FACTORS AFFECTING EFFECTIVENESS OF INVENTORY MANAGEMENT IN THE ENERGY SECTOR IN KENYA: A CASE OF KENYA PIPELINE COMPANY LIMITED

BY

JAEL A. OLACK

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DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged

Student Name: Jael Akinyi Olack Reg. No. 13/00757

Sign:…….. Date…….

I do hereby confirm that I have examined the master's dissertation of

Jael A. Olack

And have certified that all revisions that the dissertation panel and examiners recommended have been adequately address

Sign:…….. Date…….

Dr. Mary Otieno

Dissertation Supervisor

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ABSTRACT

Inventory management plays a pivotal role in the procurement performance of the public sectors in Kenya. However, it is worth noting that for the function to realize its aims properly it has to be effectively managed. This study sought to establish factors that affect effectiveness of inventory management in the energy sector in Kenya. The study was guided by four objectives which focused on the influence of Information Technology, Staff Training, Safety Stock and Global Sourcing on Inventory Management. Descriptive research design was used for the study. The data was collected using a questionnaire which was the main data collection instrument. A total of 100 respondents were targeted by the study out of which 84 responded giving a good response rate. The sampling frame for this study included procurement managers, procurement officers, procurement assistants and clerical officer in the procurement department in the Kenya Pipeline company limited. The collected data was analysed using descriptive statistics and this was done using a statistical package for analysis (SPSS). On the effect of information technology, the study found that majority of the respondents agreed that KPC has managed to reduce inventory levels by use of modern technology. It was also found that quite a number of respondents agreed that in general IT has helped KPC manage inventories more effectively and control stock outs of spares. Regarding the effect of staff training and development on inventory management, the study established that it was very important to have staff with wide experience on challenging assignments. On the effect of safety stock management on inventory management, the study found that the respondents agreed that application of the right stock levels by KPC minimizes on obsolete items and stock outs. Finally, on the effect of global sourcing on inventory management, the study found that high percentage of the respondents indicated that KPC has managed to interact with suppliers globally due to significant shift of supply base's worldwide with focus on global value countries to a large extent. The study concluded that information technology, staff training and development, safety stock management and global sourcing affect effectiveness of inventory management in KPC. It is recommended that for the inventory to be well managed and controlled, KPC needed to fully adopt the use of ERP system. Another recommendation is that more training be organized for staff on inventory management and the study further recommended that KPC needed to perform a continuous and periodical review on inventory. It was finally recommended that another study be done on the challenges of inventory management which was not the concern of this study.

Keywords: Inventory management, global sourcing, safety stock management, staff training and development, information technology, Kenya Pipeline Company

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DEDICATION

I would like to dedicate this research project is dedicated to all Public Servants working in the procurement department and upcoming procurement students.

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ACRONYMS AND ABBREVIATIONS

AST	Adaptive Structuration Theory
BI	Business Intelligence
ERP	Enterprise Resource Planning
GDP	Growth Domestic Product
KPC	Kenya Pipeline Company
ROK	Republic of Kenya
IT	Information Technology
TCT	Transaction Cost Theory
TOT	Theory of Constraint

OPERATIONAL DEFINATION OF TERMS

Inventory Management:

This is a concept which brings together under one management responsibility for determining the organizations requirement, scheduling the processes and procuring, storing and dispensing materials (David & Alex, 2000).

Safety Stock:

These are the stock held by a company in excess of its requirement for the lead time. Companies hold safety stock to guard against stock-out (Graves & Willems, 2000).

Global sourcing:

A procurement strategy in which a business seeks to find the most cost efficient location for manufacturing a product, even if the location is in a foreign country (Monczka, Trent, & Petersen, (2008).

Supply Chain Management:

Supply Chain Management (SCM) is the term used to describe the management of the flow of materials, information, and funds across the entire supply chain, from suppliers to components producers to final assemblers to distribution (warehouses and retailers), and ultimately to the consumer (Johnson & Pyke, 2001).

Energy Sector:

This sector deals with category of stocks that relates to producing or supply of energy, and includes companies involved in the exploration and development of oil or gas reserves, oil and gas drilling and integrated power firms (Maria, 2011).

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

From both operational and financial viewpoints, inventory management plays an important role in daily production. On one hand, the gross and net profit of a company will be increased by reducing carrying costs, procurement costs and associated operational expenses after conducting effective management of inventory (Silver, Pyke, and Peterson, 1998). What is more, cash flow will be improved through saving on purchasing and storing the goods, which can be used to invest in other services. On the other hand, efficient inventory management guarantees meeting the demands of customers and daily production (Kennedy, Wayne and Fredendall, 2002).

Inventory management is defined as "the continuing process of planning, organizing and controlling inventory that aims at minimizing the investment in inventory while balancing supply and demand" (Ali, 2011: 151). Specifically, the process is a supervision of supply, storage and accessibility of items in order to ensure an adequate supply without excessive oversupply. Since the mid-1990s, there has been a large increase in annual number of inventory management articles (Williams and Tokar, 2008).

The oil and natural gas industry is one of the world's largest and most capital intensive industries. In USA the industry has been able to effectively compete for global energy resources. The industry's earnings make possible the huge investments necessary to help ensure America's energy security. As a tremendous source of revenue that fuels the U.S. economy, major energy producers pay their fair share. The oil and natural gas industry pays income taxes, royalties and other fees totaling nearly $86 million every day. The industry also pays the federal government significant rents, royalties and lease payments for production—totaling more than $110 billion since 2000 U.S. based oil and gas companies have structured their operations and invested substantial capital where the resource is found rather than where the best tax regime is located. As a result, U.S. based oil and gas companies' overseas income is often subject to very high effective tax rates (Spengler, 2010)
In Europe only a small fraction of oil products import and transportation uses pipelines 80% are transported by vehicle, ship and train (Smeers, 2011). The oil pipeline link between

Eastern and Western Europe is weak. Eastern Europe is vulnerable to the supply of Russian oil and changes in Russian means of transportation and export terminals. An increasing share of the Russian export is exported by vessels.

In 2011 Russia's oil and natural gas exports to markets in the European Union and the Commonwealth of Independent States (CIS) generated around 4.5% of Russia's GDP, or half of Gazprom's total revenue. Tax receipts from gas and oil transport through pipeline amount to 10% of Russia's GDP. Producers and consumers are connected by pipelines and by bilateral LNG shipping networks. Therefore, producers have to contract with pipelines and liquid natural gas operators to transport gas to consuming countries. In Russia producers can exercise market power by playing a Cournot game against other producers. Further, transmission costs through pipelines are priced efficiently, i.e. industry players behave competitively and grant access to the pipeline infrastructure to those users who value transmission (Pirani, Stern, & Yafimava, 2011).

Indian Oil operates the 1870 km long Salaya-Mathura Pipeline from Salaya (near Vadinar) in Jamnagar district on the coast of Gujarat to bring crude oil to Indian Oil's refineries at Koyali (Gujarat), Mathura (Uttar Pradesh) and Panipat (Haryana). Two Single Point Mooring (SPM) systems are operated at Vadinar to unload the crude oil received from tankers including Very Large Crude oil Carriers (VLCCs) with offshore pipelines. Revenue generated from transportation of gas and oil in India contributes 4.09% to its GDP. According to David and Alex (2000), inventory management is a concept which brings together under one management responsibility for determining the organizations requirement, scheduling the processes and procuring, storing and dispensing materials. As such it is concerned with and controls activities involved in the acquisition and use of all materials employed in the production of finished goods.

In the earlier year, Inventory Management was treated as a cost centre, since Purchasing Department was spending money on materials while Stores was holding huge inventory of materials, blocking money and space (Ramakrishna, 2005). However, with the process of liberation and opening up of global economy, there has been a drastic change in the business environment, resulting in organizations exposed to intense competition in the market place. Organizations World Wide has been working out various strategies to face the Challenges and to cut down manufacturing costs to remain competitive. As noted by

Ramakrishma (2005) progressive management has since recognized that Inventory Management can provide opportunities to reduce costs and can be treated as a profit Centre.

Inventory management is critical to establishing and maintain a high performance working capital management program. Slow moving inventory is not only a big management headache, it can significantly reduce a company's financial; performance and result in increased carrying costs, damage, theft and obsolescence (Smith, 2013). In many cases it will encompass of information technology, staff training and development, global sourcing and safety stock management.

Inventory management in the public sector is based on the need to demonstrate accountability for public resources, improve transparency and credibility of information used for making policy choices, and improved efficiency (European Union, 2009). In addition, the public sector needs to maximize return on investment in order to deliver more services or a higher level to the community and other stakeholders served and this can be achieved through proper inventory management.

1.1.1 *Kenya Pipeline Company*

The Kenya Pipeline Company (KPC) Limited is a State Corporation established on 6th September, 1973 under the Companies Act (CAP 486) of the Laws of Kenya and started commercial operations in 1978 **(***www.kpc.co.ke*). The Company is 100% owned by the Government and complies with the provisions of the State Corporations Act (Cap 446) of 1986. The Company operations are also governed by relevant legislations and regulations such as the Finance Act, the Public Procurement Regulations, and Performance Contracting. The main objective of setting up the Company was to provide efficient, reliable, safe and cost effective means of transporting petroleum products from Mombasa to the hinterland. In pursuit of this objective, the Company constructed pipeline network, storage and loading facilities for transportation, storage and distribution of petroleum products (RoK, 2012). This study therefore seeks to assess the factors affecting effectiveness of inventory management in KPC.

1.2 Statement of the Problem

Inventory is a very critical component in every organization and it requires serious managerial consideration since it ties up a lot of firms' capital. However, Inventories are

essential for keeping the production continuous whereby moving inventories keep the market going and the distribution system intact. According to David and David (2002), these functions include providing a cushion to prevent against stock-outs and therefore if there is a constant and efficient supply of inventory, it will reduce the chances of uncertainties or lack of stocks and the costs that relate to stock-outs and if this is well achieved, it will enable any firm to attain a competitive advantage over competitors. For instance in June 2012, KPC had to halt its supply through Nakuru as its pipes had burst (KPC, 2012). This was due to unavailability of spares that required immediate attention. Due to these occurrences it led to delay in supply of fuel in the country and huge loses to KPC. Moreover the pipeline has served over a longer period of time than the required 25 years and thus manufacturing of spares is based on order due to new technology and new products in the market.

Recent work by Bacchetti and Saccani (2012) reveals the existence of a considerable gap and practice in spare parts management, pointing out that managers usually prefer to rely on their judgement. Grant (2007) examined inventory management and the role it plays in improving customer satisfaction. The study focused on how food companies have been under pressure to streamline their inventory systems and the consequences of such actions. It also examined how many retailers were trying to implement a "perfect order" system and how suppliers were constantly under pressure to meet the demands of these retailers.

In Kenya, Kimaiyo (2014) examined the role of inventory management on performance of manufacturing firms in Kenya and found that inventory control system, organizational development, information sharing and channels relationships affect the performance of the manufacturing firms.

Nyabwanga and Ojera (2012) investigated the relationship between inventory management practices and the business performance of SSEs in Kisii Municipality, Kenya. The results revealed that there was a positive significant relationship between business performance and effective inventory management. Linda (2013) examined the factors affecting stores management in the public sector and found that that inventory management system had no effect in stores management. To fill the knowledge gap which exists, this study therefore sought to assess the factors affecting effectiveness of inventory management in the energy sector paying particular attention to KPC. Specifically the researcher looked at

how technology, staff training and development, global sourcing and safety stock management impact on effectiveness of inventory management.

1.3 Objectives of the Study

The objective of the study was broken down into two parts namely general objective and specific objectives.

1.3.1 *General objective*

The main objective of this research was to investigate the factors affecting effectiveness of inventory management in energy sector with specific reference to Kenya Pipeline Company

1.3.2 *Specific objectives*

This study sought to achieve the following objectives:

1. To determine the effect of information technology on inventory management in Kenya Pipeline Company.
2. To assess the effect of staff training and development on inventory management in Kenya Pipeline Company.
3. To establish the effect of safety stock management on inventory management in Kenya Pipeline Company
4. To determine the effect of global sourcing on inventory management in Kenya Pipeline Company.

1.4 Research Hypothesis

The study was guided the by the following research hypotheses:

H_1: There is no relationship between information technology and inventory management in Kenya Pipeline Company

H_2: There is no relationship between staff training and development and inventory management in Kenya Pipeline Company

H_3: There is no relationship between safety stock management and inventory management in Kenya Pipeline Company

H_4: There is no relationship between global sourcing and inventory management in Kenya Pipeline Company

1.5 Significance of the Study

The findings of this study will be important to the following stakeholders groups among others:-

The study will benefit the companies in the energy sector in that the research will enable the procurement departments to think of the best strategies and tools to enhance the effectiveness of inventory management in the public sector.

The study will also be of importance to government officials whose interest lies on efficient inventory management. It will assist the government to point out areas of difficulties in management of inventories and also help them in putting in place adequate solutions to these challenges

Academicians will benefit from the use of the results from the study. The study will act as a reference point for future studies on same or similar studies. Acting as a reference, it may also stimulate the interest among academicians and thereby encourage further researches about the problems and solution and hence lead to effective inventory management

1.6 Justification of the Study

Kenya, like other developing economies requires large quantities of affordable and good quality energy supplies to sustain private investments and growth. The extent to which these objectives can be realized on a sustainable basis and in an environmentally sound manner is dependent on the degree and extent of efficiency with which critical factors of production are made available and combined with each other to produce desired results. The issue of inventory management being critical in the efficiency of any organization, this study will provide useful insights on the factors affecting effectiveness of inventory management in the energy sector and this will go a long way in improving efficiency.

Through using the energy sector and narrowing down on KPC as a reference point, the study will make an interesting contribution to the understanding of the general and specific the effects of inventory management in other sectors of the public. It will also serve the interest of the private sector business organizations as well as the general public as a

source of enlighten since it will enlarge existing literature on inventory management. Given the limited empirical data on inventory management in the public sector, the study results and literature review will form an important base for information for future researchers, lecturers and students interested in the area of study. The findings might be useful to the government as it will shed light on the factors that affect effectiveness of inventory management in the energy sector and also enable the researcher to come up with appropriate recommendation that can be used by other organizations.

1.7 Scope of the Study

Inventory management varies from one organization to another. This research focused on factors affecting effectiveness of inventory management in the energy sector and was confined to KPC headquarters and regional offices. The target population were employees working in the procurement department within KPC since they are in charge of inventory within KPC.

1.8 Delimitation of the study

This study was restricted to finding out factors affecting the effectiveness of inventory management in the energy sector and specifically focused on employees of KPC working in the procurement department within the regions and head office.

1.9 Limitation of the study

One of the limitation of this study was that some of the respondents were not very open when answering the research questions thus, deliberately failed to give possible challenges within the organization. The researcher counteracted this limitation by assuring them that the data collected was for education purposes. There was also the challenge on timeline of returning the answered questionnaires.

1.10 Assumption of the study

The researcher assumed that the factors been examined in the study have a direct impact on effectiveness of inventory management and also felt that the employees of Kenya Pipeline working in the procurement department were best placed to provide adequate and reliable information.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents issues related to inventory management in the energy sector. The chapter develops a conceptual framework to guide the study discussion and data methodology, theoretical framework to justify the need for the current study and the empirical review on factors that affect inventory management in the energy sector. This chapter also presents the research gaps identified.

2.2 Theoretical Framework

Theoretical framework is the explanation about the phenomenon (Camp, 2001). It presents the theory which explains why the problem under study exists. Thus it serves as a basis for conducting research.

2.2.1 *Adaptive structuration theory*

Based on structuration theory, the study intends to determine the effects of information technology on inventory management. Anthony Giddens in his *Constitution of Society* in 1984 addresses issues of human behaviour in the context of technology based on social structure. In other words, the theory looks into the process of human usage of computer systems and at the nature of group-computer interaction (Poole and DeSanctis, 2009). With the main focus of communication using information technology, the theory highlights the concepts of appropriation and structuration. In addition, the AST can be considered as a prime starting point to draw links between individuals and organisational learning. This is due to the core concept in AST that address issues of group interaction with technology as the basis of human activity (DeSanctis and Poole, 2008). AST is a viable approach in studying how information technology affects inventory management in the energy sector because it examines the change from distinct perspectives. Adaptive Structuration Theory (AST) is relevant in today's Inventory management practice due to the expanding influence that advancing technologies have had with regard to the human computer interaction aspect of AST and its implications on socio-biologically inspired structuration in security software application (Ramakrishna 2005). AST theory presents specific advances in information

technology that are driving organisation changes in the areas of business alignment, IT planning and development that show how AST is being used as a driving force of effective management within organisation.

The study will use the theory to investigate how effectiveness of inventory management is influenced by Information Technology (Ramakrishna 2005). According to DeSanctis and Poole (2008), AST is a viable approach for studying the role of advanced information technologies on inventory management. In conclusion AST's appropriation process was a good model to analyse the utilization and penetration of new technologies in organisations.

2.2.2 Scientific management theory

To investigate the influence of staff training and development on inventory management, the study was based on scientific management theory. The theory basically consists of the works of Fredrick Taylor. Taylor started the era of modern management in the late nineteenth and early twentieth centuries; Taylor consistently sought to overthrow management by rule of thumb and replace it with actual timed observations leading to the one best practice Watson (2002). He advocated for the systematic training of workers in the one best practice rather than allowing them personal discretion in their tasks. He further believed that the workload would be evenly distributed between the workers and management with management performing the science and instruction and the workers performing the labor, each group doing the work for which it was best suited. Taylors' strongest positive legacy was the concept of breaking a complex task down into a number of subtasks, and optimizing the performance of the subtasks, hence, his stopwatch measured time trials (Osdorne & Rubinstein, 2000). As a result, he proposed four underlying principles of management.

Firstly, there is need to develop a science of work to replace old rule of thumb methods, pay and other rewards linked to achievement of optimum goals, measures of work performance and output. Failure to achieve these would in contrast result in loss of earnings. Second is that workers should be scientifically selected and developed; Training each to be first class at some specific task (Watson, 2002). Thirdly, the science of work to be brought together with scientifically selected and trained people to achieve the best results. Finally,

work and responsibility to be divided equally between workers and management cooperating together in close interdependence.

According to Watson (2002) scientific management is essential for effective inventory management as it aims to improved methods of storage and distribution and removal of wastage and inefficiency in undertaking storage activities. This is especially relevant in the public sector where there is constant demand for uniformity of treatment, regularity of procedures and public accountability for operations. Scientific management in this case would ensure adherence to specific rules and procedures and to keeping of detailed records of operations in Kenya Pipeline Company.

One of the principles of scientific management as forwarded by Taylor is performance standard Taylor found out that there were no scientific performance standards. No one knew exactly how much work a worker should do in one hour or in one day. The work was fixed assuming rule of thumb or the amount of work done by an average worker. Taylor introduced Time and Motion Studies to fix performance standards. He fixed performance standards for time, cost, and quality of work, which lead to uniformity of work. As a result, the efficiency of the workers could be compared with each other Watson (2002). The principle of performance standard was therefore to be applied in investigating inventory management in KPC.

2.2.3 Theory of constraints

Based on theory of constraints the study tended to establish the effect of safety stock on inventory management. Because the energy sector uses a wide range of speciality materials, procuring materials takes considerable time and companies must stock certain amounts of spares to deal with clients orders. Major oil and gas equipment manufacturers worldwide face intense cost completion (Watson and Vokurka 2006). Therefore, to satisfy client requirements and minimise cost simultaneously, decreasing the possibility of lacking materials and eliminating inventory problems are factors critical to firm success.

The theory of constraints (TOC) is a thinking process that can be applied to help organisation to identify the problems, find ways to solve the problems and eventually implement those strategies successfully (Mabin and Balderstone 2003). In addition researchers indicated that TOC was also helpful in in identifying an effective leverage point

and strategic direction for transforming an undesirable state into a desirable future (Cox et al.2003, Gupta 2003, Gupta et al 2004). By reviewing previous literature, it is witnessed that manufacture systems applying TOC have better performance than those adopting Just in time (Mabin and Balderstone 2000.) Therefore, compared with other techniques, TOC has been applied extensively in different academic interest such as supply chain management and inventory management (Rahaman 2002, Mabin and Balderstone 2003).

TOC techniques regarding decreasing the inventory and cycle time, and increasing the output has been proved in previous literature (Gupta and Snyder 2009). Moreover TOC has been applied primarily to managerial challenges in private sector for production improvement, and inventory control (Umble et al 2006, Tsai et al. 2010), especially in the energy industry such as Boeing and Delta Airlines (Watson et al. 2007) Therefore, this study applied the theory of constraints to identify the problems many organisation face given that the energy sector uses a wide range of speciality materials, and procuring the materials take a considerable time and companies must stock certain amounts of materials to deal with changes while issuing out inventory.

2.2.4 Transaction cost theory

Transaction cost theory (TCT) or transaction cost economics (TCE), has become an increasingly important anchor for the analysis of a wide range of strategic and organizational issues of considerable importance to firms (Jones, 2001; Madhok, 2002) in particular, the TCT has been employed in studying firms' boundaries, vertical integration decisions, the ration for conducting an acquisition, the networks and other hybrid governance forms. Institutional arrangement range from transaction on the spot market to those within the firm. The critical dimensions in which transaction differ can be classified as the frequency with which transactions occur, asset specificity and the degree of uncertainty.

Efficiency in TCT is conceptualised as Pareto efficiency where governance mode are compared according to their ability to facilitate transactions until the point at which it is impossible to make one party better off without making the other party worse off (Jones, 2001). TCT claims that the firm, in many cases, provides a relatively more efficient method of organizing relative to the market because of optimization of transaction costs or overall value. Therefore, TCT is about efficiency and views economic organization as being

principally concerned with the relative efficiency of optimizing on transaction costs (Williamson, 2000). The TCT is useful in analysing and the operation of a firm. The theory was used to determine the effect of global sourcing on inventory management.

2.3 Inventory Management Practices

This section presents literature of different inventory management practices including enterprise resource planning, supply chain management and inventory management.

2.3.1 Enterprise resource planning (ERP)

Enterprise Resource Planning (ERP) is an example of a typical ES software application. ERP software, which is commercially available, aims to integrate and support all information flows in organizations. An ERP application typically integrates business processes with information technologies (Wier et al., 2007). One ERP application is (in theory) able to replace dozens of legacy systems which cost a lot to maintain because of the different expertise required. For managers who have to deal with numerous legacy information systems and duplicate, incompatible information, these standardized ERP software package solutions could provide the perfect solution to their problems if these promises are indeed met (Umble et al., 2003).

SAP, Oracle and Microsoft are the three biggest vendors of ERP software. They offer various software-packages that support many different business activities ranging from operations & logistics to sales & marketing, to financials and human resource management for example (Umble et al., 2003). ERP is strongly related to Business Intelligence (BI), because the gathering and centralized storage of data in order to create more business insight is a key characteristic of BI. Furthermore, most of the reporting that is done within ERP concerns BI.

Due to the wide range of possibilities and the well-presented promises made by vendors, expectations of ERP packages are high. The promise of a standardized (off-the-shelf) solution to business integration problems seems very tempting (Davenport, 2002). Organising production and (internal) logistics using ERP software is supposed to improve processes and create greater performances as previously mentioned. Mainly large enterprises invested heavily in ERP advice, software and implementation processes over the past decade.

These investments were done for several reasons; one of them being the optimization of internal logistic processes.

More often, small and medium sized enterprises also started to embrace and implement ERP applications (Klaus et al., 2000), (Everdingen et al., 2000). This indicates that the ERP-market is still growing. The reasons for implementing ERP are not always quite obvious. Most companies mainly implemented an ERP package because their competition was doing so. In some industries ERP has even become the standard: for example SAP has set the standard in Oil and Gas and Baan in Aerospace (Akkermans et al., 2003). The BI tools available in ERP are not always used optimal and still a lot of improvements can be made at this point to gain even more from ERP-systems (Gunasekaran et al., 2001).

Several other applications are often considered to fall within the range of ES as well, including Supply Chain Management (SCM), Customer Relationship Management (CRM) systems and financial systems across different departments as well (Hendricks et al., 2007). ES applications aim to streamline processes, the information that comes with those processes and finally the monitoring (performance evaluation) of business processes.

2.3.2 Supply chain management

Supply Chain Management is a very broad term, because it incorporates a wide range of activities: transportation & logistics, inventory & forecasting, supplier management, after sales support and reverse logistics are some examples. Inventory management is just one aspect of SCM. Johnson & Pyke (2001) even distinguished up to twelve different categories within SCM. About SCM, there are various (slightly) different definitions available, for instance:

> "Supply Chain Management (SCM) is the term used to describe the management of the flow of materials, information, and funds across the entire supply chain, from suppliers to components producers to final assemblers to distribution (warehouses and retailers), and ultimately to the consumer" (Johnson & Pyke, 2001).

2.3.3 Inventory management

The scope of inventory management is broader than stock. Basically inventory management can be defined as the "management of materials in motion *and* at rest" (Coyle et al., 2003). The following activities all fall within the range of inventory management: control of lead times, carrying costs of inventory, asset management, inventory forecasting, inventory

valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting.

Inventory management basically serves two main goals (Reid & Sanders, 2007). First of all good inventory management is responsible for the availability of goods. It is important for running operations that the required materials are present in the right quantities, quality and at the right time in order to deliver a specific level of service. The second goal is to achieve this service level against optimal costs. Not all items can be held in stock against every cost for example and therefore choices have to be made.

2.4 Empirical Review

Goodwin (2005) notes that empirical review is the authors review of information and theories currently available concerning the topic under study in order to demonstrate the author's through understanding of the topic which he/she is conducting research. Further it shows that the problem being studied had not been done before or has not been done in the way proposed by the researcher.

2.4.1 Information technology

Inventory management provides information to efficiently manage the flow of materials effectively utilise people and equipment, coordinate internal activities and communicate with customers Nairan and Subramanian (2008).

In this 21st century, the internet and internet-based technologies are impacting business in several ways. These new technologies are promising to save costs, to improve customer and supplier relationships, business processes and performance, and to open new business opportunities. Grace (2011) in a study on procurement efficiency in the petroleum industry concluded that organisations have invested in information technology to streamline the procurement process and that information technology also led to reduction on inventory costs.

These technologies allow organizations to respond better to existing challenges and improve the anticipation of future developments. As with the case with earlier innovations, rich multi-facetted interactions are occurring between developments in the place, global business environment, work environments, and technical innovations (Thompson and Cats-

Baril 2003). Loundon (2009), ERP is a packaged business software system that lets an organisation automate and integrate the majority of its business processes, share common data and practices across the enterprise and produce and access information in a real-time environment. According to the research that was done by Michael Burns (2009), ERP enables companies to break down traditional organization's silos, replacing them with a tightly integrated horizontal structure in which strategy, organizational structure, process and technology are closely aligned. One area that has recently and significantly gained attention is the Business-to-Business (B2B) procurement that encompasses the procurement of goods and services as well as higher-level management tasks and logistics.

Even if the benefits of adoption and the potential strategic implications of technology are the list of impediments for an organization includes items that are major potential barriers for an effective adoption: risk uncertainty, inefficiencies from supplier and catalogue-content readiness, cultural change, staff resistance, need for firm wide with likely disruption of on-going activities. Each of these makes it difficult for firms to implement technology strategies; to the possible extent that implementation may be deemed too partners and lack of skilled personnel are some of hindrance to adoption of modern technology to increase efficiency on inventory management (Hawking and Stein, 2004).

Arbe (2013) Government officials and elected leaders have increasingly come to realize that public agencies must utilize ICT in order to enhance the procurement processes in the public sector. Faced with tight budgets and a retiring workforce, today's government agencies are operating in an environment defined by the need to 'do more with less'. Public authorities are implementing scalable communication infrastructures to promote economic development, attract new businesses and residents, and above all, provide excellent service to constituents (Abouzeedan and Busler, 2002). Kramer, Jenkins, and Katz , (2007) report that the Government of Chile is using ICTs to facilitate the procurement from small businesses using a new business model and this has positively effected on the functioning of the procurement system especially, since the integration of online services in the system.

Frohlich and Westbrich (2002) in a study observed that IT investments have clearly played a leading role in growth of firms who have invested substantial resources in new types of IT enabling them to improve efficiency in the coordination of inventory management, thereby reducing inventory levels and saving on costs. It was established that technologies

that improve the dissemination of information enable companies to react more promptly to market signals and to economize inventories. On a similar study, Vickery, Jayaram, Droge and Calantone (2003) found that increase in IT investments results in higher inventory turns and lower inventory holding costs. IT also allows organisation to share information related to suppliers and inventory positions in supply chains. Such facilitation of information sharing by IT should help manage inventories more effectively.

Karplus (2007) in a study on innovation in China's energy revealed that technology was a major factor affecting inventory management in China's energy sector. It was found that there was extensive reliance on more labour intensive technologies. Weak intellectual property protection persisted, and had led overseas developers to introduce older versions of technologies, as in the case of auto parts, or not enter the market at all. It was established that due to market competition, enterprise in competitive industries operation on tight budgets generally spent more on marketing than technology, and often faced difficulties in obtaining loans which discouraged risky or slow payback investments. A preference for cheaper alternatives often means that domestic technologies are preferred when available, sometimes even if the quality is lower compared to imports though notably I the power sector this is not the case as quality and reliability are seen as crucial to maintaining a stable supply.

Weill (2003) on the relationship between investment in information technology and firm performance in a valve manufacturing company found that large amounts of resources have been and continue to be invested in information technology. The study presented the results of an empirical test of the performance effects of IT investment in the manufacturing sector using six years of historic data on IT investment and performance was collected for 33 valves manufacturing firms from the CEO, the controller and the production manager. Heavy use of transactional IT investment was found to be significantly and consistently associated with storm inventory management and hence firm performance. Though the study observed that once the technology becomes common, the competitive advantage is lost.

2.4.2. Staff training and development

In a study on the relationship between inventory operations and human capital, (Maria, 2011) it was found that inventory operations management depends highly on the skills of the human resource handling them. It was observed that every task and action required to be carried out

by the operatives will impact the inventory as well as the delivery lead times and other parameters. Workers who do not know why they are carrying out a task what is required to be done and the consequences are prone to carry out wrong inventory operations and in the long run lead to ineffective inventory management. It was also observed that when warehouse operations were being managed by a third party service provider and the principle customer is not present at the location, the quality of staff and operatives were compromised and people were not given adequate training before being allocated responsibility, this led to inventory discrepancies hence ineffective management of inventory.

Stock Control is no longer considered a clerical function performed independently by untrained individuals within a governmental agency (National Institute of Governmental Purchasing, 2001). Dobler and Burt (2006) says that for Stock control function to achieve a superior performance, it's necessary to recruit, train and develop personnel with the capacity and motivation to do better job. Carter and Price (2000) indicate that training of staff is vital if full use is to be made of their abilities and talents. They also state that it's important to ensure that sufficient number of the appropriate caliber is available to the organization in pursuit of its objectives. Incompetent employees can render stock control virtually ineffective.

Ngulube and Tafor (2006) in a study on impact of management of records in the public sector in Africa found that records and information management in developing countries was significant in effective management of the sector. This is because effective record management leads to accountability. However, the researchers observed that record management in most public sectors in developing countries were poorly management and hence the poor performance of most public institutions. One of the problems identified was lack of staff and appropriate training, inadequate funding to maintain records and the digital divide. This implies that if these problems are looked at, inventory management in the energy sector could be managed.

World Bank (2000) in a study on managing records as the basis for effective service delivery and public accountability in development; it was found that the quality of any records management program was directly related to the quality of the staff who operated it. The study established that lack of considering the quality and quantity of staff needed to run a store in the civil service often led to incompetence and ineffective stores management. It

was also found that because the care of records calls for a continuous management process at any phase of the life-cycle of the records, the functions of registrar, records manager, records center manager, and archivist should be performed within an integrated structure, with no rigid boundaries that limit professional collaboration and development.

2.4.3 Safety stock management

When inventory availability is measured in terms of the non-stockout probability per order cycle and the traditional safety factor approach to setting safety stock levels is employed, safety stock are a function of the management and standard deviation of demand during delivery time. The investigation of Koschat (2008) provides evidence from magazine retailing that the demand for a specific brand decreases as the on-shelf inventory of that brand decreases. Gallino et al. (2011) report that perishable items exhibit a strongly positive correlation, whereas non-perishable items exhibit a negative correlation between the displayed quantity and sales, in two university campus stores.

Arbe (2013) internal controls refer to the measures instituted by an organization so as to ensure attainment of the entity's objectives, goals and missions. They are a set of policies and procedures adopted by an entity in ensuring that an organization's transactions are processed in the appropriate manner to avoid waste, theft and misuse of organization resources. Most managers regard safety stock as a function of the cycle service level, the demand uncertainty, the replenishment lead time and the lead time uncertainty. Traditionally, a normal approximation has been used to estimate safety stock in inventory management. Arnold, chapman and Clive (2008) declare that the effectiveness and efficiency of safety stock is the key aspect in inventory management.

Supply chain consists of a variety processes ranging from raw material procurement to distribution processing. Thiel and Hiovelaque (2009) lay emphasis on optimizing the counting an information systems, the required buffer size in order to minimize shortage risks and costs but never took into consideration the risk induced by inventory inaccuracy as the occurrence of stock out. Many organisations argue that stock-outs caused by suppliers result in many customers having complaints to the company. The real issue however is the "safety stock" Companies are not aware that the effect of stock out itself can disturb the internal and

processes which lead to shortage of fuel and thus customers are affected by rise in fuel prices (Awour 2013).

Inventory management requires planning and control of inventory at optimum levels or safety stock level. It also determines the quality of a reasonable inventory to meet the needs of the processing or production on a scheduled basis and satisfy customer orders. However, Clarke underlines the fact that by treating logistics system in strict physical terms we impose constraints on them which can restrict their flexibility and limit the utilisation of resources (Clarke 1998). In a virtual stockholding environment, stocks should be treated in terms of their availability and not their identity of their physical form. Despite Clarke's contribution on safety stock, it does not appear that virtual stockholding issues have been treated yet in a detailed operative manner and this concept is still seen to date.

The losses that occur due to stock out cases make the oil marketing companies try hard to get out of this problem by raising the level of safety stock. It seems like very easy if the solution is just to raise the level of inventories. The problem is how to reach the maximum inventory levels with the minimum cost (Bottani, Ferreti, Montari, Vignali, Longo and Bruzzone 2013). Maximum inventory with the minimum cost can be determined through the Economic Order Quantity method (EOQ). Safety stock also has a relationship with forecasting (Smart 2008) and lead time which the company must determine the forecast demand to find out how many spares will be prepared in the future, whereas lead time can determine the level of safety stock due to lead long to raise the level of safety stock. Lazaridis and Dimitrios (2005) highlighted the importance of firms keeping their inventory at an optimum level by analysing the relationship between working capital management and corporate profitability and stressed that its mismanagement will lead to excessive tying up of capital at the expense of the organisation. A similar study by Rehman (2006) established a strong negative relationship between inventory turnover in days and profitability of firms.

2.4.4 Global sourcing

It has become evident that global sourcing is growing and that its nature and focus evolves, as it becomes increasingly cross-national and it involves more and more industries. Not only the number of enterprises involved in global sourcing has increased, but also the scale and variety of functions and/or tasks outsourced has grown (Capar & Kotabe, 2003).

Improved technologies have enabled companies to expand their markets worldwide and intensified competition has compelled organisations to outsource some for their non-core activities to other firms possessing the expertise. On the other side, it is not always easy to exploit such benefits due to the difficulties that arise when sourcing globally (Dornier et al., 2008; Handfield, 1994; MacCarthy and Atthirawong, 2003). Geographical distances cause longer and more variable lead times as multiple means of transportation are used. Moreover, for efficiency sake (e.g. to fill containers), batches ordered from far away suppliers have to be larger than those from domestic suppliers. Furthermore, global sourcing carries specific issues related to a lower knowledge of the suppliers and possible infrastructural deficiencies in developing countries (Meixell and Gargeya, 2005).

Finally there can be major risks of supply chain disruption, political instability in sourcing countries, exchange price fluctuations that can undermine global sourcing profitability (Carter and Vickery, 2000; Dornier et al., 2008). Because of that, in a global sourcing setting, companies typically use inventories as a shield for supply variability and disruption (Hendricks and Singhal, 2005; Stratton and Warburton, 2006). This, however, can be particularly costly and hard to sustain, especially in periods of financial constraints (Guariglia, 2001).

Morita and Nakahara (2004) and Mughe et al., (2004) find that best practices in inventory management fall into two broad categories of transaction costs and the level of the utility of the goods procured. These are two critical areas given that during hard economic times organisations must consider every avenue for cutting costs in order to survive while at the same time acquiring the most adequate supplies that cover their short-term and long term production needs. George and Harris (2009) concluded that the establishment of global sourcing is an exciting endeavour. Many organisation source internationally for proven lower costs; then look to benefit from higher quality and lower total costs; still others want to be able to satisfy local content requirement to support its inventory.

Despite the extent of documented studies on inventory management there seem to be more gaps on the subject. For example the study of innovation in china's energy carried out by Karplus (2007) through literature review revealed that there was extensive reliance on imported or older technology and this technology was often out dated. However in the same

studies identifies another problem of inventory management as having to rely on local technology. This brings our controversy and the reader may not be able to ascertain the authenticity of these results. Given the lack of elaborate methodology on how the study was carried out, the current study therefore recommends that a study be carried out on how information technology affects inventory management through using a survey in the energy sector to verify the results of the above results.

Human resources are the most valuable assets of any organization, with the machines, materials and even the money, nothing gets done without manpower. Abiodun (2009) submitted that: Training is a systematic development of knowledge, skills and attitudes require by employees to perform adequately on a given task or job. Adeyami (2005) observed that staff training and development is a work activity that can make a very significant contribution to the overall effectiveness of an organisation. There is need to make staff development a necessity, to keep track with current event and methods. Akintayo (2002) have drawn the attention of the entire sundry to inestimable value of training and development. World bank (2002) while acknowledging that there is limited empirical review in the inventory management in the public sector found that human resource was an important component of effective inventory management as the competence of the employees determine the quality of records kept. However, the study should have used a survey where employees should have been interviewed and the results compared with how effective the inventory is managed. It is not enough to conclude that employees are key in inventory management without sufficient support from empirical data. This study recommends that a study be carried out to verify the claims.

2.4.5 Availability of resources

According to Banda (2009), many procuring organizations do not have staff with the right competence critical to good procurement process management. There is need for authorities to give much greater emphasis to developing such competence and to adopt best practice more widely. For big projects the cost of employing advisers is very high and in many cases exceeded budgets by a substantial margin. Procuring organizations need to drive down advisers' costs and ensure that sensible budgets are adhered to through staff competence development.

According to Campbell (2005), technology is the change or integration of means of processing a product or service from what is perceived not be a good version to a better one. It is also change of system or way of operation from inefficient or manual to automatic operations. Private sector procurement activities have evolved from orders, systems to nowadays E-procurement. If you always remember that technology is a tool and that you need to know how to use it, for it to be productive, the money that you spend will never appear to be wasted. The emergence of Internet Technologies has changed the way that governments and organizations operate. The majority of organizational spending consists of purchasing. In order to decrease the total costs spent on purchasing process, internet technologies are used and E-Procurement has become popular to implement in the latest era by both governments and enterprises. Several researchers studying in this area says E-Procurement is named as the "Revolution" due to its potential to reduce the total costs of acquisitions (Campbell, 2005).

2.5 Research Gap

Studies done in this area agree that there are several factors that affect effectiveness of inventory management. One might expect the seemingly infinite stream of inventory theory related research to be a key resource for managers seeking to gain a competitive advantage through management. While they have given the study a good basis for information, the studies are not elaborate enough and therefore one cannot draw generalized conclusions based on some of these studies. For example, the study on safety stock (Clarke, 2005) does not identify the scope of the study nor the parameters used to measure safety stock in the study. In addition, the study only handles one factor while else the current study intends to find out several factors, this study will therefore seek to fill in this gap. From the literature reviewed different studies have been conducted on the factors that affect inventory management considering selected factors such as bureaucratic procurement procedures, documentation and stores records and funding. However the influence of factors such as information technology, staff training, global sourcing and safety stock have not been assessed to the degree that other factors singly have been assessed. Therefore the present

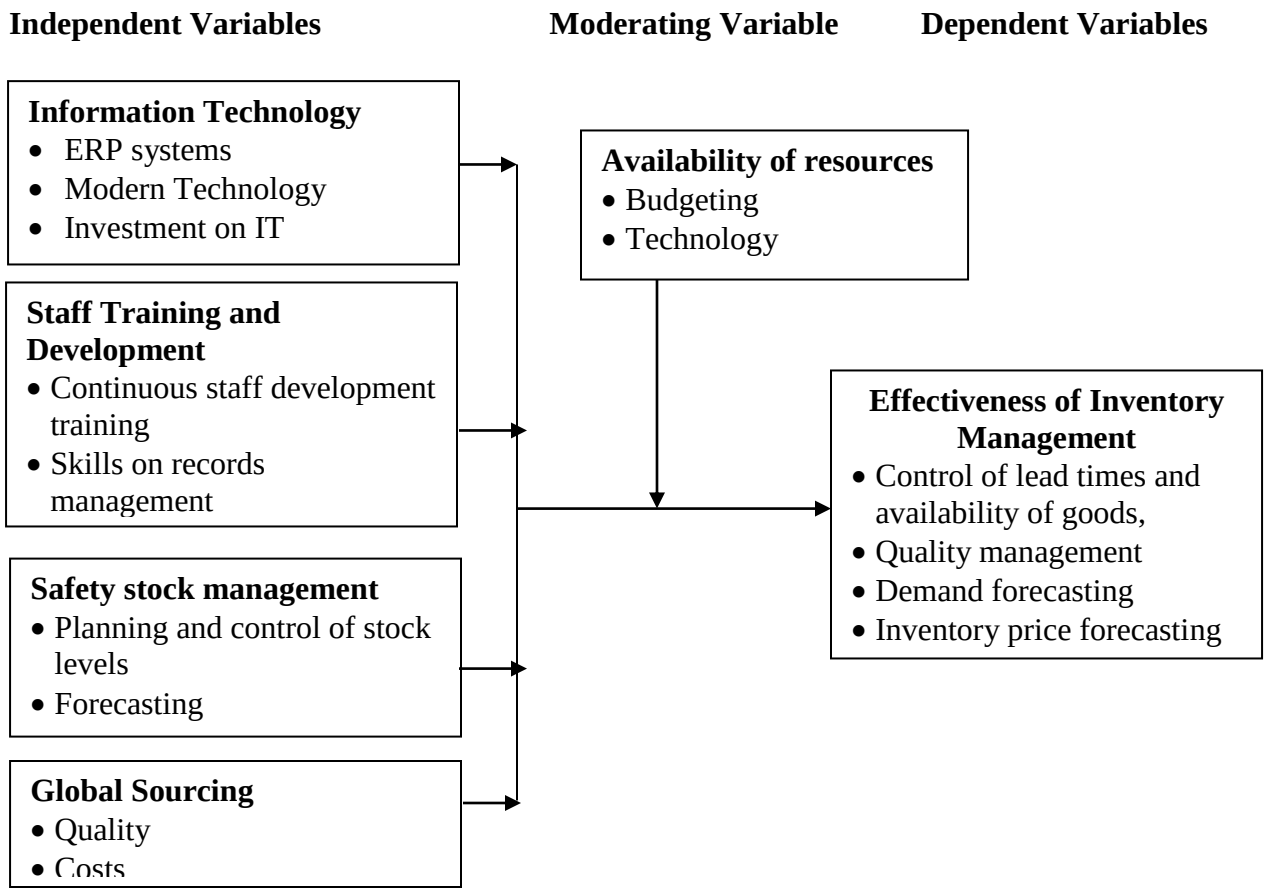
study is designed to quantitatively assess the influence of these factors on effectiveness of inventory management in the energy sector.

2.6 Conceptual Framework

A conceptual framework is very important in any research study being undertaken. It shows the relationship between the dependent variables and independent variable. The figure below shows the study's conceptual framework which illustrated the relationships between the variables of the study **(**Kotter, 2001). The independent variables were technology, staff training and development, global sourcing and safety stock management while the dependent variable was effective inventory management. The intervening variable for the study was availability of resources. The study adopted the conceptual framework shown below as figure 1.

FIGURE 1

The Conceptual Framework



Researcher's conceptualization, 2015

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the research design, its characteristics and why it was preferred over other research designs. It also provided information on the population of the study, some background and key characteristics of the organization which will be studied. The chapter examined the sample frame and sample selection. It also provided information on data collection method and the data collection instrument that will be used in the study. The chapter also looked at the research procedure including the pretesting and administration of the questionnaire. Finally, the chapter presents the data analysis method that was used and how the statistics generated from the study were analyzed and presented

3.2 Research Design

Research design is about the type of data that needs to be collected in order to address the research questions and it deals with a logical problem (White, 2009). The research was conducted through a descriptive research design. This type of research describes what exists and may help to uncover new facts and meaning. The purpose of descriptive research is to observe, describe and document aspects of a situation as it naturally occurs (Kothari, 2009). The purpose of a descriptive research project is to provide a picture of situations as they naturally happen. The design was therefore deemed appropriate for this study as it helped in the assessment of factors affecting effectiveness of inventory management in KPC.

3.3 Target Population

Target population as defined by Frederic & Behery (2010), is a universal set of the study of all members of real or hypothetical set of people, events or objects to which an investigator wishes to generalize the result. Mugenda and Mugenda (2003), defines the target population as a complete set of individuals, case or objects with the same common observable characteristics. The target population were the procurement personnel from five depots who are contracted to execute procurement services at Kenya Pipeline Company. There are 100 employees working in procurement department as they are arguably in a better position to answer the question in order to address the research problem. The respondents included

procurement managers, procurement officers, procurement assistants and clerical officers in the department. Table 1 shows the targeted population for the study.

TABLE 1

Study Population

Depots	Target Population
Mombasa	31
Nairobi	39
Nakuru	8
Eldoret	12
Kisumu	10
Total	**100**

3.4 Sample Procedures and Sampling Size

According to Kothari (2009), sampling is the process by which a relatively small number of individual, object or event is selected and analyzed in order to find out something about the entire population from which it was selected. The population were regarded homogeneous as it consisted of units of analysis that had similar characteristics. All 100 employees in the 5 depots were targeted by the study.

3.5 Data Collection Instruments

Data was collected through questionnaires. Primary data were collected through administering of questionnaires to the respondents. Questionnaires with closed-ended and open ended questions were used in this study in order to ensure uniformity and adequacy to enable the researcher to get a wide range of feedback. The questionnaires was divided into sections that addressed the objectives of the study. Mugenda and Mugenda (2003) observe that administering questionnaires is a popular method for data collection in most disciplines because of the relative ease and cost effectiveness with which they are constructed and administered to large samples. The data was collected through drop and pick method

3.6 Pilot Test

A pre-test according to Robson (2002) is the testing of one's instruments with participants who match the participants to be involved in the actual study. This is vital in ensuring that the

respondents understand the questions and ensuring that the tools are measuring what they ought to. According to Mugenda and Mugenda (2003), researchers try to maximize the reliability and validity of data collected.

Piloting of the questionnaires was done among ten employees in the procurement who were not included in the actual study. According to Bog and Gall (2003), piloting of research instruments is important to validity and reliability tests of the instrument.

3.7 Instrument Validity and Instrument Reliability

The reliability and validity of the research instruments was computed after pilot study was conducted. A research instrument is said to be valid if it measures what it is supposed to measure (Borg and Gall, 2003). The draft questionnaires were given to selected persons in research to ascertain the items suitability in obtaining information according to research objectives of the study. Supervisor's opinion was sought to test on the content validity of the instrument. These processes assisted in eliminating any potential problems of the research instrument and provided a basis for design or structural changes.

Reliability of instrument concerns the degree to which a particular instrument gives similar results over a number of repeated trials (Mugenda and Mugenda). Split-half method was used to test on the reliability of the instrument.

Spearman Brown Prophecy Formula below was used to test on the reliability of the instruments:

$$\frac{\text{2 x Corr. Between the Halves}}{\text{1+ Corr. Between the Halves}}$$

$$r = \frac{2r}{r+1} \qquad \text{(i)}$$

Where r = reliability of the coefficient resulting from correlating the scores of the odd items with the scores of the even items. According to Orodho (2004), a correlation co-efficient of about 0.7 is judged high enough for the instruments to be accepted as reliable for the study. The researcher got a reliability coefficient of 0.77 for the questionnaires. The instruments were therefore considered reliable for the study.

3.8 Data Analysis and Presentation

For data collected to have a meaningful meaning, it needs to be analyzed in a way that is easily understood. This included an analysis of data to summarize the essential features and relationships of data in order to generalize and determine patterns of behavior and particular outcomes. Before processing the responses, the completed questionnaires were edited for completeness and consistency and then coded. The researcher used quantitative techniques to analyse the data.

The study used factor analysis in order to reduce the number of indicators or factors under each research variable and retain the indicators capable of explaining the factors affecting inventory management in energy sector in Kenya. The retained factors had loading values of above 0.4 and was used for further analysis. Hair et al. (2010) recommends the use of factors with factor loading above 0.4. This is also supported by Tabachnick and Fidell (2007) using more stringent cut offs going from 0.32 (poor), 0.45 (fair), 0.55 (good), 0.63 (very good) to 0.71 (excellent).

Descriptive statistics such as mean, frequencies, percentages and standard deviations were used to analyze the data. The organized data was interpreted on account of concurrence to objectives using assistance of computer packages especially statistical package for social scientist (SPSS) to communicate research findings. According to Welman et al. (2005), data analysis by means of statistical techniques helps the researcher to investigate variables as well as their effect, relationship and patterns of involvement in the world. The findings were presented in tables, pie charts and bar graphs.

Inferential statistics such as correlation and regression was done to test on the relationship between the study variables where multiple linear regression model was used. Multiple regression model is a statistical technique, which allows for the prediction of response variables based on a set of independent variables. In a nutshell, multiple regression analysis is a method for studying the relationship between a dependent variable and two or more independent variables. The main purposes of multiple regression analysis include: prediction, explanation and theory building. The design requirement includes one dependent variable also known as criterion variable and two or more independent variables also known as predictor variables. In this study the response (criterion) variable (Y) is effectiveness of inventory management while the independent (predictor) variables are: information

technology (X_1), staff training and development (X_2), safety stock management (X_3), global sourcing (X_4) and availability of resources (X_5). The following is the model that was used in this study:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X4 + \beta_5 X5 + \varepsilon \quad \text{(ii)}$$

(Equation ii – multiple regression model)

Where:

Y is the dependent variable (effectiveness of inventory management)

X is the set of five independent variables, i.e.

X_1– Information technology

X_2– Staff training and development

X_3– Safety stock management

X_4– Global sourcing

X_5 – Availability of resources

$\beta_{i\ (i=1,2,3,4,5)}$ are the parameters associated with the corresponding independent variable that are to be estimated (partial regression coefficients)

β_0 is the intercept

$\mathcal{E}$ is the error variability (error term).

CHAPTER FOUR
RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

In the previous chapter, the researcher described the methodology used in the study. This chapter therefore presents the findings and interpretation of the study. The objective of this study was to investigate the factors affecting effectiveness of inventory management in KPC. To achieve the purpose, the first section gives demographic information of the respondents which helps to depict the characteristics of respondents. The second section deals with analysis of data on each of the four objectives. The questionnaires were administered to 100 respondents from which 84 responded and 16 did not respond.

4.2 Response Rate

A total of 100 respondents from procurement department were targeted by the study out of which 84 responded by correctly filling in the questionnaires and returning them to the researcher on time to facilitate the process of analysis giving a response rate of 84% as displayed in table 2

TABLE 2

Response Rate

Category	Frequency	Percentage
Response	**84**	**84**
Non – Response	**16**	**16**
Total	**100**	**100**

4.3 General Information

In order to capture the general information of the respondents, issues such as gender, age, level of education, years worked in the company were addressed in the first section of the questionnaire. This was to get a better understanding of respondents who took part of the study

4. 3.1 Distribution of the respondents by gender

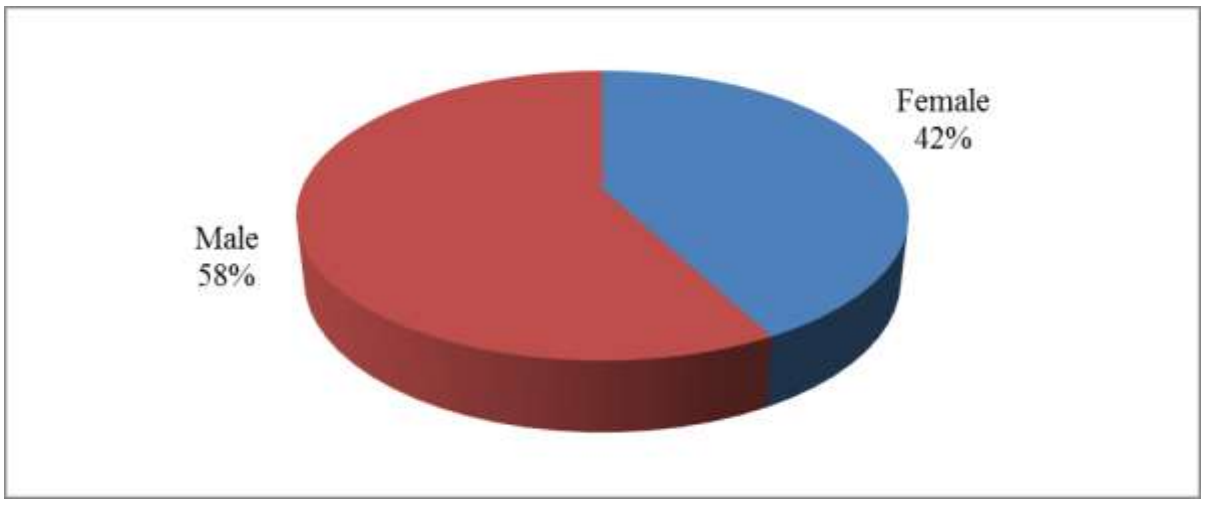
On gender distribution of the respondents, out of the 84% of the respondents who responded by filling and returning the questionnaires for analysis the study found that 58% were male while 42% were female. The findings were as presented in Figure 2 below. According to the analysis it was evident that majority of the respondents were male as compared to female.

Acker (2006) observed that gender equality was a very important trait as it can be used to improve performance of all the staff involved. He argued that it also fosters teamwork and creates a sense of unity for a common goal.

It can therefore be deduced that male dominated in the various cadres that fall within the procurement department and therefore are the major players in inventory management. However given that the difference was very small it can be inferred that KPC is gender sensitive parastatal that provides equal opportunity to both male and female employees.

FIGURE 2

Distribution of Respondents by Gender



4.3.2 Distribution of the respondents by age bracket

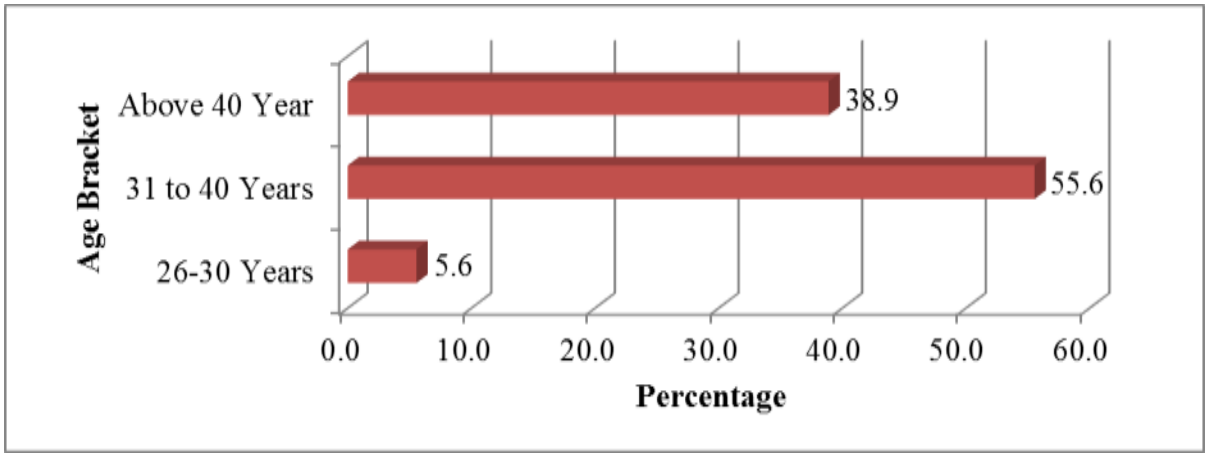
The respondents were required to indicate their age where the study funding indicated that 55.6% of the respondents interviewed were in the age bracket of 31-40 years. The study also found that 38.9% were above 40 years and 5.6 % were between the ages of 26-30 years. The findings were as presented in the table below.

Jenster & Hussey (2001) in their study of Determining Strategic Capability in organisations associated age with employee efficiency in service delivery where they indicated that there is a positive correlation between age and employee performance. He argued the older an employee was the higher the performance up to a certain age where performance would start declining.

The findings therefore implies that the respondents were old enough to provide valuable responses that pertain to effective inventory management in the energy sector.

FIGURE 3

Distribution of Respondents by Age Bracket

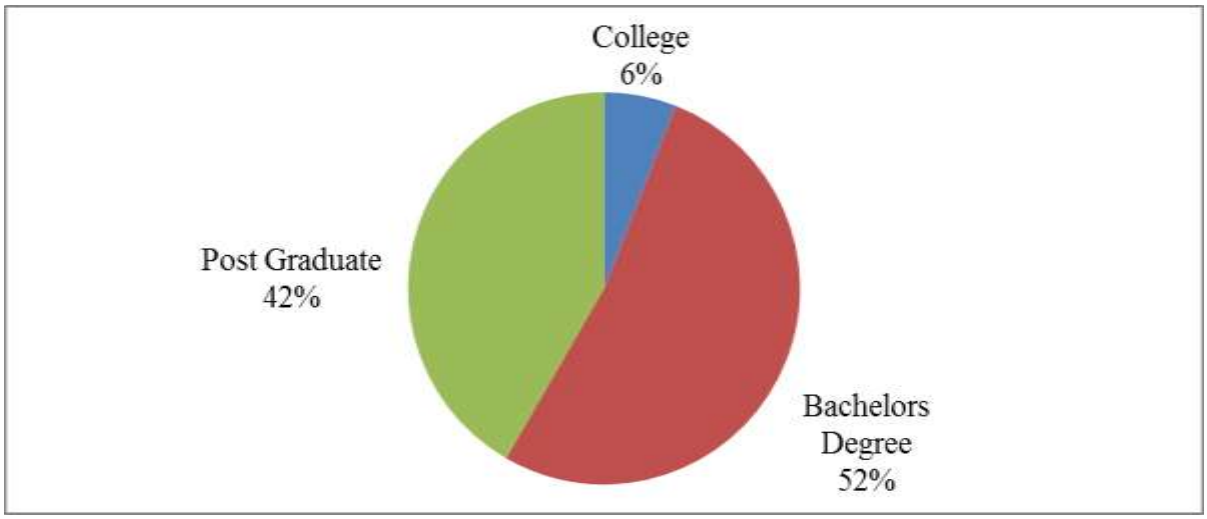


4.3.3 Distribution of the respondents by level of education

On the distribution of the respondents by level of education, the study found that 52% of the respondents were Bachelor's degree holders, 42% were post graduates and 6% were college graduates. The findings were as presented in Figure 4 below. This means the respondents were qualified enough to understand inventory management issues that were being discussed through questionnaire. In addition having university education would ensure the respondents were able to provide professional, well informed and relevant feedback to study.

FIGURE 4

Distribution of Respondents by Level of Education

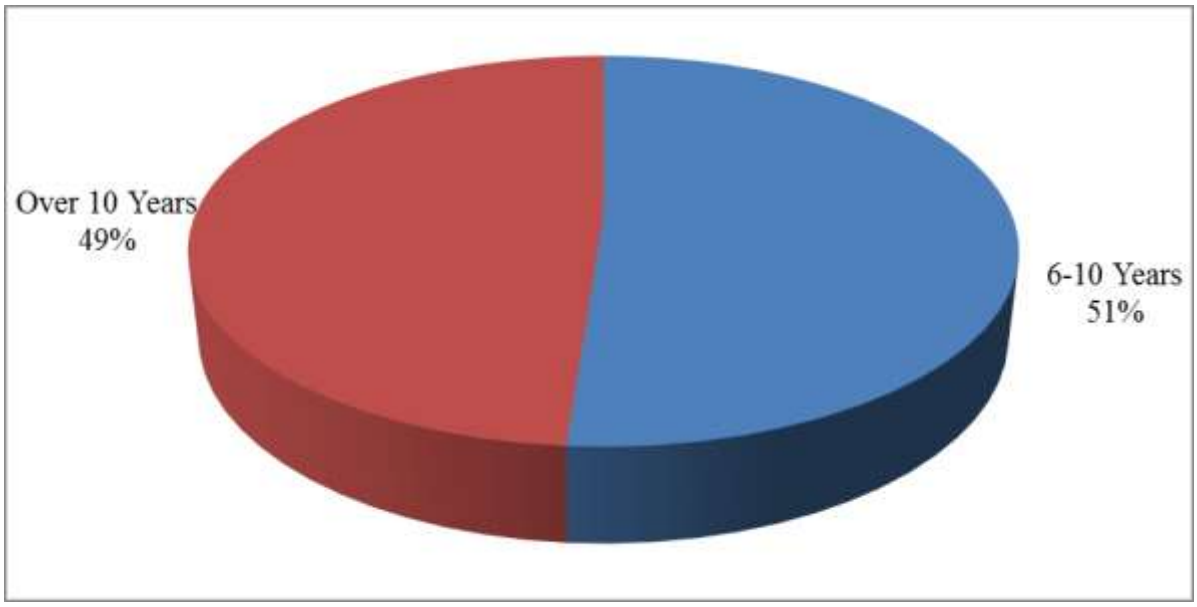


4.3.4 Distribution of the respondents by duration of service in the organization

The study found that 51% had served in the organization for duration of between 6-10 years while 49% had served for duration of over ten years. From the findings of the study, it can be said that all the respondents interviewed had served in the organization for a period more than 5 years and were therefore considered knowledgeable on the inventory management in KPC. The findings were as presented in Figure 5 below. In a study on the relationship between inventory operations and human capital, (Maria, 2011) found that inventory management depends highly on the skills of the human resource handling them. She indicated that the skills can be acquired through experience. From the findings therefore majority of the respondents were experienced and hence can be highly informative on issues that relate to effective inventory management in KPC.

FIGURE 5

Distribution of Respondents by Duration of Service in the Organization



4.4 Factor Analysis

The researcher applied factor analysis in order to reduce the number of indicator or factors under each research variable retaining the indicators capable of explaining the factors affecting inventory management in the energy sector. The retained factors had a loading value above 0.4.

4.4.1 Information technology

Table 4.2 shows Cronbach's alpha of all indicators for information technology. Cronbach's alpha results in the first column were computed using all the indicators and the results in the last column was computed after reduction of indicators with a factor loading of less than 0.4

TABLE 3

Information Technology Reliability and Factor Analysis Results

Cronbach alpha before	Indicators	Component	Cronbach alpha after
.628	KPC has managed to reduce inventory levels by use of modern technology	.697	.831
	Adoption of modern technology in handling inventory management has enabled KPC to react more promptly to market signals and to economize on the inventories	.959	
	Increase in IT investment results in higher inventory turns and lower inventory holding costs	.289	
	IT allows business partners to share information related to customer order and inventory positions in KPC	.070	
	In general IT has helped KPC manage inventories more effectively and control stock outs of spares	.892	

Table 3 shows that Cronbach's alpha result of all information technology indicators was 0.628 and the factor loading results were between 0.070 and 959. This implies that two of the indicators that had a factor loading of below 0.4 were removed and the rest of the indicators were retained for further analysis. Using the retained distribution chain indicators, the value of Cronbach's alpha was computed again and generated a similar value of 0.831. This indicated that data collected using the retained distribution chain indicator values were reliable since the Cronbach's alpha value was above 0.70. The study hence deduced that three out of the five information technology indicators were reliable in determining the use of information technology in inventory management. These indicators were later used for further analysis.

4.4.2 Staff training and development

Table 4 shows Cronbach's alpha of all indicators for staff training and development. Cronbach's alpha results in the first column were computed using all the indicators and the results in the last column was computed after reduction of indicators with a factor loading of less than 0.4

TABLE 4

Staff Training and Development Reliability and Factor Analysis Results

Cronbach alpha before	Indicators	Component	Cronbach alpha after
.651	Staff with wide experiences of challenging assignments	.823	.717
	Quality and quantity of staff needed to manage inventory	.779	
	Management courses/Strategic leadership programmes for procurement personnel	.665	
	Skills in records and inventory management	.315	
	Mentoring by senior management	.702	

Table 4 shows that Cronbach's alpha result of all staff training and development indicators was 0.651 and the factor loading results were between 0.315 and 823. This implies that one of the indicators that had a factor loading of below 0.4 was removed and the rest of the indicators were retained for further analysis. Using the retained distribution chain indicators, the value of Cronbach's alpha was computed again and generated a similar value of 0.717. This indicated that data collected using the retained staff training and development indicator values were reliable since the Cronbach's alpha value was above 0.70. The study hence deduced that four out of the five staff training and development indicators were reliable in determining the effect of staff training and development on inventory management. These indicators were later used for further analysis.

4.4.3 Safety stock management

Table 5 shows Cronbach's alpha of all indicators. Cronbach's alpha results in the component column were computed using the results of all indicators. The results revealed that all the indicators had a loading of more than 0.4.

TABLE 5

Safety stock management Reliability and Factor Analysis Results

	Component	**Cronbachalpha**
KPC is frequently faced with stock outs of spares due to lead time set to acquire spares from overseas	.941	.756
Application of the right stock levels by KPC minimizes on obsolete items and stock outs	.723	
KPC is often faced with frequent shortages of spare parts	.642	

Table 5 shows that Cronbach's alpha result of all safety stock indicators was 0.756 and the factor loading results were between 0.642 and 0.941. This implies that all the indicators were retained for further analysis. Using all safety stock indicators, the value of Cronbach's alpha was computed again and generated similar value of 0.840. This indicated that data collected using all the safety stock indicator values was reliable since the Cronbach's alpha value was above 0.70. The study hence deduced that all the three safety stock indicators were reliable in determining the effect of safety stock on inventory management. These indicators were later used for further analysis.

4.4.4 Global sourcing

Table 6 shows Cronbach's alpha of all indicators. Cronbach's alpha results in the component column were computed using the results of all indicators. The results revealed that all the indicators had a loading of more than 0.4.

TABLE 6

Global Sourcing Reliability and Factor Analysis Results

	Component	Cronbach alpha
KPC has managed to interact with suppliers globally due to significant shift of supply base's worldwide with focus on Global Value Countries	.662	.706
Structured sourcing decisions are based on total cost evaluation	.751	
Global sourcing has enabled KPC to focus on the best suppliers	.416	
Supplier management process has enabled KPC to cut on costs	.811	

Table 6 shows that Cronbach's alpha result of all global sourcing indicators was 0.706 and the factor loading results were between 0.662 and 0.811. This implies that all the indicators were retained for further analysis. This was an indication that data collected using all the global sourcing indicator values were reliable since the Cronbach's alpha value was above 0.70. The study hence deduced that all the four global sourcing indicators were reliable in determining the effect of global sourcing on inventory management. These indicators were later used for further analysis.

4.4.5 Availability of resources

Table 7 shows Cronbach's alpha of all indicators. Cronbach's alpha results in the component column were computed using the results of all indicators. The results revealed that all the indicators had a loading of more than 0.4.

TABLE 7

Availability of Resources Reliability and Factor Analysis Results

	Component	Cronbachalpha
There is adequate allocation of budgetary resources for facilitating inventory management in KPC	.602	.749
There is adequate allocation of technological resources for inventory management in KPC	.851	
There is adequate human resources for inventory management in KPC	.757	

Table 7 shows that Cronbach's alpha result of all availability of resources indicators was 0.749 and the factor loading results were between 0.602 and 0.851. This implies that all the indicators were retained for further analysis. This indicated that data collected using all the availability of resources indicator values was reliable since the Cronbach's alpha value was above 0.70. The study hence deduced that all the three availability of resources indicators were reliable in determining the effect of availability of resources on inventory management. These indicators were later used for further analysis.

4.4.6 Inventory management

Table 8 shows Cronbach's alpha of all indicators. Cronbach's alpha results in the component column were computed using the results of all indicators. The results revealed that all the indicators had a loading of more than 0.4.

TABLE 8

Inventory Management Reliability and Factor Analysis Results

	Component	Cronbachalpha
Inventory management has enabled control of lead times and availability of goods at KPC	.876	.909
Inventory management has helped in ensuring quality management at KPC	.858	
Inventory management has helped in forecasting demand for goods at KPC	.905	
Inventory management has helped in price forecasting at KPC	.936	

Table 8 shows that Cronbach's alpha result of all inventory management indicators was 0.909 and the factor loading results were between 0.858 and 0.936. This implies that all the indicators were retained for further analysis. This was an indication that data collected using all the inventory management indicator values were reliable since the Cronbach's alpha value was above 0.70. The study hence deduced that all the four inventory management indicators were reliable in measuring inventory management at KPC. These indicators were later used for further analysis.

4.5 Effect of Information Technology on Inventory Management in KPC

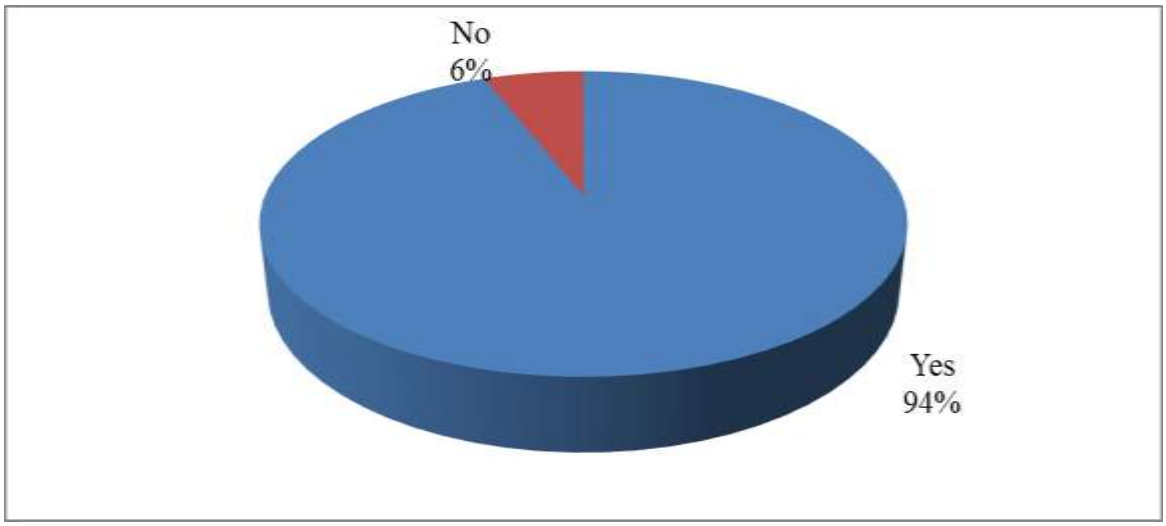
The respondents were presented with statements that concerned the use of information technology in inventory management where they were required to tick the one that best described their opinion. They were to rate the statements on a 5 point likert scale where 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree. The findings of the study are displayed below

4.5.1 Computerization at KPC

The respondents were asked to indicate whether KPC was computerized. The findings of the study revealed that 94% of the respondents indicated that KPC is computerized while 6% indicated that it was not computerized. The findings are as presented in Figure 6 below.

FIGURE 6

Computerization at KPC



4.5.2 Effect of information technology of inventory management at KPC

To establish the effect of information technology on inventory management at KPC, the respondents were asked to indicate the level of their agreement with different statements. The findings are as presented in Table 9

TABLE 9

Effect of Information Technology of Inventory Management at KPC

Statement	Strongly Disagree		Disagree		Neither Agree Nor Disagree		Agree		Strongly Agree		Total (%)	
	f	%	f	%	f	%	f	%	f	%	f	%
KPC has managed to reduce inventory levels by use of modern technology	0	0	9	10.7	0	0	65	77.4	10	11.9	84	100
Adoption of modern technology in handling inventory management has enabled KPC to react more promptly to market signals and to economize on the inventories	0	0	5	6	18	21.4	37	44	24	28.6	84	100
In general IT has helped KPC manage inventories more effectively and control stock outs of spares	0	0	5	6	9	10.7	43	51.2	27	32.1	84	100

The findings on Table 9 Shows that 77.4% of the respondents agreed that KPC has managed to reduce inventory levels by use of modern technology. It was also found that 51.2% agreed that in general IT has helped KPC manage inventories more effectively and control stock outs of spares. The findings finally revealed that 44% of the respondents agreed that adoption of modern technology in handling inventory management has enabled KPC to react more promptly to market signals and to economize on the inventories. These findings are in line with that of Grace (2011) where she found that organisations have invested in information technology to streamline the procurement process and that information technology also led to reduction on inventory costs.

The respondents were further asked to mention other ways through which the use of information technology had influenced inventory management at KPC. The following were mentioned: Controlled purchase prices, coordination between stations, making informed

decisions, coding items, establishment of stock obsolesce, reduced lead times, improved efficiency in inventory management, establishment of inventory re-order levels, real time relay of information to users and suppliers and forecasting usage. These findings are in line with study by Frohlich and Westbrich (2002) in a study observed that IT investments have clearly played a leading role in growth of firms who have invested substantial resources in new types of IT enabling them to improve efficiency in the coordination of inventory management, thereby reducing inventory levels and saving on costs. It was established that technologies that improve the dissemination of information enable companies to react more promptly to market signals and to economize inventories. On a similar study, Vickery, Jayaram, Droge and Calantone (2003) found that increase in IT investments results in higher inventory turns and lower inventory holding costs. IT also allows organisation to share information related to suppliers and inventory positions in supply chains. Such facilitation of information sharing by IT should help manage inventories more effectively.

4.5.3 Hypothesis Test: Information Technology and Inventory Management

H_1: There is no relationship between information technology and inventory management in Kenya Pipeline Company

TABLE 10

Chi-Square Test: Information Technology and Inventory Management

Test Statistics	
	Information Technology
Chi-Square	25.238[a]
df	3
Asymp. Sig.	.000
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 21.0.	

Table 10 shows the probability of the chi-square test statistic (χ^2=25.238) was p<0.000, less than or equal to the alpha level of significance of 0.05. This study establishes that there is a significant relationship between information technology and inventory management in Kenya Pipeline Company. In line with these findings, Karplus (2007) in a study on innovation in China's energy revealed that technology was a major factor affecting inventory management

in China's energy sector. It was found that there was extensive reliance on more labour intensive technologies. Weill (2003) on the relationship between investment in information technology and firm performance in a valve manufacturing company found that large amounts of resources have been and continue to be invested in information technology.

4.6 Effect of Staff Training and Development on Inventory Management in KPC

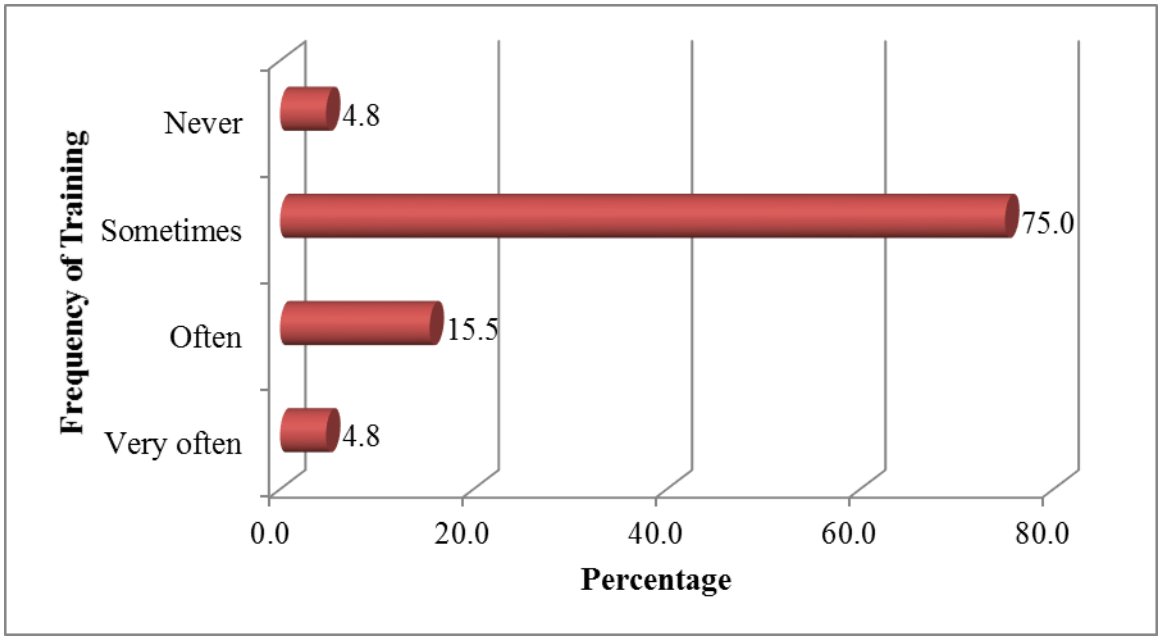
The study sought to find out the effect of staff training and development on inventory management with specific reference to KPC. The respondents were therefore presented with statements and questions where they were expected to express their opinion. The findings of the study are discussed below.

4.6.1 Frequency of formal training at KPC

The respondents were asked to indicate the frequency at which they undertook formal training at KPC. The study found that 75% indicated that they undertook the trainings sometimes, 15.5% indicated that they often undertook formal training at KPC, 4.8% indicated that they undertook the trainings very often and another 4.8% indicated that they never undertook the formal trainings at KPC. The findings were as presented in figure 7

FIGURE 7

Frequency of Formal Training at KPC



4.6.2 Effect of Staff training and development on inventory management

On the effect of staff training and development on inventory management, the respondents were given different statements on the importance of staff training and development on inventory management. The findings are as presented in Table 4.10.

TABLE 11

Effect of Staff training and Development on Inventory Management

Statement	Not important at all		Fairly important		Neutral		Important		Very important		Total (%)	
	f	%	f	%	f	%	f	%	f	%	f	%
Staff with wide experiences of challenging assignments	0	0	0	0	0	0	34	40.5	50	59.5	84	100
Quality and quantity of staff needed to manage inventory	0	0	0	0	0	0	52	61.9	32	38.1	84	100
Management courses/ Strategic leadership programmes for procurement personnel	0	0	5	6	0	0	46	54.8	33	39.3	84	100
Mentoring by senior management	0	0	0	0	10	11.9	43	51.2	31	36.9	84	100

The findings on Table 11 show that 59.5% of the respondents indicated that staff with wide experiences of challenging assignments were very important. The study also found that 61.9% indicated that quality and quantity of staff needed to manage inventory was important, 54.8% indicated that management courses/ Strategic leadership programmes for procurement personnel was important and 51.2% indicated that mentoring by senior management was important. Dobler and Burt (2006) says that for Stock control function to achieve a superior performance, it's necessary to recruit, train and develop personnel with the capacity and motivation to do better job. Carter and Price (2000) indicate that training of staff is vital if full use is to be made of their abilities and talents. They also state that it's important to ensure

that sufficient number of the appropriate calibre is available to the organization in pursuit of its objectives. Incompetent employees can render stock control virtually ineffective.

4.6.3 Hypothesis Test: Staff Training and Development and Inventory Management

H_2: There is no relationship between staff training and development and inventory management in Kenya Pipeline Company

TABLE 12

Chi-Square Test: Staff Training and Development and Inventory Management

Test Statistics	
	Staff training and development
Chi-Square	19.929[a]
df	2
Asymp. Sig.	.000
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 28.0.	

Table 12 shows the probability of the chi-square test statistic (χ^2= 19.929) was p<0.000, less than or equal to the alpha level of significance of 0.05. This study establishes that there is a significant relationship between staff training and development and inventory management in Kenya Pipeline Company. In a study on the relationship between inventory operations and human capital, (Maria, 2011) it was found that inventory operations management depends highly on the skills of the human resource handling them. It was observed that every task and action required to be carried out by the operatives will impact the inventory as well as the delivery lead times and other parameters. Workers who do not know why they are carrying out a task what is required to be done and the consequences are prone to carry out wrong inventory operations and in the long run lead to ineffective inventory management.

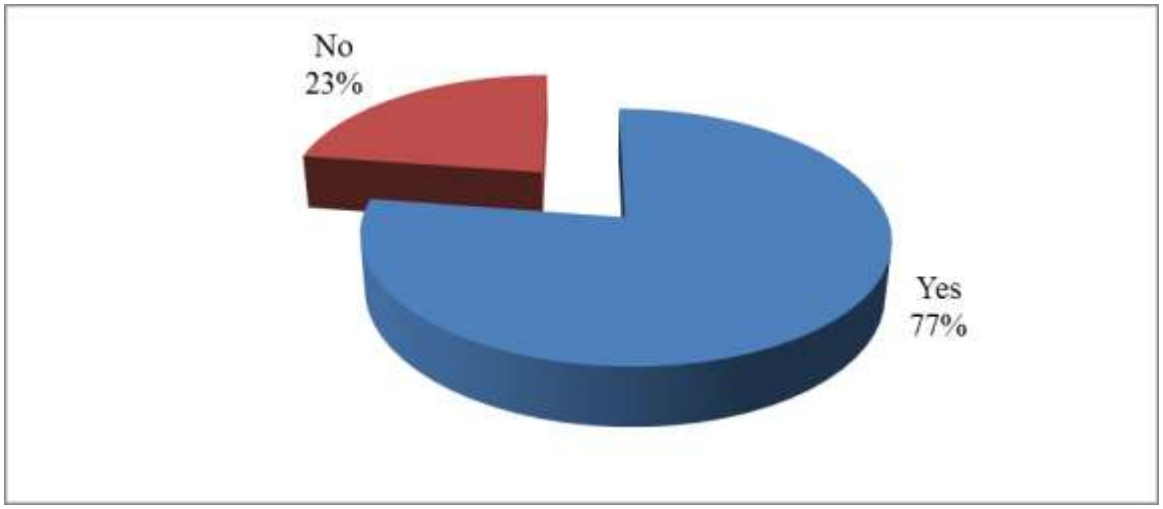
4.7 Effect of Safety Stock Management on Inventory Management in KPC

4.7.1 Adequacy of equipment for monitoring stock movements

The respondents were asked to indicate whether equipment for monitoring stock movement at KPC were adequate. The study found that 77.4% indicated that they were adequate while 22.6% indicated that they were inadequate. The findings are as presented in Figure 8.

FIGURE 8

Adequacy of Equipment for Monitoring Stock Movements



4.7.2 Effect of Safety stock movement on inventory management

In establishing the effect of safety stock management on inventory management, the respondents were given different statements and asked to indicate their level of agreement. The findings are as presented in table 13.

TABLE 13

Effect of Safety Stock Movement on Inventory Management

Statement	Strongly Disagree		Disagree		Neither Agree Nor Disagree		Agree		Strongly Agree		Total (%)	
	f	%	f	%	f	%	f	%	f	%	f	%
KPC is frequently faced with stock outs of spares due to lead time set to acquire spares from overseas	0	0	33	39.3	15	17.9	19	22.6	17	20.2	84	100
Application of the right stock levels by KPC minimizes on obsolete items and stock outs	0	0	10	11.9	14	16.7	43	51.2	17	20.2	84	100
KPC is often faced with frequent shortages of spare parts	13	15.5	28	33.3	20	23.8	19	22.6	4	4.8	84	100

The results on Table 13 shows that 39.3% of the respondents disagreed with the statement that KPC is frequently faced with stock outs of spares due to lead time set to acquire spares from overseas. The study also found that 51.2% agreed that application of the right stock levels by KPC minimizes on obsolete items and stock outs and 33.3% disagreed that KPC is often faced with frequent shortages of spare parts. Thiel and Hiovelaque (2009) lay emphasis on optimizing the counting an information systems, the required buffer size in order to minimize shortage risks and costs but never took into consideration the risk induced by inventory inaccuracy as the occurrence of stock out. Safety stock also has a relationship with forecasting (Smart 2008) and lead time which the company must determine the forecast demand to find out how many spares will be prepared in the future, whereas lead time can determine the level of safety stock due to lead long to raise the level of safety stock.

4.7.3 Hypothesis test: safety stock management and inventory management

H_3: There is no relationship between safety stock management and inventory management in Kenya Pipeline Company

TABLE 14

Chi-Square Test: Safety Stock Management and Inventory Management

Test Statistics	
	Safety stock management
Chi-Square	18.976[a]
df	4
Asymp. Sig.	.001
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 16.8.	

Table 14 shows the probability of the chi-square test statistic (χ^2=18.976) was p<0.000, less than or equal to the alpha level of significance of 0.05. This study establishes that there is a significant relationship between safety stock management and inventory management in Kenya Pipeline Company. The findings thus concur with that of Koschat (2008) who provided evidence from magazine retailing that the demand for a specific brand decreases as the on-shelf inventory of that brand decreases.

4.8 Effect of Global Sourcing on Inventory Management in KPC

In establishing the effect of global sourcing on inventory management, the respondents were given asked to indicate the extent of different effects of global sourcing on inventory management. The findings are presented on Table 15.

TABLE 15

Effect of Global Sourcing on Inventory Management in KPC

Statement	No extent at all		Small extent		Neutral extent		Large extent		Very large extent		Total (%)	
	f	%	f	%	f	%	f	%	f	%	f	%
KPC has managed to interact with suppliers globally due to significant shift of supply base's worldwide with focus on Global Value Countries	0	0	5	6	0	0	62	73.8	17	20.2	84	100
Structured sourcing decisions are based on total cost evaluation	0	0	0	0	14	16.7	53	63.1	17	20.2	84	100
Global sourcing has enabled KPC to focus on the best suppliers	0	0	0	0	25	29.8	46	54.8	13	15.5	84	100

The findings on Table 15 shows that 73.8% of the respondents indicated that KPC has managed to interact with suppliers globally due to significant shift of supply base's worldwide with focus on global value countries to a large extent. The study also found that 63.1% indicated that structured sourcing decisions are based on total cost evaluation to a large extent and that global sourcing has enabled KPC to focus on the best suppliers to a large extent. George and Harris (2009) concluded that the establishment of global sourcing is an exciting endeavour. Many organisation source internationally for proven lower costs; then look to benefit from higher quality and lower total costs; still others want to be able to satisfy local content requirement to support its inventory.

Asked to mention other ways through which global sourcing had helped in inventory management at KPC, the following were mentioned: getting better quality products and value for money, technology and skills transfer, bench marking and value analysis and ensuring a wide range of supplies.

4.8.1 Hypothesis test: global Sourcing and inventory management

H_4: There is no relationship between global sourcing and inventory management in Kenya Pipeline Company

TABLE 16

Chi-Square Test: Global Sourcing and Inventory Management

Test Statistics	
	Global sourcing
Chi-Square	19.929[a]
df	2
Asymp. Sig.	.000
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 28.0.	

Table 16 shows the probability of the chi-square test statistic (χ^2=19.929) was p<0.000, less than or equal to the alpha level of significance of 0.05. This study establishes that there is a significant relationship between global sourcing and inventory management in Kenya Pipeline Company. In line with these findings, Dornier *et al*., (2008), found that there can be major risks of supply chain disruption, political instability in sourcing countries, exchange price fluctuations that can undermine global sourcing profitability. Because of that, in a global sourcing setting, companies typically use inventories as a shield for supply variability and disruption (Stratton and Warburton, 2006).

4.9 Availability of Resources on Inventory Management in KPC

Respondents were given different statements on the effect of availability of resources on inventory management at KPC and asked to indicate their level of agreement with each. The findings are as presented in Table 17.

TABLE 17

Availability of Resources on Inventory Management in KPC

Statement	Strongly Disagree		Disagree		Neither Agree Nor Disagree		Agree		Strongly Agree		Total (%)	
	f	%	f	%	f	%	f	%	f	%	f	%
There is adequate allocation of budgetary resources for facilitating inventory management in KPC	0	0	0	0	0	0	66	78.6	18	21.4	84	100
There is adequate allocation of technological resources for inventory management in KPC			5	6	5	6	66	78.6	8	9.5	84	100
There is adequate human resources for inventory management in KPC			14	16.7	19	22.6	47	56	4	4.8	84	100

The findings on Table 17 show that 78.6% of the respondents agreed that there is adequate allocation of budgetary resources for facilitating inventory management and that there is adequate allocation of technological resources for inventory management in KPC. It was also found that 56% agreed that there is adequate human resources for inventory management in KPC. According to Banda (2009), many procuring organizations do not have staff with the right competence critical to good procurement process management. There is need for authorities to give much greater emphasis to developing such competence and to adopt best practice more widely.

Asked to mention other ways through which availability of resources influenced inventory management, the following were mentioned: work flow is continuous due to

availability of resources therefore mitigating losses, helps in avoiding stock outs, timely delivery of goods and services to customers and early planning and procurement of spares.

4.10 Inventory Management in KPC

Respondents were given different statement on inventory management at KPC and asked to indicate their level of agreement with each. The findings are as presented below.

4.10.1 Inventory management practices at KPC

Respondents were given different inventory management practices and asked to indicate the extent to which each was adopted at KPC. The findings are as presented in Table 18.

TABLE 18

Inventory Management Practices at KPC

Statement	No extent at all		Small extent		Neutral extent		Large extent		Very large extent		Total (%)	
	f	%	f	%	f	%	f	%	f	%	f	%
Enterprise Resource Planning (ERP)	0	0	0	0	5	6	61	72.6	18	21.4	84	100
Supply chain management practices	0	0	5	6	14	16.7	65	77.4	0	0	84	100
Inventory management	0	0	5	6	4	4.8	75	89.3	0	0	84	100

Table 18 Shows that inventory management practices was used to a large extent as indicated by 89.3%. The study also found that supply chain management and Enterprise Resource Planning (ERP) practices were used to a large extent as indicated by 77.4% and 72.6% respectively.

Other inventory management practice by KPC included: ABC analysis, goods receipt/goods issue, fleet management, warehouse stock management, asset management and disposal of obsolete materials and expired materials.

4.10.2 Inventory management in KPC

To test on the benefits of inventory management, the respondents were asked to indicate their level of agreement with different statements. The findings are presented in Table 19.

TABLE 19
Inventory Management in KPC

Statement	Strongly Disagree		Disagree		Neither Agree Nor Disagree		Agree		Strongly Agree		Total (%)	
	f	%	f	%	f	%	f	%	f	%	f	%
Inventory management has enabled control of lead times and availability of goods at KPC	0	0	5	6	9	10.7	43	51.2	27	32.1	84	100
Inventory management has helped in ensuring quality management at KPC	0	0	5	6	0	0	67	79.8	12	14.3	84	100
Inventory management has helped in forecasting demand for goods at KPC	0	0	5	6	14	16.7	52	61.9	13	15.5	84	100
Inventory management has helped in price forecasting at KPC	0	0	5	6	9	10.7	66	78.6	4	4.8	84	100

Table 19 show that 79.8% agreed that inventory management has helped in ensuring quality management at KPC. It was also found that 78.6% agreed that inventory management has helped in price forecasting at KPC, 61.9% agreed that inventory management has helped in forecasting demand for goods at KPC and 51.2% agreed that inventory management has enabled control of lead times and availability of goods at KPC.

Other benefits of inventory management in KPC included: better control and identification of inventory, low stock holding levels, better coordination and management of inventory, fast decision making, reduction in theft and pilferage, minimal stock outs, quick

recovery during emergency, reduce inventory holdup costs, stock controls and lead times are maintained

4.11 Correlation Analysis

This study conducted correlation analysis to test on the strength of association/relationship between the variables of the study. Correlation is a measure of the relationship or association between two continuous numeric variables. It indicates both the direction and degree to which they vary with one another from case to case without implying that one is causing the other. Correlation analysis results give a correlation coefficient which measures the linear association between two variables (Crossman, 2013).

Values of the correlation coefficient range between -1 and +1. A correlation coefficient of +1 indicates that two variables are perfectly related in a positive linear. A correlation of -1 indicates that two variables are negatively linearly related and a correlation efficient of 0 indicates that there is no linear relationship between two variables (Wond, 2012).

TABLE 20

Correlation Analysis

		Effective Inventory Management	Information Technology	Staff training and development	Safety stock management	Global Sourcing	Availability of resources
Effective Inventory Management	Pearson Correlation	1	.538**	.038	.243*	.489**	.726**
	Sig. (2-tailed)		.000	.032	.026	.000	.000
	N	84	84	84	84	84	84
Information Technology	Pearson Correlation	.538**	1	.468**	.534**	.096	.238*
	Sig. (2-tailed)	.000		.000	.000	.384	.029
	N	84	84	84	84	84	84
Staff training and development	Pearson Correlation	.038	.468**	1	.353**	.036	.154
	Sig. (2-tailed)	.032	.000		.001	.744	.161
	N	84	84	84	84	84	84
Safety stock management	Pearson Correlation	.243*	.534**	.353**	1	.317**	.209
	Sig. (2-tailed)	.026	.000	.001		.003	.057
	N	84	84	84	84	84	84
Global Sourcing	Pearson Correlation	.489**	.096	.036	.317**	1	.410**
	Sig. (2-tailed)	.000	.384	.744	.003		.000
	N	84	84	84	84	84	84
Availability of resources	Pearson Correlation	.726**	.238*	.154	.209	.410**	1
	Sig. (2-tailed)	.000	.029	.161	.057	.000	
	N	84	84	84	84	84	84
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

The results of the correlation analysis on Table 20 shows that effectiveness of inventory management is positively related with use of information technology with a Pearson's Correlation Coefficient of r = 0.538 and that at a level of significance of 0.000, it is statistically significant at p value less than 0.05. The results also show that there is a positive correlation between effectiveness of inventory management and staff training and development with a Pearson's Correlation Coefficient of r = 0.038 and a level of significance of 0.032 (statistically significant). The results further show that effectiveness of inventory management have a positive relation with safety stock management with a Pearson's Correlation Coefficient of 0.343 and 0.026 level of significance. It was also found that effectiveness of inventory management have a positive relation with global sourcing with a Pearson's Correlation Coefficient of 0.489 and 0.000 level of significance. The results finally show that effectiveness of inventory management have a positive relation with availability of resources with a Pearson's Correlation Coefficient of 0.726 and 0.000 level of coefficient. The significance values tell us that the probability of the correlation being a fluke is very low; hence the study can have confidence that the relationship between the variables is genuine.

4.12 Regression Analysis

Multiple regression analysis was done to test on the relationship between the variables of the study. The relationship was tested between effectiveness of inventory management (dependent variable) and the independent variables such as information technology, staff training and development, safety stock management, global sourcing and availability of resources.

Multiple regression model presented below was used to test on the relationship between the variables of the study:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X4 + \beta_5 X5 + \varepsilon \quad \text{(iii)}$$

Where:

Y is the dependent variable (effectiveness of inventory management)

X is the set of five independent variables, i.e.

X_1– Information technology

X_2– Staff training and development

X_3– Safety stock management

X_4– Global sourcing

X_5 – Availability of resources

$\beta_{i\ (i=1,2,3,4,5)}$ are the parameters associated with the corresponding independent variable that are to be estimated (partial regression coefficients)

$\beta_0$is the intercept

$\mathcal{E}$ is the error variability (error term).

The study carried out an overall regression model to determine the significance of each of the independent variables on the dependent variable. As can be observed in Table 21, R Square was 0.795 and R was 0.891 at 0.05 significant level. The coefficient of determination indicates that 79.5% of the variations on effectiveness of inventory management can be explained by information technology, staff training and development, safety stock management, global sourcing and availability of resources. The remaining 20.5% can be explained by other variables not included in the study. R square and adjusted R is high an implication that there is a high variation that can be explained by the model.

TABLE 21

Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.891[a]	.795	.781	.283
a. Predictors: (Constant), Availability of resources, Staff training and development, Safety stock management, Global Sourcing, Information Technology				

Further analysis of ANOVA as shown in Table 22 showed that significance of F statistics is 0.000, which is less than 0.05 and the value of F (60.319) being significant at 0.00 confidence level.

TABLE 22

ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24.091	5	4.818	60.319	.000[b]
	Residual	6.231	78	.080		
	Total	30.321	83			
a. Dependent Variable: Effective Inventory Management						
b. Predictors: (Constant), Availability of resources, Staff training and development, Safety stock management, Global Sourcing, Information Technology						

Table 23 presents the beta coefficients of all independent variables versus the dependent variable.

TABLE 23

Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.858	.418		4.443	.000
	Information Technology	.418	.046	.597	9.075	.000
	Staff training and development	.234	.055	.254	4.266	.000
	Safety stock management	.097	.035	.182	2.790	.007
	Global Sourcing	.200	.048	.251	4.192	.000
	Availability of resources	.539	.056	.557	9.610	.000
a. Dependent Variable: Effective Inventory Management						

The regression model is written as: Effective inventory management = 0.418* Information Technology +0.234* Staff training and development + 0.097* safety stock management + 0.200* global sourcing + 0.539* Availability of resources.

The Beta Coefficients in the regression show that all the variables tested: information technology, staff training and development, safety stock management, global sourcing and

availability of resources have positive relationship with effective inventory management. The findings show that all the variables tested are statistically significant with p-values less than 0.05.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter gives conclusions of the research and recommendation based on the objectives of the study. It also proposes areas for further research.

5.2 Summary of Findings

The study established that information technology, staff training and development, safety stock and global sourcing affected inventory management effectiveness of the organization sampled

5.2.1 Effect of information technology on inventory management in Kenya Pipeline Company

On the effect of information technology, the study found that 77.4% of the respondents agreed that KPC has managed to reduce inventory levels by use of modern technology. It was also found that 51.2% agreed that in general IT has helped KPC manage inventories more effectively and control stock outs of spares. The findings finally revealed that 44% of the respondents agreed that adoption of modern technology in handling inventory management has enabled KPC to react more promptly to market signals and to economize on the inventories. Other benefits of the use of information technology included: controlled purchase prices, coordination between stations, making informed decisions, coding items, establishment of stock obsolesce, reduced lead times, improved efficiency in inventory management, establishment of inventory re-order levels, real time relay of information to users and suppliers and forecasting usage. The findings from the correlation analysis revealed that effectiveness of inventory management is positively related with use of information technology with a Pearson's Correlation Coefficient of r = 0.538 and that at a level of significance of 0.000, it is statistically significant at p value less than 0.05.

5.2.2 Effect of staff training and development on inventory management in Kenya Pipeline Company

Regarding the effect of staff training and development on inventory management, the study found that 59.5% of the respondents indicated that staff with wide experiences of challenging assignments was very important. The study also found that 61.9% indicated that quality and quantity of staff needed to manage inventory was important, 54.8% indicated that management courses/ Strategic leadership programmes for procurement personnel was important and 51.2% indicated that mentoring by senior management was important. The findings from the correlation analysis revealed that there is a positive correlation between effectiveness of inventory management and staff training and development with a Pearson's Correlation Coefficient of r = 0.038 and a level of significance of 0.032 (statistically significant).

5.2.3 Effect of safety stock management on inventory management in Kenya Pipeline Company

On the effect of safety stock management on inventory management, the study found that 39.3% of the respondents disagreed with the statement that KPC is frequently faced with stock outs of spares due to lead time set to acquire spares from overseas. The study also found that 51.2% agreed that application of the right stock levels by KPC minimizes on obsolete items and stock outs and 33.3% disagreed that KPC is often faced with frequent shortages of spare parts. The findings from the correlation analysis revealed that that effectiveness of inventory management have a positive relation with safety stock management with a Pearson's Correlation Coefficient of 0.343 and 0.026 level of significance.

5*.2.4 Effect of global sourcing on inventory management in Kenya Pipeline Company*

Finally, on the effect of global sourcing on inventory management, the study found that 73.8% of the respondents indicated that KPC has managed to interact with suppliers globally due to significant shift of supply base's worldwide with focus on global value countries to a large extent. The study also found that 63.1% indicated that structured sourcing decisions are

based on total cost evaluation to a large extent and that global sourcing has enabled KPC to focus on the best suppliers to a large extent. Other benefits of global sourcing included: getting better quality products and value for money, technology and skills transfer, bench marking and value analysis and ensuring a wide range of supplies. The findings from the correlation analysis revealed that that effectiveness of inventory management have a positive relation with global sourcing with a Pearson's Correlation Coefficient of 0.489 and 0.000 level of significance.

5.3 Conclusion

Based on the findings of the study, it was concluded that information technology helped in controlling of purchase prices, making informed decision, coding items and reduced lead times. Thus improved on efficiency in inventory management and establishment of inventory re-order levels, Vilanga (2010) viewed automated systems as means of providing competitive edge and hence, they are becoming part of organisation strategy.

On the basis of Staff training the study also found that quality and quantity of staff needed to manage inventory was important, it also indicated that management courses/Strategic leadership programs for procurement personnel was important as well as mentoring by senior management was important.

The study further concluded that Safety Stock management needed the application of the right stock levels by KPC in order to minimize on obsolete items and stock outs. As far as global sourcing is concerned KPC has managed to interact with suppliers globally due to significant shift of supply bases worldwide with focus on global value countries to a large extent.

5.4 Recommendations

The following were the recommendations were made based on the summary and conclusions of the study

The study recommends that KPC should fully adopt the use of ERP to ensure that inventory is well managed and controlled in order to avoid stock outs of spares

On the basis of staff training, the study recommended that more training be organized for staff on inventory management in KPC. This will make inventory management more effective as the staff will be more knowledgeable on matters of inventory. This will also benefit both the organization and the employees.

The study further recommends that KPC should perform continuous and appropriate periodic review of inventory.

The study finally recommends timely interactions continuously with end users and the inventory management team. This will ensure effective inventory management.

5.6 Recommendations for Further Research

The study was carried out in KPC which is a small sample to investigate the factors affecting effectiveness of inventory management in energy sectors' operations in Kenya. The researcher therefore recommends that the same study should be carried out in other companies within the energy sector which is a larger sample and should seek validity. The researcher further recommends that another study to be done on challenges of inventory management which was not the concern of this study.

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APPENDIX 1

QUESTIONNAIRE

Instructions

Kindly answer all the questions by ticking in the appropriate box or filling in the spaces provided.

SECTION ONE: GENERAL INFORMATION

1. Name of Depot.....
2. What is your Gender? Female [ ] Male [ ]
3. Please indicate your highest level of education (Tick as applicable)

   Primary [ ] Secondary [ ]

   College [ ] Bachelors' degree [ ]

   Post graduate [ ] Others-specify……
4. Please indicate your age bracket

   Below 25yrs [ ] 26 – 30 yrs [ ] 31 – 40 yrs [ ] above 40 yrs [ ]

5. For how long have you worked in the procurement department at KPC? (Tick as applicable)

   Less than 1 year [ ] 6-10 years [ ]

   1-5 years [ ] Over 10 years [ ]

SECTION TWO: INFORMATION TECHNOLOGY

This section is concerned with investigation of whether information technology affects inventory management in the energy sector

6. Is your firm computerized? Yes [ ] No [ ]
7. The statements below are concerned with use of information technology in inventory management. Please tick the one that best describes your opinion.

Use a scale of 1-5 where 1= Strongly agree, 2 = Agree, 3 = Neutral, 4 = Disagree and 5 = Strongly disagree

Statement	**1**	**2**	**3**	**4**	**5**
KPC has managed to reduce inventory levels by use of modern technology					
Adoption of modern technology in handling inventory management has enabled KPC to react more promptly to market signals and to economize on the inventories					
Increase in IT investment results in higher inventory turns and lower inventory holding costs					
IT allows business partners to share information related to customer order and inventory positions in KPC					
In general IT has helped KPC manage inventories more effectively and control stock outs of spares					

8. In your own opinion, how else does information technology affect inventory management in KPC? ----------

SECTION THREE: STAFF TRAINING AND DEVELOPMENT

9. How often do you undertake formal training as an employee of KPC?
   Very often [ ] Often [ ] Sometimes [ ] Never [ ]
10. What kind of training does KPC offer
    In house seminars and workshops [ ] Outside seminar and workshops [ ]
11. Are you pursuing any additional education at the University or College as part of your training? Yes [ ] No [ ]
12. How would you rate each of the following in terms of improving performance of the staff in procurement department

Statement	Very Important	Important	Neutral	Fairly Important	Not Important at all
Staff with wide experiences of challenging assignments					
Quality and quantity of staff needed to manage inventory					
Management courses/Strategic leadership programmes for procurement personnel					
Skills in records and inventory management					
Mentoring by senior management					

SECTION FOUR: SAFETY STOCK MANAGEMENT

13. Does KPC have adequate equipment's to monitor stock movements

    Yes [ ] No [ ]

14. What is the current position of inventory in regards to Spares at KPC

    Very Good [ ] Good [ ] Average [ ] Poor [ ]

15. How do you rate costliness of spares parts when procured during stock outs

    Very Costly [ ] Costly [ ] Average [ ] Cheap [ ] Very Cheap [ ]

16. The Statements below are concerned with safety stock management and its effects on inventory management. Please tick the one that best describes your opinion. Be sure to use the following scale

1 – Strongly Agree, 2 – Agree, 3 – Neutral, 4 – Disagree, 5 – Strongly Disagree

Statement	**1**	**2**	**3**	**4**	**5**
KPC is frequently faced with stock outs of spares due to lead time set to acquire spares from overseas					
Application of the right stock levels by KPC minimizes on obsolete items and stock outs					
KPC is often faced with frequent shortages of spare parts					

17. In your own opinion, how often does KPC recalculate safety stock levels on a regular basis to ensure they are up to date ----------

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SECTION FIVE: GLOBAL SOURCING

18. To what extent do you agree with the following statements regarding Global Sourcing in KPC

Use a scale of 1-5 where: **1 - Very large extent** **2 - Large extent**

3 - Neutral extent **4 - Small extent** **5 - No extent at all**

Statement	**1**	**2**	**3**	**4**	**5**
KPC has managed to interact with suppliers globally due to significant shift of supply base's worldwide with focus on Global Value Countries					
Structured sourcing decisions are based on total cost evaluation					
Global sourcing has enabled KPC to focus on the best suppliers					
Supplier management process has enabled KPC to cut on costs					

19. In your own opinion, how else do you think KPC benefits from Global Sourcing? ---------

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SECTION SIX: AVAILABILITY OF RESOURCES

20. What is the level of your agreement with the following statements on the effect of availability of resources on inventory management in KPC?

1 – Strongly Agree, 2 – Agree, 3 – Neutral, 4 – Disagree, 5 – Strongly Disagree

Statement	**1**	**2**	**3**	**4**	**5**
There is adequate allocation of budgetary resources for facilitating inventory management in KPC					
There is adequate allocation of technological resources for inventory management in KPC					
There is adequate human resources for inventory management in KPC					

21. In your own opinion, how else do you think availability of resources has affected inventory management at KPC? ----------

SECTION SEVEN: INVENTORY MANAGEMENT

22. The following are some of the inventory management practices. Please indicate the extent to which each has been adopted at KPC.

Use a scale of 1-5 where 1= Very large extent, 2 = Large extent, 3 = neutral, 4 = Small extent and 5 = No extent at all

Inventory management practice	**1**	**2**	**3**	**4**	**5**
Enterprise Resource Planning (ERP)					
Supply chain management practices					
Inventory management					

23. What are other inventory management practices at KPC?----------

24. What is the level of your agreement with the following statements regarding inventory management in KPC?

1 – Strongly Agree, 2 – Agree, 3 – Neutral, 4 – Disagree, 5 – Strongly Disagree

Statement	**1**	**2**	**3**	**4**	**5**
Inventory management has enabled control of lead times and availability of goods at KPC					
Inventory management has helped in ensuring quality management at KPC					
Inventory management has helped in forecasting demand for goods at KPC					
Inventory management has helped in price forecasting at KPC					

25. In your own opinion, how else do you think KPC benefits from inventory management? -

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26. What would you recommend to be done to improve inventory management at KPC?

Thank you for your time and cooperation