INVENTORY MANAGEMENT AND SUPPLY CHAIN PERFORMANCE OF PETROLEUM MARKETING FIRMS IN NAIROBI

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

AUGUST 2015

DECLARATION

I declare that this project is my original work and has not been submitted to any other university or institution of higher learning for examination purposes

Signature : …… Date: ……

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This project has been submitted for examination with my approval as the University Supervisor.

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ACKNOWLEDGEMENTS

It is because of the almighty God that I have been able to undertake this program successfully. I also want to acknowledge my parents and families for their moral and financial support.

I am also thankful to my Supervisor Dr Peterson Obara Magutu for his invaluable support in guiding me in this proposal through his ideas and support that have seen my research idea developed.

Not forgetting the University of Nairobi an internationally recognized institution that provides high quality education and makes its student competitive at the highest standards.

DEDICATION

I dedicate this work to God who has kept me in good health throughout the whole process, including the completion of this research project. Secondly I dedicate this research project to my parents who brought me up and educated me

This work is also dedicated to my husband Jackan Mwandango, my son Jason Ngecho and daughter Zalia Wawuda.

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ABSTRACT

Inventory refers to the goods and materials that a business holds for the ultimate purpose of resale or repair. Inventory can also be used to refer to quantity of raw materials, components, assemblies, consumables, work -in- progress and finished stock that is kept for use or for resale in any business, and which provides the organizational structure and the operating polices for maintaining and controlling goods to be stocked. The main aim of the study was to inventory management and supply chain performance of petroleum marketing firms in Nairobi. The study was guided by two specific objectives that included; to establish the inventory management techniques and to determine the relationship between the inventory management techniques and supply chain performance of petroleum marketing firms in Nairobi. Descriptive design was the most appropriate because the study is concerned with finding out what relationship exists between the independent and dependent variables by collecting quantifiable data. The data was collected from the target population in order determine the current status with regard to inventory management techniques and supply value chain performance in petroleum marketing firms. The sample size of 66 petroleum companies (fuel stations) in Nairobi was randomly sampled from the sampling frame of 114. The study used both primary and secondary data. The main instrument for data collection was a structured questionnaire and an interview guide to gather secondary data. Quantitative data collected was analysed using SPSS as it offers numerous statistical analysis routines that analyse small to very large data statistics. The study findings indicated that all of the surveyed petroleum firms in Nairobi use Inventory Management Techniques; this is the first indication that these techniques help them in the improvement of Supply Chain Performance of their firms. Conclusions were made that the independent variables predicted the response variable. This is an indication that the model is a good model in predicting the supply chain performance by use of specific inventory management techniques variables. It is recommended that Petroleum marketing firms develop a policy framework to facilitate faster implementation of the best inventory management practices. It is also recommended that Petroleum marketing firms consider investing in modern technology and implement EDI. This will reduce inventory costs and improve returns. The agencies should also strengthen the supplier relation to the level of partnerships. This will facilitate implementation of programmes such as Vendor Managed Inventory (VMI).

CHAPTER ONE INTRODUCTION

1.1 Background of the Study

Inventory refers to the goods and materials that a business holds for the ultimate purpose of resale or repair (Jaber, 2009). Inventory can also be used to refer to quantity of raw materials, components, assemblies, consumables, work -in- progress and finished stock that is kept for use or for resale in any business, and which provides the organizational structure and the operating polices for maintaining and controlling goods to be stocked (Lysons, 1996). Good inventory management benefits organizations in terms of easy distribution and acquiring of goods. Non-governmental organizations in particular use both public and sourced funds and therefore must ensure proper stock control systems are in place and that adequate measures that may compromise the stock such as theft, misappropriation of the assets and false records are addressed, (Boundless, 2015).

Inventory management is a science primarily about specifying the shape and percentage of stocked goods. It is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock of materials, (Jaber, 2009). Inventory management facilitates maintaining adequate inventory for smooth operations in any organization. For inventory management to be effective, certain inventory control systems must be put in place depending on the set up and preferences of an organization. Inventory control system concerns the fine lines between replenishment lead time, holding costs of inventory, inventory ordering cost, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, returns and defective goods, and demand forecasting (Mercado, 2007). Balancing these competing requirements leads to optimal inventory

levels, inventory requirements and set targets identification, replenishment techniques, actual and projected inventory reporting which is an ongoing process as the business needs shift and react to the wider environment. Inventory control also involves systems and processes that include the monitoring of material moved into and out of stores or warehouse and the reconciling of the stock balances. It also may include ABC analysis, lot tracking and cycle counting support. Management of the inventories, with the primary objective of determining or controlling stock levels within the physical distribution system, functions to balance the need for product availability against the need for minimizing stock holding and handling costs (Boundless, 2015).

Inventories are a significant portion of the current assets of any business enterprise. Kruger, (2005). Inaccuracies in an inventory according to Meyer (1991) create a range of problems, including loss of productivity, the manufacturing of unwanted items, a reduction in the levels of customer commitment, the accumulation of costly physical inventories and frustration and whose costs is significant. Therefore, the cost savings that accrue from improved practices in inventory management (IM) are substantial. Rajeev (2008)

IM and control are crucial to a firm because mismanagement of inventory threatens a firm's viability (Sprague & Wacker, 1996). Vergin's study (1998) on inventory turnover in the Fortune 500 industrial companies for the years of 1986 through 1995 revealed that management of inventories influences a firm's financial strength and competitive position because the approach taken to IM directly affects working capital, production and customer service.

In Kenya, procurement has evolved from a system with no regulations to an orderly legally regulated procurement system. Shortcomings were noted and addressed when a review of the country's public procurement systems was undertaken in 1999. A law to govern the procurement system in the public sector was needed to ensure that all procurement entities observe the provisions of the law. However, inventory management still minimal in most sectors including Petroleum marketing Firms in Kenya.

However, while the critical role of inventories to a firm's survival is well recognized in theory, IM does not necessarily drive practice in many petroleum marketing firms. Donald (2006), points out that there is failure in the firms' systems since most of them are not applying IM techniques fully and such firms tend to have huge inventories due to poor planning. The failure leads to problems of demand forecasting since material managers are not able to predict the exact amount of inventory to maintain so as to meet the customer's demand. When business strategies are formulated, Inventory Management Techniques are not generally treated as a critical or strategic activity (Sprague & Wacker, 1996). Therefore, this paper begins to bridge this gap by investigating the status of Inventory Management Techniques in Petroleum marketing Firms in Kenya.

1.1.1 Inventory Management

According to Dobler and Starling (2006) inventory is the total amount of goods and or materials contained in a store or factory at any given time. Brealy & Marcus (2007) stated that while inventory is a prerequisite for production, they are expensive to store and they tie up productive capital. In case of too little inventory, sales would significantly decline as there is nothing much to sell and hence loss of customers. Besides this, little inventory would reduce holding costs associated with inventory hence there is need for the organization to ensure that they have optimal inventory hence need for inventory management.

Inventory management is the coordination of efforts (planning, controlling, organizing, directing) towards achieving efficiency in the procurement, transportation, stocking and utilization of inputs of a manufacturing organization is therefore central to production activities and management.Ali, Madaan, & Kannan (2013). It ascertains present and future requirements for all types of inventory to avoid overstocking or under-stocking. Chase & Jacobs (2006). Mageto(2012) noted that not having enough stock at any stage of the production process may lead to loss of business but also tying up too much cash in inventory can hurt your cash flow and lower storage costs, so by managing inventory, firm funds are properly used.

Various Inventory Management Techniques include, Economic Order Quantity (EOQ), Just In Time (JIT), Vendor Managed Inventory (VMI) and Materials Requirement Planning (MRP).

Inventory is often where the biggest costs are hidden in businesses. In addition, Fleisch &Tellcamp (2005) found out that inadequate information sharing results into inventory inaccuracies which increases the chains holding costs and out of stock situations. This is also the first reason for choosing inventory management as the subject of this research. First of all stocks, are responsible for a large part of the total working capital costs: up to about one third (Goor & Weijers, 2008). Inventory costs also represent a significant component of total logistics costs (Coyle et al., 2003). Hence benefits can thus be gained by reducing these costs (using ERP according to expectations). Working capital invested in stocks could also have been a very useful resource when it could have been used otherwise (Wild, 2002), Capital invested in stocks is thus, from a company-perspective, a 'useless' waste of money. Cost reductions are required by the market in order to keep offering competitive products and services; reducing the working capital costs using more efficient inventory management is one way to achieve this goal. Secondly stocks are a source for risks (Fawcett, 2007).If stock levels are lower the related risks will also be reduced. Risks caused by maintaining stocks are again related to costs, because stocks have to be stored secure and have to be protected against these risks, which costs the firm. Lastly, inventory costs are some of the easiest to identify and reduce when attacking supply chain problems (Johnson & Pyke, 2001). Budgets are often under pressure and costs have to be reduced to keep up with the competition. In accordance working capital costs will have to be reduced; optimizing internal logistics is a way to do this in a relatively easy manner (Ploos van Amstel, 2008).

1.1.2 Supply Chain Performance

According to Mentzer (2004), the definition of supply chain is more consolidated as definition of supply chain management. In his paper, he tried to make a common definition of a supply chain, based on a comprehensive research study conducted by several coauthors. They came up with the definition as a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances and/or information from a source to a customer. It is essentially a series of linked suppliers and customers until products reach the ultimate customer, Handfield (2002).

A Supply Chain Performance as defined by Olhager, Persson, Parborg& Rosen (2002), is as a measure of a network of entities that starts with suppliers' suppliers and ends with the customers' customers for the production and delivery of goods and services. It is an integrated process

measure of efficiency, which includes raw materials, manufactured into final products, and then delivered to customer via a systematic distribution channel and consists of four main clusters, which are supplier, manufacturer, distribution and consumers.Beamon (1999).

Performance measures of supply chain performance for each company are treated very differently and it is subjective to individual company (Kleijnen& Smits, 2003).The Supply Chain Operations Reference(SCOR model),Balanced scorecard, and benchmarking are three methods that are used for Supply Chain performance measurements within the industry. The SCOR model allows users to address, improve and communicate supply chain management practices within and between all stakeholders. It is based on a number of distinct management processes which include planning, sourcing, make decisions, deliver and return. Rolf (2007). The balanced scorecard (BSC) suggested by Kaplan and Norton (1996) can provide a comprehensive measurement system for supply chains by including four different perspectives while measuring performance, viz, customer, financial, internal business process and learning and innovation. It takes care of financial and non-financial measures. Brewer & Speh (2000). It enables management reports to focus on measures specifically selected to represent the organizations strategy.Kaplan (2005).

According to Hoffecker and Goldenberg, (1994), many organizations have found the BSC to be a useful technique in performance and strategic management .A formal definition of benchmarking is that it consists of a systematic procedure for identifying the best practice and modifying actual knowledge to achieve superior performance according to Camp (1998). It is a compares against best practice and is important with common metrics that can be used when comparing companies. Benchmarking has five basic purposes described by Splendolini (1992) namely; Strategy (planning for short and long term), Forecasting (predict trends) New ideas (stimulate new thoughts) Process comparisons, Setting objectives and targets (base them on best practice).

Supply chain performance measures are used to determine the efficiency and effectiveness of an existing system, or to compare competing alternative systems. Beamon (1998). They provide the necessary feedback information to reveal progress, enhance motivation and communication and diagnose problems (Chan, Qi et al. 2003). Measuring it facilitates a greater understanding of the supply chain, positively influence behavior, and improve overall performance (Shepherd and Gunter 2006).

1.1.3 Petroleum Marketing Firms in Kenya

One of the largest and most powerful industries globally with operations across continents and with the worlds' energy heavily dependent of oil according to Amnesty International, (2009), is the petroleum industry.

Petroleum fuels constitute the main source of commercial energy in Kenya whose refinery is owned and managed by the Kenya Petroleum Refineries Ltd (KPRL), an 800 km cross country oil pipeline from Mombasa to Nairobi and Western Kenya with terminals in Nairobi, Nakuru, Eldoret and Kisumu, run by the Kenya Pipeline Company (KPC). The sector also boasts of over 30 oil importing and marketing companies comprising of 5 major companies namely Shell, Total, Kenol/Kobil, Oil Libya, Chevron, and other emerging oil companies which include the Government owned National Oil Corporation of Kenya (NOCK) (www.erc.go.ke)

As at December 2014 there were 71 OMCs licensed to import petroleum products and 176 companies licensed to market petroleum products in Kenya and more are expected to join. The licensing criteria have been simplified to facilitate the entry of indigenous traders in the oil business. However, the market is still largely oligopolistic with over 55% being controlled by the three main marketing firms. Importation of petroleum products is through the OTS which allows all the PMF to access petroleum products at the same price and therefore ensures competition in the petroleum market. Since OTS is run through monthly tenders, it entails sourcing of petroleum predominantly from the spot market whereby petroleum is sourced from the open market without any prior contracts. (National Energy and Petroleum Policy, January 2015)

Kenya Petroleum Refineries Limited (KPRL) is owned by government and Shell/BP and Chevron/Texaco on a 50 per cent basis (Government of Kenya, 2005).Kenya has until now remained without strategic petroleum stocks which are critical in cushioning the country against both onshore and offshore supply chain disruptions and to provide supply security. The Energy (Petroleum Strategic Stock) Regulations, 2008 (Legal Notice No. 43 of 2008) provides for Strategic stocks of refined petroleum for 90 days of consumption. The regulations provide that NOCK shall procure the stock to be stored by KPC. (National Energy and Petroleum Policy, January 2015)

The supply chain in the Petroleum industry is very dynamic, and thus it is very important to measure its performance to know what to control and keep the company on track of its business objectives. Measuring the performance of a supply chain will create a scope for improvement of its performance, which will go a long way in leading a company to gaining competitive advantage (Shivoh, 2012)

1.2 Research Problem

Inventory management Techniques are aimed at reducing stock holding costs, being able to supply what is required, when is required and being supplied in the right quality and quantity to avoid waste, while remaining competitive. Supply chain performance on the other hand aims at the ability to meet customer needs through product availability, and responsiveness with n time delivery. Thus, it was found out that keeping moderate inventory is good and it enables an organization operate minimal expenses of holding costs as well as keep setup cost at bare minimum, eliminate unwanted lead time and produce goods as per customers order. Eventually, this enables an organization achieve total quality control (TQC) as efficient and effective supply chain management are employed within a firm's value chain.Datta (2007).

As inventory is reduced there will be profit improvements due to interest savings as well as a reduction in storage fees, handling, and waste. These savings have been estimated by the literature to be on the order of 20:30 percent (Brigham and Gapenski,1999).EOQ replenishment minimizes total inventory costs. The backorder is triggered when the inventory level hits the reorder point. The EOQ is calculated in order to minimize a combination of costs such as the purchase cost (which may include volume discounts), the inventory holding cost, and the ordering cost.

Studies on petroleum industry show diverse findings. Several studies have been conducted on the petroleum industry both globally and locally. (Siddharth, et al. 2008) study on evaluating petroleum supply chain performance in India established that the following factors are important in evaluating the performance purity of product, market share, and steady supply of raw material and use of information technology. Kojima et al. (2010) study on petroleum markets in Sub-Saharan Africa revealed that petroleum products are widely used in most countries and have far-reaching micro and macroeconomic effects.

Local studies on petroleum firms include Muya (2014), whose study specifically emphasized on the supply chain risk factors and performance in petroleum industry in Kenya, Shivoh (2012) pointed out the downstream supply chain performance measurement by the oil marketing companies in Kenya, Kieyah (2011) also studied the petroleum industry in Kenya and established that leading petroleum companies have some level of power to influence activities in the industry. It is therefore clear that from the studies conducted, extensive research has been conducted as far as the petroleum industry is concerned. However none of the authors has paid attention to Inventory Management Techniques and SCP, which are the main interests of this study therefore, it is for this research gap that the study wishes to address the two issues.

1.3 Research Objectives

The research objectives for the study were;

1. To establish the inventory management techniques commonly used by petroleum marketing firms in Nairobi.

2. To determine the relationship between the inventory management techniques and supply chain performance of petroleum marketing firms in Nairobi.

1.4 Value of the study

This study is of practical relevance to all stakeholders in the petroleum industry in Kenya. It will enable players in the petroleum industry to get a better understanding of inventory management and supply chain performance. The government is expected to benefit from the results of the study by using them to streamline performance in the Supply Chain of the entire institutional structure of petroleum industry.

It will also assist the supply chain and procurement heads in the Petroleum Marketing firms in Kenya to weigh whether to outsource the inventory management responsibility to suppliers or not, thus leading to the successful implementation of supply chain performance measurement.

The concepts from this study will form a basis for further research to the academicians. There has been little study on the concept of inventory management and supply chain performance and its importance in the Petroleum industry. This study will also contribute to the knowledge in the area of downstream, midstream and upstream supply chain performance measurement in Kenya.

CHAPTER TWO LITERATURE REVIEW

2.0 Introduction

This chapter provides information in inventory management and supply chain performance as practiced locally in Petroleum industry in Nairobi. It will examine findings from various scholars about common inventory management techniques and will also cover the supply chain performance and conceptual framework of the study. The section also seeks to collate various findings on what needs to be done by firms and individuals in order to be successful at supply chain performance.

2.1 Inventory Management Techniques

Inventory management techniques are extremely important for business operations because their success and cost reduction of the firm's expenditure necessitate improved supply chain performance and knowledge to the employees. Lambert (2008). These techniques are critical and knowledge in them is highly desirable thus, managers and procurement staff need to be able to apply the techniques for the benefit of the organization (Fellows and Rottger, 2005). Wild (2002) recommends proper warehousing of inventory so that when items are ordered, they are kept at the warehouse for the least time possible minimizing holding cost of inventory.

2.1.1 Economic Order Quantity

The economic order quantity (EOQ) approach can be regarded as the conventional method for purchasing materials. Economic order quantity is the quantity of material within an order that minimizes the total costs that are required to order and hold inventory.(Peterson & Silver, 1979) This approach leads to placing of large sized and infrequent orders (Schonberger, 1982) and was originally conceptualized by Harris (1915) in 1915. Fazel et al. (1998) suggested that Harris' (1915) model can be modified to incorporate different price discount schemes to better reflect the industry practice. This approach has been a fundamental technique for inventory management decisions and continues to be the starting point in the development of many subsequent inventory purchasing models (Ray and Chaudhuri, 1997)

2.2.1 Just in Time Technique

This is a Japanese management philosophy applied in manufacturing which involves having the right items if the right quality and quantity in the right place and at the right time. Use of Just In time Technique results in increase in quality, productivity and efficiency, improved communication and decreases in costs and wastes (T.C Cheng, S.Podolsky, P Jarvis).Hutchins (1999) defines (JIT) inventory as a process that is capable of instant response to demand without the need for any over stocking, either in expectation of the demand being forthcoming or as a result of inefficiencies in the process.

Hutchins,(1999) also studied that the prime goal of Just In time Technique is the achievement of zero inventory, not just within the confines of a single organization but ultimately throughout the entire supply chain.It can be applied to the manufacturing process within any company as it is also being adapted within service organizations. Hay (1998).

The elements of Just In time Technique include continuous improvement, eliminating the seven types of wastes Kanban and Jikoda among others. The widespread adoption of just-in-time (JIT) inventory principles undoubtedly makes production operations more efficient, cost effective and customer responsive. Companies' effectively implementing JIT principles have substantial competitive advantages over competitors that have not. The trick is figuring out how to apply JIT principles to gain competitive advantages in your specific industry and business situation. The basic premise of JIT is to have just the right amount of inventory, whether raw materials or finished goods, available to meet the demands of your production process and the demands of your end customers. No more, nor less. The closer you get to operating in a true JIT situation, the more responsive you are to your customers – and the less capital you have tied up in raw materials and finished goods inventory. The less you spend to store and carry inventory, the less obsolescence you have to write off, and the better you can optimize your transportation and logistics operations. Ultimately, this all translates into saving your company real money.

The logistics/transportation manager is tasked with getting raw materials in and finished goods out of the production process and seeks to optimize the transportation and distribution network. This manager focuses on the lowest cost and reliability of the logistics and transportation solutions. Since reliability is a requirement, lowest cost is the focus. It's fine if the purchasing

team negotiates a delivered cost package deal with a supplier because it means lower cost, and the supplier is responsible for the reliability and performance of the carriers or transporters, at least in theory.

2.2.2 Vendor Managed Inventory

Vendor Managed Inventory is a streamlined approach to inventory management and order fulfillment whereby the vendor is fully responsible for the replenishment of inventory based on timely POS information to the buyers (retailer). This concept helps to increase the customer responsiveness by reducing the supply and demand gap thus giving the satisfaction to end customer by availing the desired product when needed. Supply chain partners must share their vision of demand, requirement and constraint to set the common objectives.Guillaume et al; (2008) Quality of buyer supplier trust and relationship, quality of ICT system and intensity of information sharing has positive impact on VMI implementation.Marloes et al; (2008) Before implementing VMI, it is important to analyze the level of uncertainty of customer demand because a high uncertainty in demand negatively influences the performance attained through VMI.Kazim Sari (2007). Upstream data transferred to supplier's i.e. current inventory level and accurate sales forecast is the most important factor for the successful implementation of VMI.Astrid Vigtil, (2007)

The common objectives which permit to build up a better collaboration between the partners and so to reach the main objectives which include speeding up the supply chain (Holweg, Disney,Holmström, & Småros, 2005) and reducing the bullwhip effect Achabal et al. (2000), It also gives benefits to retailer as manufacturer stock more to reduce risk of stock out which in turn reduces retailer holding and shortage cost and increases its profit

2.2.3 Material Requirement Planning

In a research paper by Davood(2010),Material requirement planning (MRP) is described as a plan for the production and purchase of the components used in making items in the master production schedule(MPS).It shows the quantities needed and when manufacturing intends to make or use them. The application of this popular tool in inventory management has greatly reduced inventory levels and improved productivity (Wee and Shum, 1999).According to Browne (1996) in Davood (2010) research, The introduced MRP was the first version of MRP system, named as Materials Requirements Planning (MRP I).Later, several MRP systems

were extended into other versions including Manufacturing Resources Planning (MRP II) and Enterprise Resources Planning (ERP)

MRP is typically applied to manage inbound material movement in the enterprise and is based on the production requirements and scheduling. Sople, (2010). Lysons and Farrington (2006), point out that an MRP system has the MPS,Bill Of Materials(BOM)and the inventory file. Real time MRP comes in handy to reduce the effects of forecasting errors which are a major source of problems to any firm's performance. It has been modified by using route lead-time to estimate the customers' order lead-time which would be less cumbersome. Kitheka (2012).

2.3 Supply Chain Performance

Supply Chain Performance can be defined as a measure of a network of entities that starts with suppliers' suppliers and ends with the customers' customers for the production and delivery of goods and services (Olhager, Persson, Parborg& Rosen, 2002). It is an integrated process measure of efficiency, which includes raw materials manufactured into final products, and then delivered to customer via a systematic distribution channel consisting of four main clusters, which are supplier, manufacturer, distribution and consumers (Beamon, 1999).

In her study on Downstream Supply Chain Performance on Petroleum Firms in Kenya,Livoh (2011) found out that although there is no universal method of measuring supply chains performance, many scholars have come up with innovative ways while others have studied existing methods of measurement. Many firms look to continuously improve their operations to enhance core competitiveness using supply chain measurement. Khisa (2011) also suggested that such supply system needs to be enhanced by developing metrics and an assessment of implementation to overcome barriers in implementing the existing measurement system.

However, many companies have not succeeded in maximizing their supply chain's potential because they have often failed to develop performance measures and metrics needed to fully integrate their supply chains to maximize effectiveness and efficiency. Gunasekaran,(2004). Measurement of supply chain performance is important in the entire chain's ability to meet end-customer needs through product availability and responsive, on-time delivery (Baghwat&Sharma, 2007).

2.4 Empirical Review

A study was undertaken between 1981 and 2000 in the US to analyze inventory management and was found out that organizations that kept too much inventory in their warehouse operated an inefficient supply chain, while those that kept very few inventory in their warehouse were very efficient (Lai and Cheng, 2009). Thus, it was found out that keeping moderate inventory is good and it enables an organization operate minimal expenses of holding costs as well as keep setup cost at bare minimum, eliminate unwanted lead time and produce goods as per customers order. Eventually, this enables an organization achieve total quality control (TQC) as efficient and effective supply chain management are employed within a firm's value chain (Datta, 2007).

Bachetti, Plebani, Saccani and Syntetos (2010) argues that inventory management need to be organized in a logical way so that the organization can be able to know when to order and how much to order. This can only be achieved through the Economic Order Quantity (EOQ) computation. Economic order quantity enables organizations to plan their inventory replenishment on a timely basis such as monthly, quarterly, half yearly or 18 yearly basis. By so doing, it enables firms to have minimal storage costs or zero within their warehouses since inventory is coming in and going out immediately. Thus, this tends towards the just in time concept of supply chain management adopted by Toyota motor Corporation in Japan which helps in having zero holding costs, (Schonberger, 2008).

Thus, as organizations try to improve on the inventory management, the Economic Order Quantity (EOQ) and Re-order Point (ROP) are important tools that organizations can use to ensure that inventory supply does not hit a stock out as explained by Gonzalez and Gonzalez (2010). Over time, organizations have been maintaining their inventory in a haphazard manner which has necessitated a change in the way firms conduct their business. Stock outs have been experienced adversely leading to customer dissatisfaction hence; firms are changing their approach to be able to remain relevant by employing Economic Order Quantity (EOQ) and Re-order Point (ROP) for customer satisfaction. Determining the economic order quantity will ensure that the supply chain are replenished on a timely basis and delivered to the final consumer.

2.5 Summary of Literature Review and Knowledge Gap

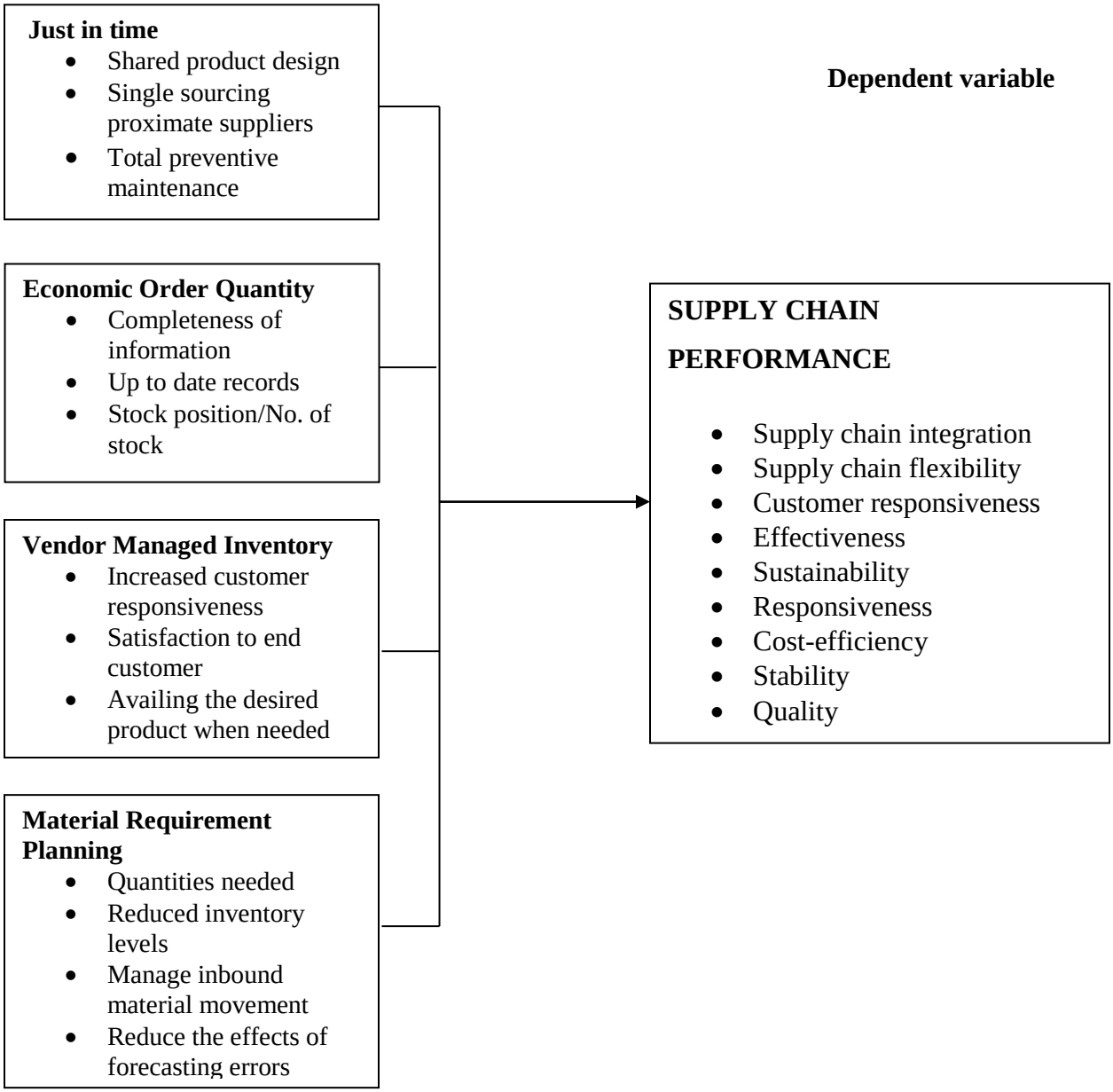
The literature review infers that there is a relationship between inventory management techniques and supply chain performance. There seem to be awareness about the Techniques in most developing countries, even though few companies are reluctant to apply them due to changing demands from their customers. In Kenya, there is no study that has tried to establish the effect of inventory management techniques and supply chain performance in petroleum firms. Thus the need to establish whether Kenyan petroleum firms do apply inventory management techniques in their supply chain performance.

2.6 Conceptual Framework

Conceptual Model links the two variables. It highlights the relationship between inventory management techniques (independent variables) and the supply Chain performance (dependent variable). It shows that, whenever the Inventory Management Techniques are well applied, such leads to better performance of the firm in terms of supply Chain Performance as shown in figure 2.1 below.

Figure 2.1 Conceptual Framework

Independent variable



Source: Author 2015

CHAPTER THREE RESEARCH METHODOLOGY

3.1 Introduction

This chapter sets out various stages and phases that were followed in completing the study. In this stage, most decisions about how research was executed and how data was gathered, towards the completion of research. Precisely, the section covers; research design, target population, sample and sampling procedure, instrumentation, data collection, entry and analysis.

3.2 Research Design

Maina (2004) describes Research Design as the basic plan that indicates an overview of the activities that are necessary to execute the research project.This study used a descriptive research design that sougt to describe the study variables and also the relationship between the these variables. Descriptive survey research designs can be used in preliminary and exploratory studies to allow researchers to gather information and summarize, present and interpret data for the purpose of clarification (Orodho, 2003)

Descriptive design is the most appropriate because the study is concerned with finding out what relationship exists between the independent and dependent variables by collecting quantifiable data (Mugenda and Mugenda, 1999). The data was collected from the target population in order determine the current status with regard to inventory management techniques and supply value chain performance in petroleum marketing firms.

3.3 Quantitative Sample Computation

It is important to note that computation of a robust sample size that ensures reliable survey estimates requires that key beneficiary population size is available and known. The study sampled from a list of petroleum marketing firms in Nairobi as per the list of the (Appendix 2)

There are 161 licensed companies to market petroleum in Nairobi. Thus in computing the sample size for study, was utilized the standard formula below;

n=

Where;**n** is the sample size

N is the population size

e is the level of precision

The study assumed a 95% level of confidence, and the level of precision, e, was set at ±5%. These are the industry standards for computation of sample sizes.

Using this formula and the proposed level of confidence and precision, we arrive at the following:

== 114

Since the computed sample size is more than 5% of the population size of the Petroleum firms in Nairobi, (so that n/N > 0.05), we utilize a Finite Population Correction factor (FPC) to derive a new corrected sample size. The new corrected sample size is computed as follows:

Corrected Sample Size for Petroleum Firms in Nairobi,

Where is the initial computed sample size and **N** is the population size

Thus The Corrected Sample Size for Petroleum firms in Nairobi is,

=66

Thus, the proposed number of Petroleum firms in Nairobi to be included in the sample is **66.**

The sample size of 66 petroleum companies (fuel stations) in Nairobi was randomly sampled from the sampling frame of 114.

3.4 Data Collection

The study used both primary and secondary data. The main instrument for data collection was a structured questionnaire and an interview guide to gather secondary data. The questionnaire wasboth closed ended and open ended questions.According to Burns and Grove (2005) a questionnaire with both closed and open ended questions allowed every possible answer to have a response.

The questionnaire consisted of Section A, B, C and D. Section A aimed at gaining demographic data such as gender, position of respondent in the firm, organization operation period, respondent's level of education and experience in the petroleum field. This information could

assist the researcher when interpreting the results, for example, whether subjects lacked knowledge of Inventory Management Techniques because they were uneducated, or due to underperformance of their Supply Chain. Section B indicated the extent to which these Petroleum Firms have used the Inventory Management techniques to manage inventory. Section C looked at the extent to which Petroleum Marketing Firms have measured Supply Chain Performance in their respective firms while section D sought to find the relationship between inventory management techniques and the supply chain performance.

The study used the key informant approach where the target respondents were either the Warehouse manager or Procurement manager in every firm because they are deemed to be the most knowledgeable in the aspects of the study for which they are responsible or execute them personally. The researcher administered the questionnaires through a 'drop and pick' technique.

3.5 Data Entry and Analysis

Once the data has been collected, open ended questionnaires was coded and then the data was entered through **Statistical Package for Social Sciences (SPSS)**.Quantitative data collected was analysed using SPSS as it offers numerous statistical analysis routines that analyse small to very large data statistics. Mujis, (2004). For objective one, data analysis was conducted through descriptive statistics to establish the inventory management techniques commonly used by petroleum marketing firms in Nairobi. It was presented through percentages, means, standard deviations and frequencies Descriptive statistics enable the researcher to meaningfully describe a distribution of measurements (Mugenda & Mugenda, 1999) and also to describe, organize and summarize data (Fain 1999).

Data for objective two was analyzed using regression modeling analysis; so as to be able to determine the relationship between the Inventory Management Techniques and Supply Chain Performance of petroleum marketing firms in Nairobi, with inventory management techniques as the independent variables and supply chain as the dependent variable.

The following regression model was used to show impact of inventory management techniques on supply chain performance $Y = a + b1X1 + b2X2 + b3X3 + b4X4 + e$ Where Y = Supply chain performance measured by responses on effects of inventory management techniques on supply chain performance; a = Y intercept that is the value of Y when X is equal

to zero; b1, b2, b3 and b4 are regression weights coefficients attached to the variables; X1 = Economic Order Quantity, X2=Just-In-Time, X3= Vendor Managed Inventory, X4 = Material Requirement Planning Analysis and e = Error Term.

CHAPTER FOUR DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents a detailed discussion of the research findings in an attempt to achieve the research objective. Descriptive Statistics is to be used to establish the inventory management techniques commonly used by petroleum marketing firms in Nairobi whereas Regression Modeling Analysis will be used to determine the relationship between these techniques and supply chain performance of petroleum marketing firms in Nairobi.

4.2 Response Rate

The study targeted 66 Petroleum firms in Nairobi with 66 questionnaires distributed. However, only 46 of them were filled and picked response rate of 70%. Mugenda and Mugenda (1999) indicate that a 50% response rate is adequate whereas 60% is good and 70% is excellent as presented in table 4.2. The response rate achieved by the researcher in the study was made possible by constant follow-ups through telephone calls, personal visits and email communication reminders.

Table 4.1: Response rate

Category	Frequency	Percentage
Achieved	46	70%
Not achieved	20	30%
Target response	66	100%

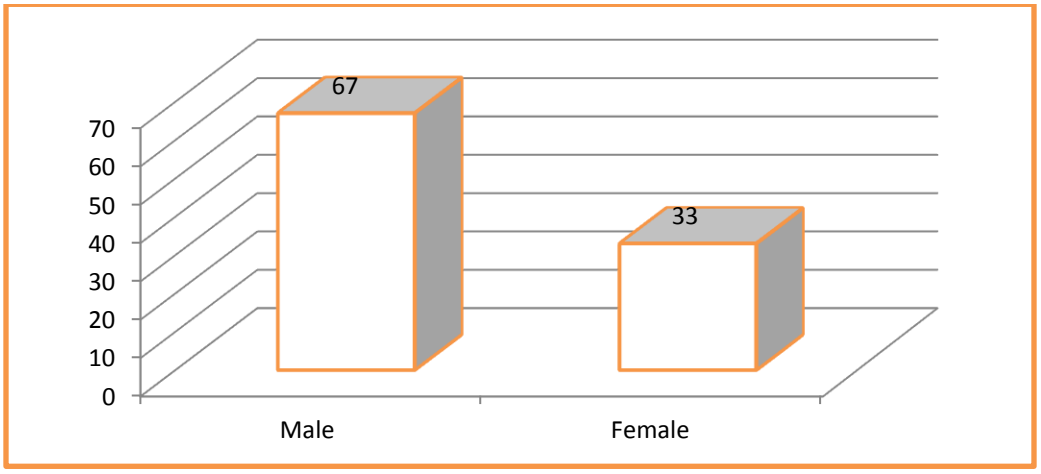
4.3 Demographic Information

The information sought in this study was gender of the respondents, position held working period, the education level and organization's operation period. This ensured that the respondents were well informed on the study area and were able to respond appropriately to the questions fronted on inventory management techniques.

4.3.1 Gender of the Respondents

The researcher sought to establish the gender of the respondents. The results were recorded in Figure 4.1.

Fig. 4.1: Gender Distribution of the Respondents



The study from figure 4.1 shows that male respondents were represented by 67% while female was 33%.

It is therefore apparent that majority of the respondents were male with 67%. However, the gender distribution was well represented for the study.

4.3.2 Respondents Position

The researcher had to find out the respondents position as recorded in Figure 4.2

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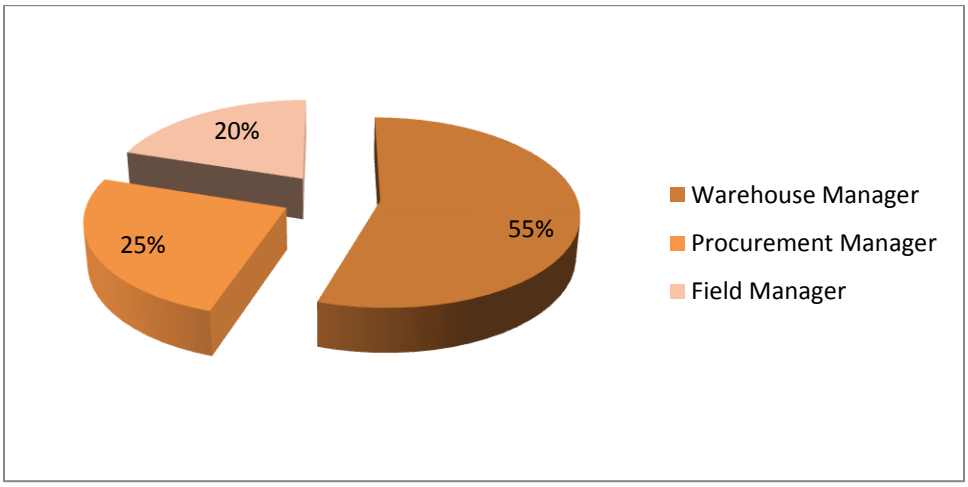
Figure 4.2: Respondent's Position



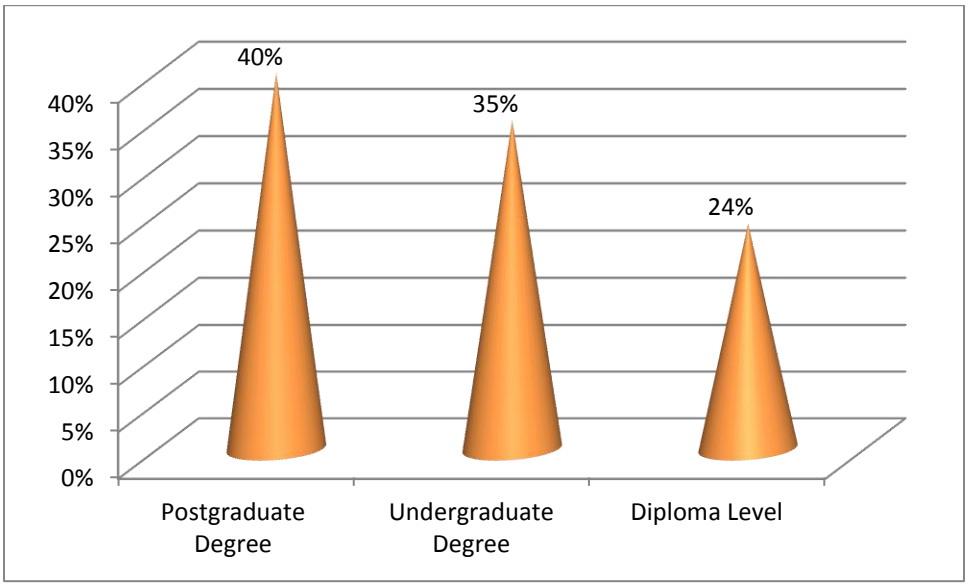
The above shows that 55% of the respondents were employed as warehouse mangers, 25% were procurement managers while 20 were field managers.

The study posits that majority of the respondents' warehouse managers as shown by 55%. This was beneficial to the study since they understood the questionnaire appropriately and could therefore respond to it very well.

4.3.3 Level of Education

The researcher had to find the education level of the respondents. The results were recorded in figure 4.3 below for interpretation purposes.

Figure 4.3 Respondent's Level of Education



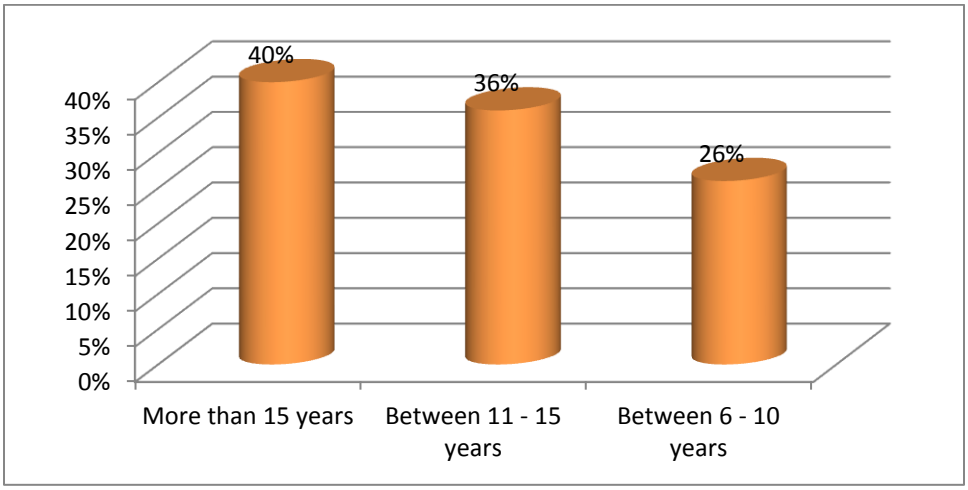
The study above shows that respondents with postgraduate degree were represented by 40%, on the other hand, 35% had undergraduate degree while 24% had attained diploma level.

It therefore clear that majority of the respondents had postgraduate degree as shown 40% of the respondents. The education level of the respondents was well distributed to carry out the study.

4.3.4 Respondent's Experience

The study had to establish the respondent's experience. The results were recorded in figure 4.4 below.

Figure 4.4 Respondent's Years in the Firm



The results shows that 40% of the respondents had worked for more than 15 years, 36 had worked for between 11 and 15 years while 26% had worked for between 6 and 10 years.

The results show that 40% of the respondents represented the majority of the employees with the highest experience of more than 15 years. This was ideal in carrying the study out since they understood the firms' dynamics and could understand the questionnaire appropriately.

4.3.5 Firm's Period of Operation

The researcher had to find out the duration in which the firms were in operation. The results were recorded in table 4.3 below.

Table 4.2 Firm's Period of Operation

Longevity	Frequency	Percentage
Over 20 years	12	26%
16-20 years	14	30%
11-15 years	10	22%
5-10 years	7	15%
Less than 5 years	3	7%
Total	**46**	**100%**

4.4 Inventory Management Techniques

The study sought to find out if petroleum marketing firms in Nairobi apply or have ever applied inventory management techniques and which inventory management techniques they use. Further the study sought to establish existence of resistance from Petroleum marketing firms' employees to adaptability of these techniques.

Table 4.3 Inventory Management Techniques

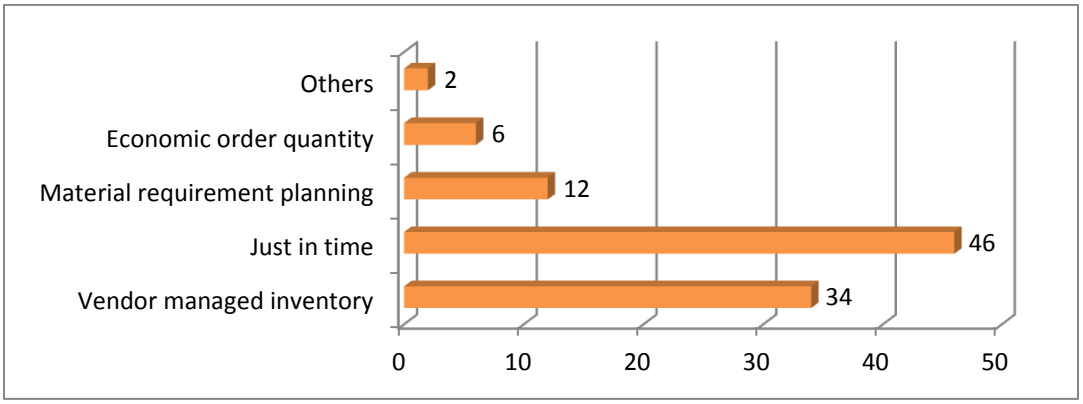
Statements	Mean	Std. Dev.
Just-In-Time Technique.	4.645	.541
Vendor Management Inventory Technique.	3.985	.461
Material Requirement Planning Technique.	3.487	.823
Economic order quantity (EOQ)	4.254	.451
Economic Batch Quantity (EBQ)	4.124	.652
Thumb rule model	3.846	.354
ABC analysis	3.641	.658
Scientific inventory model	4.354	.641
Automatic Replenishment	3.841	.218
Demand forecast inventory	3.734	.524

The study above shows that petroleum marketing firms in Nairobi applied economic order quantity technique with a mean of 4.253 and standard deviation of .874. Just-In-Time technique with a mean of 4.045 and standard deviation of .541.Vendor Managed Inventory technique with a mean of 3.985 and standard deviation of .461.Material Requirement Planning technique had a mean of 3.487 and standard deviation of .823. Economic order quantity (EOQ) had a mean of 4.254 and standard deviation of .451. Economic Batch Quantity (EBQ) had a mean of 4.124 and standard deviation of .652. Thumb rule model had a mean of 3.846 and standard deviation of .354. ABC analysis had a mean of 3.641 and standard deviation of .658. Scientific inventory model had a mean of 4.354 and standard deviation of .641. Automatic replenishment had a mean of 3.841 and standard deviation of .218 while demand forecast inventory had a mean of 3.734 and standard deviation of .524. Vendor managed inventory had a mean of 4.165 and standard deviation of .244.

The study above shows that the most commonly used inventory management technique was just in time with a mean of 4.645 and standard deviation of .541. These findings were in line with Astrid Vigtil, (2007) who argued that just in time leads to lower warehouse costs. Storing excess inventory can cost a lot of money, and reducing the amount of inventory you keep on hand can

reduce your carrying costs as well. Companies that implement the just-in-time inventory model may be able to reduce the number of warehouses they maintain, or even allow them to eliminate those warehouses altogether. He further notes that just-in-time inventory model can also help companies be more efficient and competitive in the way they handle their supply chains and use their parts to assemble products for their customers. A more efficient supply chain can provide lower costs throughout the manufacturing process, and those lower costs can then be passed on to the customer. Those lower costs can make the company's products more affordable, and help the company gain a larger market share and stay ahead of its competitors. Implementing the just-in-time inventory management model can allow companies to serve their customers faster and more efficiently. Companies that use the just-in-time model have a greater level of control over the entire manufacturing process, making it easier to respond quickly when the needs of customers change.

4.4.1 Utilization of Inventory Management Techniques



The study above shows that the firms' utilized vendor managed inventory as indicated by 34%, just in time had 46%, material requirement planning had 12%, economic order quantity had 6% while others were represented by 2%.

It is therefore clear that majority of the respondents utilized just in time inventory management technique as shown by 46%. The reasons and benefits of just in time as discussed in table 4.7 above.

4.4.2 Employee Resistance to Adaption / Use of Inventory Management Techniques

The study revealed that 30% of the employee showed resistance of adaptation or usage of inventory techniques by their firms.

Asked to rate employees' resistance, the table below shows the mean score of the resistance by the inventory management technique. The data from the table 4.6 below shows Economic Order Quantity recorded a high resistance mean score of 2.20 as compared to the other inventory management techniques. It is important to note that resistance of these techniques mostly occurred during initial adaption of the techniques, but later the resistance reduced.

Table 4.4: Employees' Resistance to Adaption

Inventory management technique	Mean	Std. deviation
Vendor Managed Inventory	1.70	0.865
Just In Time	1.85	0.813
Material Requirement Planning	2.10	1.119
Economic Order Quantity	2.20	1.281

Source: study data

4.5 Supply Chain Performance Measures

The researcher had to establish Supply Chain Performance Measures as used by the firms. The results were recorded in table 4.6 below.

Table 4.5 Supply Chain Performance Measures

Statements	**Mean**	**Std. Dev.**
Supply chain integration	4.325	.4544
Supply chain flexibility	5.201	.5412
Customer responsiveness	5.547	.6752
Effectiveness	3.481	.4204
Sustainability	4.961	.4964
Responsiveness	3.862	.3212
Cost-efficiency	3.540	.3684
Quality	3.432	.3663
Stability	3.561	.3012

The study indicates that supply chain integration had a mean of 4.325 and standard deviation of .4544. Supply chain flexibility had a mean of 5.201 and standard deviation of .5412. Customer

responsiveness had a mean of 5.547 and standard deviation of .6752. Effectiveness had a mean of 3.481 and standard deviation of .4204. Sustainability had a mean of 4.961 and standard deviation of .4964. Responsiveness had a mean of 3.862 and standard deviation of .3212. Cost-efficiency had a mean of 3.540 and standard deviation of .3684. Quality had a mean of 3.432 and standard deviation of .3663. While stability had a mean of 3.561 and standard deviation of .3012.

As the above study posits that customer responsiveness is the most commonly used method of measurement with a mean of 5.547, but according to (Towill, 2000) maximizing customer satisfaction based performance measure, has recently received substantial attention in SCM. For example, researchers have considered different aspects of maximizing customer satisfaction based performance relative to various stages of the overall value delivery cycle and have proposed several measures to evaluate them. The key dimensions of maximizing customer satisfaction-based performance include delivery speed, new product development time, delivery reliability/dependability, new product introduction and manufacturing lead-time.

4.6 Relationship between Inventory Management and Supply Chain Performance

The study below shows the results in regard to the relationship between inventory management and supply chain performance. The results were recorded in table 1.10 below.

Table 4.6 Relationship between Inventory Management and Supply Chain Performance

Statements	**Mean**	**Std. Dev.**
Application of Economic Order Quantity helps improve organizational supply chain performance through Supply chain integration	4.206	.541
They say Just-in-time helps organizations enhance Customer responsiveness	4.214	.674
Vendor management inventory system ensures Effectiveness	4.654	.652
MRP has enables the petroleum firms to incur Cost-efficiency	4.358	.574

The study above shows that respondents posits that Application of Economic Order Quantity helps improve organizational supply chain performance through Supply chain integration had a mean of 4.206 and standard deviation of .541. They say Just-in-time helps organizations enhance Customer responsiveness had a mean of 4.214 and standard deviation of .674. Vendor management inventory system ensures Effectiveness had a mean of 4.654 and standard deviation of .652. MRP has enables the petroleum firms to incur Cost-efficiency had a mean of 4.358 and standard deviation of .574.

The results above were in line with (Li., 2006) who posits that inventory management techniques encompasses set of approaches and practices that effectively integrate with suppliers, manufactures, distributors, and customers to improve the long-term business performance and their supply chain. Inventory management techniques are related to supply chain integration, supply chain flexibility and customer responsiveness.

The results from interview guide shows that those operations update their calculations about every three to six months to ensure that decisions are based on the most accurate information.

The results on who decides key inventory-related policy such as striking the right balance between customer service and cost-effective product inventory levels shows that many decisions about inventory levels are strategically important. So instead of relying solely on the supply organization to decide, the respondents were for the idea that executives need to have a major say in the fundamental issues that impact inventory management—everything from determining the right breadth and complexity of product offerings to optimal plant and distribution footprints.

On ways of determining the optimal frequency for producing or ordering products, the results indicated that several factors impact effective inventory planning. For example, marketing campaigns can play a role alongside sourcing. So a cross-functional team should set production and ordering schedules. Production alone determines lot sizes, usually based solely on minimizing production costs. By weighing all factors and using a sales and operations planning process, cross-functional teams often reduce the company's replenishment stock by 50 percent and ensure that the right products are available for big promotions.

The findings indicated that the firm considers calculations that minimize the overall cost such as inventory and changeover costs. They also base frequency on negotiations between the different parties involved and factor in upcoming events such as promotions and uncertainties like bad weather as methods of determining the frequency for ordering and inventory production if it's not set solely by factories or the supply organization.

4.7 Relationship between Inventory Management and Supply Chain Performance

The study sought to establish the relationship between Inventory Management and Supply Chain Performance in Petroleum Marketing firms in Nairobi.

This was achieved by conducting a regression analysis to determine if there was any relationship between the two variables. The regression model adopted was a linear one to depict the impact and the variables above:

$Y = a + b1X1 + b2X2 + b3X3 + b4X4 + e.$

Where;

Y = Supply chain performance measured by responses on effects of inventory management techniques on supply chain performance;

a = Y intercept that is the value of Y when X is equal to zero;

b1, b2, b3 and b4 are regression weights coefficients attached to the variables;

X1 = Economic Order Quantity Technique,

X2=Just-In-Time Technique,

X3= Vendor Managed Inventory Technique,

X4 = Material Requirement Planning Technique.

Our raw score regression model equation looks like this:

Supply Chain Performance=Constant+b_1EOQ+ b_2JIT+ b_3VMI+ b_4MRP

Table 4.7: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.702	1.086		.657	.526
Economic Order Quantity Technique	-.338	.35	-.193	-.965	.357
Just-In-Time Technique	.427	.147	.568	2.903	.016
Vendor Managed Inventory Technique	.062	.213	.064	.293	.776
Material Requirement Planning Technique.	.426	.329	.293	1.296	.224

Source: study data

The findings in table 4.7 above indicated that as the regression model tends to zero all factors held constant, supply chain performance changes by 0.702. Consequently, all other factors held constant, when Economic Order Quantity Technique increases by one unit, supply chain performance decreases by 0.338, when Just-In-Time Technique increases by one unit, supply chain performance increases by 0.427, when Vendor Managed Inventory Technique increases by one unit, supply chain performance increases by 0.062 and when Material Requirement Planning Technique. Increases by one unit supply chain performance increases by 0.426.

Table 4.8: Regression Model Summary

Model	R	R Square	Adjusted R Squared	Std. Error of the estimate	Change statistics				
					R Square change	F Change	df 1	df 2	Sig. F Change
1	.832[a]	.721	.478	.624	.721	2.029	4	5	.442

Source: study data

The regression model summary table 4. 8 above indicates R2 value as 72.1% implying that the four independent variables explains 72.1% of the variance in supply chain performance of Petroleum marketing firms in Nairobi. It is therefore true to say that the variables contributes immensely as per respondents feedback to achieve optimal level of supply chain performance.

Table 4.9: Significance of the Model using F-test

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	9.128	4	1.025	2.029	0.442[b]
Residual	3.972	5	0.397		
Total	13.1	9			

Source: study data

Significance of the model using F Test

The F-test statistics shown by *Table 4.9* above indicates computed F statistic at 1.025 and at 5% level confidence, the numerator df is equal to 4 and denominator df is equal to 5. This implies that the regression model is sufficiently significant and can be used to explain the impact of inventory management techniques on supply chain performance.

SUMMARY, CONCLUSION AND RECOMMENDATIONS CHAPTER FIVE

5.1 Introduction

This chapter discusses the results gathered from the analysis of the data, as well as the conclusions reached. Findings have been summarized alongside the objectives of the study, conclusions have been drawn from the study and the recommendations for action are also given.

5.2 Summary

The study had two objectives; to establish the inventory management techniques commonly used by petroleum marketing firms in Nairobi and to determine the relationship between the inventory management techniques and supply chain performance of petroleum marketing firms in Nairobi.

The results findings indicated that majority of the respondents were male. The study posits that majority of the respondents' warehouse managers. This was beneficial to the study since they understood the questionnaire appropriately and could therefore respond to it very well. Majority of the respondents had postgraduate degree. The education level of the respondents was well distributed to carry out the study. The majority of the employees had the highest experience of more than 15 years. This was ideal in carrying the study out since they understood the firms' dynamics and could understand the questionnaire appropriately.

The study above shows that the most commonly used inventory management technique was just in time. These findings were in line with Astrid Vigtil, (2007) who argued that just in time leads to lower warehouse costs. Storing excess inventory can cost a lot of money, and reducing the amount of inventory you keep on hand can reduce your carrying costs as well. Companies that implement the just-in-time inventory model may be able to reduce the number of warehouses they maintain, or even allow them to eliminate those warehouses altogether.

As the above study posits that customer responsiveness is the most commonly used method of measurement, but according to (Towill, 2000) maximizing customer satisfaction based performance measure, has recently received substantial attention in SCM. For example, researchers have considered different aspects of maximizing customer satisfaction based performance relative to various stages of the overall value delivery cycle and have proposed

several measures to evaluate them. The key dimensions of maximizing customer satisfaction-based performance include delivery speed, new product development time, delivery reliability/dependability, new product introduction and manufacturing lead-time. The results were in line with (Li., 2006) who posits that inventory management techniques encompasses set of approaches and practices that effectively integrate with suppliers, manufactures, distributors, and customers to improve the long-term business performance and their supply chain. Inventory management techniques are related to supply chain integration, supply chain flexibility and customer responsiveness.

5.3 Conclusion

On the basis of the findings above, the study showed that all of the surveyed petroleum firms in Nairobi use Inventory Management Techniques; this is the first indication that these techniques help them in the improvement of Supply Chain Performance of their firms. It was also evident that majority of those who mostly use these Inventory Management Techniques were highly educated with undergraduate degrees or Post-graduate degrees, this is evident that they are able to efficiently understand and effectively use these inventory techniques. Our regression model showed that the independent variables predicted the response variable up to 72.1%. This is an indication that the model is a good model in predicting the supply chain performance by use of specific inventory management techniques variables.

5.4 Recommendation

It is recommended that Petroleum marketing firms develop a policy framework to facilitate faster implementation of the best inventory management practices. It is also recommended that Petroleum marketing firms consider investing in modern technology and implement EDI. This will reduce inventory costs and improve returns. The agencies should also strengthen the supplier relation to the level of partnerships. This will facilitate implementation of programmes such as Vendor Managed Inventory (VMI).

It is also clear from the study findings that Inventory Management Techniques have a positive impact on the improvement of Supply Chain Performance; hence, Petroleum marketing firms

should embrace inventory management techniques so that they can reap from the immense benefits accrued from implementation.

5.5 Limitation of the study

The research study constituted of only 46 licensed Petroleum marketing firms in Nairobi by the Energy Regulatory Commission. This is a relatively small number since there are many more other Petroleum marketing firms and other Petroleum marketing stakeholders who were not included in this study. This limits generalization of the findings to other sectors and firms that were not included in the study.

5.6 Suggestions for further study

The study also recommends further studies be carried out to ascertain if supply chain performance has a direct effect on individual Petroleum marketing firms inventory management techniques. Also, further studies can be conducted on Petroleum marketing firms in the Petroleum sector in Kenya to find out why and how they manage their inventory by having one centralized inventory management unit that serves a range of Petroleum marketing firms.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

SECTION A- INTRODUCTION

Q1. What is the name of your Firm? .....

Q2.What is your Gender? Male [ ] Female [ ]

Q3.What is your position in the firm?.....

Q4. For how long has your Firm been in operation?

1. Less than 5 years [ ] **2.**5-10years [ ] **3.**11-15years [ ] 4.16-20 years [ ] 5**.** Over 20 [ ]

Q5. What is the level of experience of your warehouse/stores in charge?

1. Less than 5 years [ ] **2.**5-10years [ ] **3.** 11-15years [ ] **4.** 16-20 years [ ] **5.**over 20 [ ]

Q6**.** What is your level of Education?

1. Postgraduate Degree [ ] 2. Undergraduate Degree [ ] 3. Diploma Level. [ ]

SECTION B.INVENTORY MANAGEMENT TECHNIQUES

Q1. Does your firm use any inventory management technique/s? 1. Yes 2. No

Q2. If YES, which inventory management technique/s?

1. Economic order Quantity(EOQ)
2. Just In Time Technique(JIT)
3. Vendor managed inventory Technique(VMI)
4. Material requirement planning(MRP)
5. Others (specify)

Q3.To what extent have the following Inventory Management Techniques been used in your Petroleum Marketing Firm?

1= to a very large extent 2= Large extent 3= moderate extent 4= small extent 5=very small extent

INVENTORY MANAGEMENT TECHNIQUES	**1**	**2**	**3**	**4**	**5**
Economic Order Quantity Technique.					
Just-In-Time Technique.					
Vendor Management Inventory Technique.					
Material Requirement Planning Technique.					
Economic Batch Quantity (EBQ)					
Scientific inventory model					
Automatic Replenishment					
Demand forecast inventory					
Vendor managed inventory					
Thumb rule model					
ABC analysis					

Q4. Do you receive any resistance from the employees on the introduction or use of inventory management technique/s?

1. Yes
2. No

Q5. If YES, What is the level of resistance from the employees on the introduction of inventory management Techniques?

1. No resistance [ ] **2.**Very Weak [ ] **3.**Moderate [ ] **4.**Strong [ ] **5.** Very strong [ ]

SECTION C: SUPPLY CHAIN PERFORMANCE

To what extent have the following Supply Chain Performance measures been measured in your Petroleum Marketing Firm?

1= to a very large extent 2= Large extent 3= moderate extent 4= small extent 5=very small extent

SUPPLY CHAIN PERFROMANCE MEASURES	**1**	**2**	**3**	**4**	**5**
Supply chain integration					
Supply chain flexibility					
Customer responsiveness					
Effectiveness					
Sustainability					
Responsiveness					
Cost-efficiency					
Stability					
Quality					

Any other measures?

Please specify…….

SECTION D : RELATIONSHIP BETWEEN INVENTORY MANAGEMENT AND SUPPLY CHAIN PERFORMANCE OF PETROLEUM MARKETING FIRMS IN NAIROBI

Please indicate by ticking the extent to which there exists a Relationship between Inventory Management and Supply Chain Performance in your firm.

1= to a very large extent 2= Large extent 3= moderate extent 4= small extent 5=very small extent

Statements	**1**	**2**	**3**	**4**	**5**
Application of Economic Order Quantity helps improve organizational supply chain performance through Supply chain integration					
They say Just-in-time helps organizations enhance Customer responsiveness					
Vendor management inventory system ensures Effectiveness .					
MRP has enables the petroleum firms to incur Cost-efficiency					

Please give any other information not captured in this questionnaire or comments that you consider useful for this study.

_____
_____
_____
_____

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How do you manage your safety stock levels? How often do you do that?

Who decides key inventory-related policy such as striking the right balance between customer service and cost-effective product inventory levels?

How do you determine the optimal frequency for producing or ordering products?

How do you determine the frequency for ordering and inventory production if it's not set solely by factories or the supply organization?

How do you manage regular visibility into excess and obsolete stock, and is it linked to targeted action plans to sell off or reduce this inventory?

How do you perform root-cause analyses on excess and obsolete stock and know how they are linked to action plans that curb more excesses from being created?

How do you apply the above practices to all parts of your inventory (finished goods, raw material, works in process and spare parts) and in all organizational entities?

Thank you for taking time to answer this Questionnaire.

APPENDIX II: LIST OF PETROLEUM MARKETING FIRMS IN NAIROBI

1	Abundant Petroleum
2	Afrioil International Limited
3	Afro Petroleum Ltd
4	Agdaben Limited
5	Ainushamsi Energy Limited
6	Al Tawakal Energy Solutions Ltd
7	Alfamax Limited
8	Amana Petroleum (Kenya) Limited
9	Anglo Energy Refining Corporation (K) Limited
10	Arech Petroleum Limited
11	Aspam Energy Kenya Limited
12	Astrol Petroleum Company Limited
13	Atlas Petroleum Limited
14	Bakri International Energy Company Limited
15	Balol Energy Limited
16	Bamoil Limited
17	Banoda Oil Limited
18	Bass Petroleum Kenya Limited
19	Beta Petroleum Company Limited
20	Bit And Lubes Limited
21	Broadway Petroleum Limited
22	Bushra Energy Limited
23	Calpine (K) Energy Limited
24	Cheddy and Co Enterprises Limited
25	City Oil (K) Limited
26	Cosmo Petroleum Company Limited
27	Denmark Petroleum Ltd
28	Depar Limited
29	Dimka Power System Ltd
30	Drokem Group Limited
31	Dupont Kenya Ltd
32	Eco Oil Kenya Limited
33	Energy Africa Services Limited
34	Engen Kenya Limited
35	Ensen Energy Limited
36	Eppic Oil (K) Limited

37	Ethos Investment Kenya Limited
38	Exol Energy East Africa Ltd
39	Exxen Energy Limited
40	Exxon Oil International Limited
41	Fedha Service Station
42	First Jogoo Road Service Station
43	Flamex Petroleum Limited
44	Flowlink Petroleum Limited
45	Fossil Fuels Limited
46	Fredamo Kenya Limited
47	Futures Energy Company Limited
48	Galana Oil Kenya Limited
49	Gapco Kenya Limited
50	Gas And Go Petroleum Products Ltd
51	Gaza Strip Oils Limited
52	Generation Petroleum Limited
53	Geoil Energy Limited
54	Gulf Energy Limited
55	Hammex Energy Limited
56	Hared Energy Limited
57	Hashi Energy Limited
58	Hass Petroleum Kenya Limited
59	Haven Petroleum Limited
60	Henjo Energy Limited
61	High Star International Ltd.
62	Ilade Oil Co. Limited
63	Indiana Energy Ltd
64	Indus Energy Limited
65	Interlink Petroleum Limited
66	Intoil Limited
67	Jaf Company Limited
68	Jaguar Petroleum Limited
69	Jazeera Energy Limited
70	Joventers Energy Limited
71	K .B Sanghani And Sons Limited
72	K.K. Transporters Limited
73	Kada Enterprises Limited
74	KamorLiban Construction Limited

75	Kengas Energy Limited
76	Kenolkobil Limited
77	Kenya Petroleum Refineries Limited
78	Kerolite Petroleum Ltd
79	Kinsteen Trading Company Limited
80	Lego Oil Limited
81	Libya Oil Kenya Limited
82	Logitac Oil Ltd
83	Lubeschem Kenya Limited
84	Luqman Petroleum Limited
85	Majestic Petroleum Enterprises And General Merchandise Limited
86	Malka Company Limited
87	Marsep Petroleum Dealers
88	Massoil Investments Limited
89	Midax Petroleum Limited
90	Mobil Energy Limited
91	Mobil Group Of Companies Limited
92	Mogas Kenya Limited
93	Movids Energy Suppliers
94	Ms Oil Limited
95	Munjeme Petroleum Supply
96	National Oil Corporation Of Kenya
97	Netgas And Energy Limited
98	Next Investment Limited
99	Ngatu Investment Limited
100	Nimoil Marketing Kenya Limited
101	Oasis Premium Oil Limited
102	Oilcom (K) Limited
103	Oilpoint Kenya Limited
104	Olympic Petroleum Limited
105	One Petroleum Limited
106	Oryx Energies Kenya Limited
107	Pacific Petroleum Limited
108	Packfuels Limited
109	Pamo Oil International
110	Pearls Energy East Africa Ltd
111	Petro Oil Kenya Limited
112	Petro Star Petroleum Co. Ltd

113	Petrogas Distributors Limited
114	Petygas And Lubes
115	Phoenix Petroleum Dealers
116	Pinnacle Petroleum
117	Pixels Energy Limited
118	Plan And Trend (EA) Limited
119	Prisko Petroleum Network Limited
120	Quality Petroleum Limited
121	Quantum Petroleum Limited
122	Rania (Ea) Limited
123	Ranway Traders Limited
124	Red Moran Energy Ltd
125	Redhouse Energy Ltd
126	Regnol Oil (K) Limited
127	Reyhan Petroleum Limited
128	Riva Petroleum Dealers Limited
129	Rockspring Energy Limited
130	Rogmer Enterprises Limited
131	Romax Petroleum Distributors
132	Rommax Oil Suppliers
133	Royal Energy (K) Limited
134	Saaman Gas Company Limited
135	Seitto Oil Trading And Supply
136	Sheikh Petroleum Inter (K) Limited
137	Shiloh Petroleum Limited
138	Simkel Traders Limited
139	Smooth Rift Merchants Limited
140	Sonangol Petroleum Limited
141	Stabex International Ltd
142	Star Energy Limited
143	Steam And Petroleum Limited
144	T.S.S Pop In Station Limited
145	Texas Energy Ltd
146	Tijays Limited
147	Tirepa Oil Limited
148	Tosha Petroleum (Kenya) Limited
149	Total Kenya Limited
150	Towba Petroleum Company Limited

151	Trans African Energy Limited
152	Transworld Energy Limited
153	Trojan International Limited
154	Ultra Petroleum Limited
155	Vivo Energy Kenya Limited
156	Wambu Petroleum Products
157	Warens Petroleum
158	Wehly Petroleum
159	Wells Petroleum Ltd
160	World Fuel Services Kenya Limited
161	Yukos Oil Kenya Limited

Source: Energy Regulation Commission.