to generating reports on the sale and/or movement of pharmaceutical drugs.

Description of the traditional modes of communication

Just like in the internet-based and electronic technologies, participants were required to indicate the descriptions of the traditional modes of communication from a list of six. Some of these modes included sending of representatives from either the customer facility to the supplier or vice versa, telephones, faxes, postal mails paper-based documentation and courier services. The results are as shown in table 5

Table5.Description of the traditional modes of information processing and communication

| | Facility | | | |
|--|-----------------------|------------------------|-----------------------|-----------------------|
| | district hospitals | sub-district hospitals | health centres | dispensaries |
| | Frequency/ percent | Frequency/ percent | Frequency/ percent | Frequency/ percent |
| Internal memos are printed and posted on the notice boards within the hospital to communicate to employees. | 5 45.45% | 6 60% | 6 42.86% | 3 18.75% |
| Documents are printed and shared between the hospital and its suppliers of drugs by postal mails and courier services | 5 45.45% | 6 60% | 6 42.86% | 4 25% |
| Description of the traditional modes of information processing and communication Departments within the hospital are connected using extension phones | 2 18.18% | 1 10% | 2 14.29% | 0 0% |
| The hospital connects with its suppliers of pharmaceutical drugs by use of faxes and / or phones | 5 45.45% | 6 60% | 6 42.86% | 7 43.75% |
| Documentation in the hospital is largely paper-based | 9 81.82% | 10 100% | 13 92.86% | 15 93.75% |
| Employees in the hospital move to relevant departments to collect any information or data they need | 8 72.73% | 4 40% | 5 35.71% | 7 43.75% |

Paper-based documentation seems to be the most widely used mode of information processing and communication across all the four categories of health facilities studied. 81.82% of the respondents in district hospitals confirmed this while in the other categories, at least 92% of the respondents in each category described their traditional modes of information processing and communication as largely paper-based. Movement of employees within the hospital to collect information had the highest percentage of respondents in district hospitals (at 72.73%) and the lowest was in health centres at 35.71%. Perhaps the most unpopular mode in the traditional modes is the use of extension phones to connect departments within the hospital. The highest

percentage of respondents for this mode was in the district hospitals at 18.18% and the lowest being in dispensaries at 0%. This difference would be because of the age difference of the facilities. That is, some dispensaries were recently built, a time when extension phones are not popular.

Functionalities of the traditional modes of information processing and communication

Respondents were given a list of the functionalities of the traditional modes of communication in which they were required to indicate only the ones that apply to their respective facilities. Table 4.6 shows the results obtained from the study.

Table 6. Functionalities of the traditional modes of information processing and communication

| | Facility | | | |
|--|---------------------------------------|-----------------------------------|---------------------------------------|---------------------------------------|
| | District hospitals | sub-district hospitals | Health centres | Dispensaries |
| We make reports on the sale and /or movement of drugs. | Frequency/ percent 10 90.91% | Frequency/ percent 8 80% | Frequency/ percent 12 85.71% | Frequency/ percent 13 81.25% |
| We place orders on drugs with suppliers via postal mail, courier services and sending representatives. | 8 72.73% | 7 70% | 11 78.57% | 14 87.5% |
| Suppliers send their representatives to deliver documents indicating drugs that are available and those in short supply. | 6 54.55% | 5 50% | 10 71.43% | 10 62.5% |
| We track orders or get to know our order status by making phone calls. | 4 36.36% | 3 30% | 3 21.43% | 6 37.5% |

The traditional modes clearly are used in making reports on the sale and / or movement of drugs. At least 80% of the respondents across all the categories said they use the traditional modes for this purpose. The least popular function of the traditional modes across all the categories was ‘tracking orders to know their statuses. The highest percentage of respondents for this purpose was in the dispensaries at 37.5% and the least was in the health centres at 21.43%. Placing of orders and exchanging documents by sending representatives from either the supplier or the customer facility are also popular across all the categories of the facilities studies. 87.5% of the respondents in dispensaries reported that they place orders using the traditional modes compared to 70% of respondents in sub-district hospitals. The use of supplier and customer facility representatives to share information was highest in health centres at 71.43% of the respondents in this category acknowledging it compared to 50% of respondents in sub-district hospitals.

Effects of the internet-based and electronic technologies on the procurement of drugs

This section required the participants to agree or disagree with statements that indicate the perceived effects brought about the use of information processing and communication technologies in the procurement of pharmaceutical drugs. The statements the respondents were to either agree or disagree to cover the three areas of procurement in part B question four of the questionnaire. The results obtained from the study are as seen in figure 5

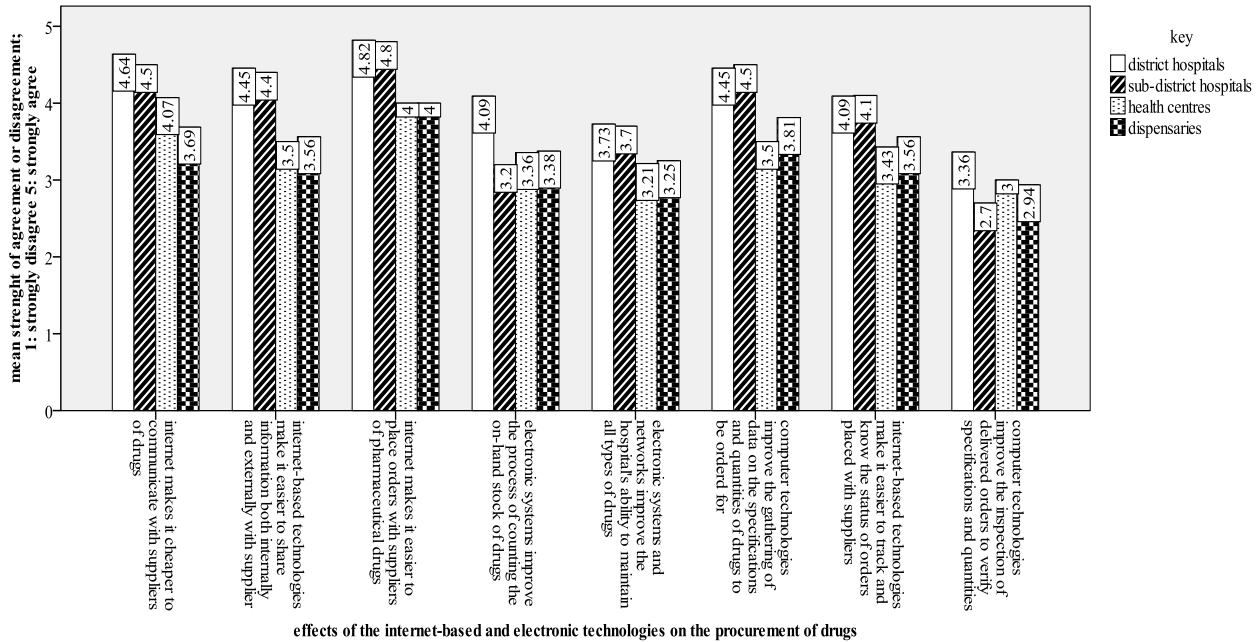


Figure 5 Effects of internet-based technologies on the procurement of drugs

1 indicates the strongest disagreement while 5 indicates the strongest agreement. Figure 4.4 provides the averages of the strength of agreement and disagreement from the participants regarding the perceived effects brought about by utilising the internet-based and electronic modes of information processing and communication on the procurement of pharmaceutical drugs. That internet makes it easier to communicate with suppliers of drugs, participants from district hospitals, sub-district hospitals and health centres tended to agree with means of 4.436, 4.5 and 4.071 respectively. However respondents from dispensaries tended to somewhat agree at 3.688. On internet-based technologies making it easier to share information both internally and externally with suppliers, participants from district and sub-district hospitals tended to agree at 4.455 and 4.4 respectively while health centres and dispensaries somewhat agreed at 3.5 and 3.563 respectively. Regarding internet making it easier to place orders with suppliers of pharmaceutical drugs, respondents from all the four categories of health facilities tended to agree with the least mean being 4 in dispensaries. Electronic systems improving the process of counting the on-hand stock of drugs, only district hospitals tended to agree at 4.091 while respondents from the other categories tended to somewhat agree. On information technology improving the process of gathering data on the specifications and quantities of drugs to be ordered for, district and sub-district hospitals tended to agree while health centres and dispensaries tended to somewhat agree. The same was observed on internet-based technologies making it easier to track and know the status of orders placed with suppliers. Worthy to note also, is that participants from all the four categories tended to disagree that electronic systems

Effects of traditional modes of information processing and communication on the procurement of drugs

Just like on the effects of modern internet-based and electronic technologies on the procurement of pharmaceutical drugs, in this section also participants were required to agree or disagree with the statements provided concerning the perceived effects of using the traditional modes of information processing and communication on the procurement of pharmaceutical drugs. The results obtained from the study are as shown in figure 6.

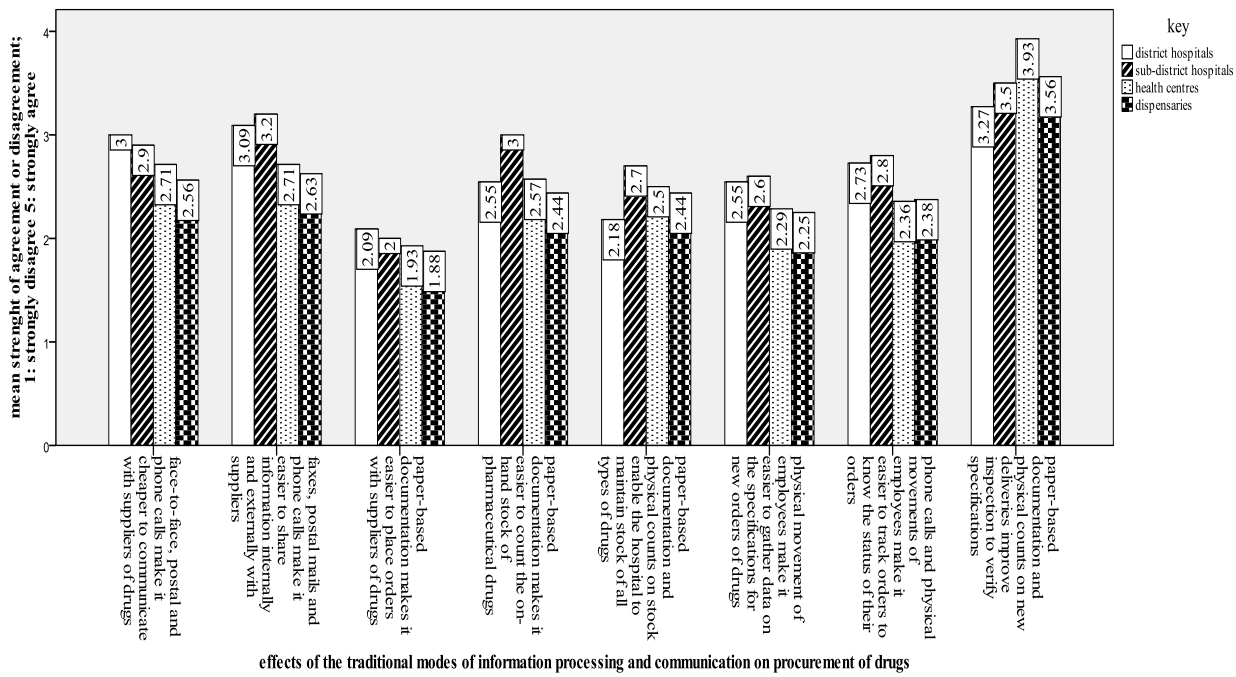


Figure 6. Effects of the traditional modes of information processing and communication on the procurement of pharmaceutical drugs.

A significant difference is observed between these traditional modes and the internet-based and electronic technologies so far discussed. In most of the statements to which respondents were to agree or disagree concerning the perceived positive effects of traditional modes, respondents across all the four categories of health facilities studied tended to disagree with them except one in which they tended to somewhat agree. Paper-based documentation and conducting physical counts on new deliveries of pharmaceutical drugs improving inspection to verify specifications and quantities seems to be most popular of the traditional modes of processing information on quantities and specifications of delivered consignments of pharmaceutical drugs. Face-to-face communication, postal mails and phone calls were somewhat favoured by respondents from district hospitals in making communication with suppliers of pharmaceutical drugs cheaper while the respondents from the other categories disagreed with that. This is probably because of the large quantities of pharmaceutical supplies that are handled by these facilities than the ones lower in the rank. On sharing information internally and externally with suppliers, respondents in district and sub-district hospitals tended to somewhat agree that faxes, postal mails and phone calls make it easier while those in health centres and dispensaries tended to disagree. Placement of orders made easier by using the traditional modes was strongly disagreed with by respondents from dispensaries and health centres while respondents from district and sub-district hospitals simply disagreed with it. On counting the on-hand inventory, respondents from sub-district hospitals tended to somewhat agree that paper-based documentation makes it easier as respondents in the rest of the categories disagreed. Respondents across all the categories of the facilities studied simply disagreed that physical movement of employees and

phone calls make it easier to track orders thus knowing the status of the orders they make. This same observation was made concerning physical movement of employees making it easier to gather information on the specifications and quantities of drugs to be ordered for as well as paper-based documentation enabling the hospitals to maintain appropriate amounts of all types of pharmaceutical drugs.

When comparing the results obtained from respondents concerning the effects of the two modes of information processing and communication, some deductions can be made. The internet makes it cheaper to communicate with suppliers of pharmaceutical drugs than the face-to-face, postal mails and phone calls. The same is true in the placement of orders, sharing of documents and tracking of orders. Also electronic systems improve the process of counting the on-hand inventory, ability of the health facilities to maintain appropriate amounts of all types of pharmaceutical drugs and the process of gathering data on the quantities and specifications of orders to be made. However when it comes to inspecting new deliveries to verify quantities and specifications, on average respondents from sub-district hospitals and dispensaries disagreed that electronic systems improve the process. Though respondents from district hospitals and health centres seemed to somewhat agree that electronic systems have brought about some improvements in the process, traditional modes seem to do better when considering the results of the two modes of information processing and communication.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to document the effect of information communication technology on the procurement of pharmaceutical drugs in Kisii County, Kenya. The objectives of the study were; to find out the information processing and communication technologies currently used in the procurement of pharmaceutical drugs in public hospitals, to find out the functionalities of the information processing and communication technologies used in public hospitals in the procurement of pharmaceutical drugs and to find out the effects of internet-based technologies and traditional modes of communication on the procurement of pharmaceutical drugs.

Data was collected using a structured questionnaire from a sample size of thirty-seven public health facilities stratified along district hospitals, sub-district hospitals, health centres and dispensaries. From each stratum, a representative sample was randomly chosen for inclusion in the main sample. In cases where the cases in a given stratum were few, like in district hospitals, all the cases were included in the main sample for better representation. The summary of the findings is as follows.

Participants of the study

Respondents who participated in the study were pharmacists (47.06%), nursing officers (39.22%), clinical officers (9.08%) and procurement officers (3.92%). The high number of pharmacist respondents was probably due to fact that they are the ones charged with the responsibility of managing pharmaceutical drugs in these health facilities. Nursing officers also have the same responsibility mostly in dispensaries.

Important areas in the procurement of pharmaceutical drugs.

Inventory management, order processing and communication among the supply chain partners were all rated as important areas in the procurement of pharmaceutical drugs. More than 80% of the respondents in district hospitals indicated that they count the on-hand inventory and maintain appropriate amounts of all types of drugs in order to ensure proper management of stock. Also on order processing, over 80% of respondents in district hospitals indicated that they check for specifications and quantities before placing orders with suppliers and that once orders have been placed they track them to know their status. However, though up to 63% of the

respondents indicated that they make new orders once the on-hand inventory has reached the pre-determined minimum levels, compared to percentages in other areas, this appears to be unpopular. This is probably due to the fact that the main supplier, KEMSA, offers four cycles in a year during which public health facilities are supposed to make orders. Therefore orders could be made once ordering cycle has come regardless of whether the on-hand stock has reached minimum levels or not. There was no difference in the observations in the other categories of health facilities from the once in district hospitals regarding the areas of procurement in which information communication technologies can be applied.

Information processing and communication technologies used.

On the section of information communication technology, only 18.18% of the respondents in district hospitals indicated that they use the modern internet-based technologies when procuring for pharmaceutical drugs. The other 81.82% of the participants in the district hospitals indicated that they use both the traditional modes and the internet-based technologies when procuring for pharmaceutical drugs. In the rest of the categories of health facilities, 100% of the respondents in each category indicated that they use both the internet-based technologies and the traditional modes to procure for the pharmaceutical drugs.

Description of the internet-based electronic modes of information processing and communication technologies used.

When asked to describe their internet-based technologies, 18.18% of the respondents from district hospitals indicated that they use intranets, that is, departments in the hospital are linked using a private network through which employees share documents by posting them in the network. However there was no indication across all the categories of health facilities that the public internet is used to link the various departments of the facilities. On linking up with the suppliers, 100% of the participants in each stratum indicated that they use the public internet when procuring for the pharmaceutical drugs. However there was no indication that extranet, that is, a private network with suppliers is used to link the two institutions.

Functionalities of the internet-based and electronic modes of information processing and communication

The functionalities of the internet-based and electronic technologies described by the respondents were majorly indicated to be placing orders on-line and tracking the orders to know their status. Also, accessing information from suppliers on the drugs that are available and those that are in short supply was indicated to be a function of the technologies they use. Since no facility indicated that it uses extranet to link with suppliers, automatic placement of orders as drugs are sold or issued to patients is not done in any facility across all the categories.

The traditional modes of information processing and communication.

On the other hand, the research findings indicated that the traditional modes of information processing and communication in the procurement of pharmaceutical drugs are widely used in most facilities. Phones, faxes, postal mails and courier services are used when procuring for pharmaceutical drugs. Manual generation of reports on the sale, issuance and/ or movement of drugs as well as posting of orders by sending representatives, postal mails and courier services are popular in most facilities. Phones calls are commonly used in tracking orders to know their status. On sharing of documents, representative from both the customer facility and the supplier

Effect of the internet-based and traditional modes of information processing and communication

Based on the comparison of the results on the effects of the two modes of information processing and communication, internet-based technologies and electronic systems seem to have brought about some improvements, across all facilities, in order placement, order tracking, communication along the supply chain,

sharing of documents, counting the on-hand inventory, maintenance of appropriate amounts of all types of pharmaceutical drugs and the process of gathering data concerning the quantities and specifications of orders to be made. However, traditional modes seem to do better than electronic systems in the inspection of new deliveries of pharmaceutical drugs in order to verify quantities and specifications.

Conclusions

As per the results of this study, inventory management, order processing and processing and communicating information are important areas in the procurement of pharmaceutical drugs in public health facilities. ICT is applicable in such areas as generation and transfer of reports on the sale and/or movement of drugs to other departments and externally to suppliers, accessing information from suppliers concerning drugs that are available and those in short supply and on-line order placement and tracking. It was noted that rather placing orders depending on outcomes of some techniques like periodic or continuous review systems and reordering level technique, the main supplier of pharmaceutical drugs offers cycles during which all facilities make orders. Therefore overstocking and understocking are issues concerning the management of the stock of pharmaceutical drugs in public health facilities. On information processing and communication technologies used, the study found out that a great deal of public hospitals use both the traditional and the modern electronic and internet-based technologies to process and communicate information. Most facilities do not use electronic systems to link various departments internally. However the public internet is most popular in all categories of facilities to link with suppliers. Private networks like the cheap internet-based Electronic Data Interchange (EDI) and / or Electronic point of Sale (EPOS) are not used to link with suppliers so that orders can be automatically placed as pharmaceutical drugs are sold. It is also worthy to note that paper-based documentation, phones, postal mails and courier services are among the most commonly used traditional modes of information processing and communication though costly and labour intensive.

The functionalities of both the traditional and the modern internet-based and electronic technologies are in the areas of order placement, order tracking, communication along the supply chain, sharing of documents, counting the on-hand inventory, maintenance of appropriate amounts of all types of pharmaceutical drugs, the process of gathering data concerning the quantities and specifications of orders to be made and the inspection of new deliveries of pharmaceutical drugs in order to verify quantities and specifications.

The electronic systems and internet-based technologies in use by the facilities studied are thought to have brought about some improvements in the procurement of pharmaceutical drugs in these facilities. For instance communication and sharing of information with suppliers has been made cheaper. In addition, processes of counting the on-hand inventory and gathering of data for new orders to be made have been improved. However, electronic systems lag behind the traditional modes in terms of inspecting new deliveries to verify quantities and specifications.

Recommendations

Although the study revealed some interesting insights into the procurement of pharmaceutical drugs in public hospitals, some questions remain open prompting the following recommendations;

Softwares that can scan barcodes containing information on the kind of pharmaceutical drugs delivered by suppliers should be used to improve the process of inspection rather than using the traditional modes of inspection like conducting physical counts on every new consignment arriving.

Rather than placing orders because the ordering cycle has come as offered by KEMSA, reordering should be done based on the some inventory management technique like reordering once pre-determined minimum levels of the on-hand inventory has been reached. This can help in sorting the issues of over-stocking and under-stocking.

Suggestions for further research

The supplier side, especially KEMSA, offers cycles during which the health facilities are supposed to make new orders. This affects the issues of overstocking and under stocking while managing the inventory of pharmaceutical drugs. Therefore knowledge about the suppliers of pharmaceutical drugs is essential in order to gain deeper understanding in the procurement of pharmaceutical commodities.

REFERENCES

- Araka, O., (2011). *Information systems to boost service delivery*, Agritech news issue no.46 page 6, corporate communications Nairobi.
- Baily, P. Farmer, D. Jessop, D. & Jones, D., (2005). *Purchasing principles and management*, Prentice Hall, London.
- Belli, G, (2008). Surfing on the internet. *Nonexperimental Quantitative Research*
- Bonnie, C., (2010). Surfing on the internet: *What are the benefits of electronic point of sale*. www.ehow.com/list-6753477-6contne.07965.pdf
- Dunning, D. (2011). Surfing on the internet: *Advantages of an extranet*. www.ehow/in-12028071-advantages-extranet.html.
- Eddie, R. (2007). *Drivers and barriers of public sector e-procurement*. ITcom volume 12
- Handfield, R., (2011). Surfing on the internet: *Role of procurement within an organization* scm.ncsu.edu/scm-articles/
- Fasanghari, M. Habibipour, F. & Chaharsooghi, K. (2008). *Assessing the impact of ICT on supply chain management*, world applied sciences journal 4(1): 87-93 ISSN 1818-4952, IDOSI publications.
- Flynn, J.L. , (2011), *purchasing and supply management*, McGraw-Hill, New York.
- Imbuga, M. Namusonga, G. Sakwa, M. & Iravo, M, (2010). *Conducting procurement research in east Africa*, Agritech news issue no. 44 page 9 corporate communications Nairobi.
- Johnson, M. Hazemba, O. Kimeu, J. Kirika, R. & Thuo, M, (2008). *Assessment of Kenya medical supplies agency*, MSH/SPS, regional office Nairobi.
- Kenya Institute of Supplies Management, KISM, (2008). *Procurement and supply in Kenya. The market for small and medium enterprises*.
- Kiula, B. Muliaro, J. John, M. & Kiohoro, J, (2011). *The state of ICT penetration and utilization in local authorities in Kenya*, Agritech news page 14. Corporate communications Nairobi
- Lysons, K. & Farrington, B., (2006), *purchasing and supply chain management*, Pearson Education Limited, Prentice Hall.
- Mugenda, O. & Mugenda, G. (1999). *Research Methods Qualitative and Quantitative approaches*, Nairobi Act Press, Nairobi
- Mulama, J, (2009). *Drug shortages Threaten public Health*, Nairobi.
- Noone, L, (2010). *Storage and distribution*, Profex publishing limited, Berkshire.
- Ouma, S. & Herselman, M, (2008), *e-health in rural areas; a case of developing countries*, international journal of biological and life sciences 4:4.
- PPOA , (2007). Surfing on the internet. *Assessment of the procurement system in Kenya*.
- Segev, A. Gebauer, J. & Beam, C. (1998). *Procurement in the internet Age – Current Practices and Emerging Trends*, university of California, Berkeley.
- Tetzlaff, R, (2010). Surfing on the internet. *Understanding intranet-advantages of intranets*.