

# Role of Applying Strategic Inventory Management Systems on Performance of Petroleum Marketing Firms in Nairobi

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**Abstract-** This study sought to establish the role of applying strategic inventory management systems on performance of petroleum marketing firms in Nairobi. The specific objectives were: to determine the effect of applying strategic chip based fuel management system on performance of petroleum marketing firms in Nairobi, to investigate the effect of applying strategic economic order quantity (EOQ) model on performance of petroleum marketing firms and to examine the effect of applying strategic Always Better Control (ABC) analysis on performance of petroleum marketing firms. The research design was descriptive in nature and the population consisted of management and supervisory staff from different departments of the petroleum marketing firms within Nairobi County. Stratified random sampling technique was used to determine the sample elements. Primary data was solicited from the population through questionnaires, which was administered via hand delivery to the respondents. Secondary data was obtained by use of session papers and publication work. The raw data was subjected to thorough analysis, tabulation and presentation. The study established that applying strategic chip based fuel management system eliminates human error, assuring timely, accurate and detailed information capture for each vehicle and each fuelling session and that strategic strategic chip based fuel management system accurately monitor fuel being dispensed and reduce the opportunity for fraud and pilferage. Through strategic EOQ, the petroleum marketing firms enjoyed reduced carrying costs, and that the petroleum marketing firm can experience smooth fuel restocking process which results in better customer service as inventory is available when needed. Strategic ABC analysis, allows the petroleum marketing firm to use its resources to prioritize control of high-priority inventory over inventory that has a lower impact on its bottom line. The research therefore concludes that applying strategic (EOQ) model, strategic (ABC) analysis system and applying strategic CBFMS promoted the performance of petroleum marketing firms. The study recommends that petroleum marketing firms should increase the number of services possible through strategic chip based fuel management system. Also, more investment should go into strategic ABC analysis inventory management systems since they drive profitability. Finally, petroleum marketing firms should seek to integrate all strategic inventory management systems to one platform so that information sharing and duplication of system functions can be reduced.

**Index Terms-** Strategic Chip Based Fuel Management System, Strategic Economic Order Quantity Model, Strategic Always Better Control Analysis

## I. INTRODUCTION

Strategic Inventory Management Systems and Inventory Control process provides information to efficiently manage the flow of materials, effectively utilize people and equipment, co-ordinate internal activities, and communicate with customers. Inventory management system usage has had little application in most petroleum stations. This has resulted in problems that come as a result of stock-outs and stoppage in inventory flow (Rushton, Croucher & Baker, 2014).

Libya Oil Holding Ltd (LOHL) is one of the leading pan-African groups in the downstream oil & gas industry under the umbrella of the Libya Africa Investment Portfolio (a Libyan Investment Fund). Libya oil Kenya Ltd (LOKL) is an affiliate of the LOHL. Under the brand name 'OiLibya', Libya oil Kenya Ltd (LOKL) operates 67 stations country wide through a dealer network. It operates a lubricant blending plant in Mombasa, terminals in Nairobi, Mombasa and Eldoret and has a presence at the Kenya Pipeline Company (KPC) depots in Western Kenya. It also operates its aviation business through the two main airports in Kenya. The business covers the sale and marketing of a range of quality Lubricants, Fuel to retail and commercial customers, LP Gas, Chemicals and Special products. LOKL also provides services such as ATMs and Chemist outlets at select retail outlets. LOKL has also partnered with Innscor (K) Limited to provide a comprehensive back-court offering that includes quality food brands and convenience retailing stores. OilLibya has a market share of 6.3% as at December 2015 (Petroleum Institute of East Africa, 2015).

The Kenyan petroleum industry and indeed the general business environment have undergone tremendous macro-environmental changes. Consequently, there has been pressure on organizations to respond with strategies formulated to propel them to retain their market share and competitive position. The petroleum industry in particular, has witnessed significant changes in the business environment. The changes that have occurred include government regulation of fuel prices, creation of a common exchange pool for LPG gas cylinders, expansion strategy by rival companies, discovery of oil in Kenya and Uganda, escalating international crude prices, crisis in oil

producing countries, increased piracy in the Horn of Africa, among others (Machuki&Aosa, 2011).

Shell fuels are sold by Vivo Energy, a licensee of the Shell brand. Vivo Energy is a joint venture between Vitol (40%), Helios (40%) and Shell (20%). Shell Lubricants are sold and marketed by Shell & Vivo Lubricants, a joint venture with Shell share 50%, Vitol 25% and Helios 25%. The Shell brand has been in Kenya since 1900. Today, under Vivo Energy, it is one of the country's most sought-after fuel and lubricant brands, operating an extensive retail network; major bulk oil storage terminals in Nairobi and Mombasa; aviation services at all airports; and a lubricants blending plant in Mombasa. Vivo Energy Kenya serves all market segments from retail to commercial customers with a full range of products ; automotive fuels, lubricants, aviation fuels, liquefied petroleum gas (LPG) and fuel oil. Shell commands 18.1% of the Kenyan market share as at December 2015 (Petroleum Institute of East Africa, 2015).

KenolKobil ltd is an indigenous oil marketing conglomerate with an expansive investment portfolio spanning the entire Eastern, Central and Southern parts of the African continent. The Group consists of subsidiaries in eight African countries outside Kenya (Head Office) including; Uganda, Tanzania, Rwanda, Zambia, Ethiopia, Burundi, Mozambique and Congo DR. it engages in downstream sourcing and marketing of petroleum. The company trades in both crude and refined petroleum products which include motor fuels, industrial oils, LPG, aviation fuels, lubricants and various other specialist oils. The company commands 13.8% of the market share as at December 2015 (Petroleum Institute of East Africa, 2015).

The environmental turbulence in the oil industry has not spared the major Oil marketers either because they too have no ability to stop the discontinuous changes in the environment. The best they can do is to strategically respond to these changes to reduce their undesirable effects on the organizations performance. This research's purpose is to find if strategic inventory management systems, application affects performance of petroleum marketing firms. Lee and Kleiner (2001) stated that in order to manage inventory management successfully, "retailers should understand customer needs, vendor partnerships, technology, data integrity, and performance measurements".

Kiptugen (2003) noted that the old practice for managing inventories by petroleum firms is reactive. As a result, petroleum firms are faced with: increase inventory carrying cost; high premium freight charges; decreased customer satisfaction; diminishing assets utilization; and decreased supplier's performance. Most managers of today's oil marketing firms are reluctant to embrace the need for inventory management partly due to lack of expertise or managerial know how on inventory management systems. It's therefore important to analyze the role of different inventory management systems that may be used by petroleum marketing firms and see the effect of each system on the general performance of the firms.

Ndoti (2008) studied the strategic and operational responses by Kenya Petroleum Refineries Limited to challenges in the competitive business environment. Petroleum firms stand to benefit if they use strategic inventory management effectively since it helps in: keeping the cost of products or services low to allow the firm to offer customers better value for

money through competitive pricing, maintaining quality and reliability, thus product and service quality and process quality, increase speed of delivery of product and services, thus reduction in delays or stock outs, maintaining delivery reliability, thus delivery on time or ahead of time to secure repeat business, increase flexibility.

This study sought to establish the role of applying strategic inventory management systems on performance of petroleum marketing firms in Nairobi. The specific objectives were to determine the effect of applying strategic chip based fuel management system on performance of petroleum marketing firms in Nairobi, to investigate the effect of applying strategic economic order quantity (EOQ) model on performance of petroleum marketing firms and to examine the effect of applying strategic Always Better Control (ABC) analysis on performance of petroleum marketing firms.

The study was aimed at benefiting the petroleum marketing firms in understanding the role played by optimum usage of these inventory management systems. The findings are beneficial to petroleum station managers in understanding the need to hold desired stock when, how and what to order at specific times. The study helps the managers to choose the correct inventory systems to different applied situations and also to find out the extent and the applicability of using certain inventory management systems. This research is also a base for further research by other scholars.

## II. LITERATURE REVIEW

Wabobwa (2011) studied the impact of MRP on financial performance of Stabex Petroleum Ltd Company. The research covered a period of twelve months between the year July 2010 and June 2012. The study used data from the company's audited semiannual reports. The performance of the company was analyzed using ratios for the period before and after introduction of MRP. Data was analyzed using Microsoft excel and presented using tables and graphs. The researcher found that gross profit margin increased tremendously thus broadening the company's gross profit after introduction of MRP. The main limitation of the study was that profitability cannot be attributed to one inventory management system especially since many systems are implemented at the same time. The study was also limited to one oil marketing company with very small market share and could fail to give a true representation of other companies.

Tony and Zamolo (2005) studied the impact of strategic chip based fuel management system in inventory management and established that telecommunication had a direct relationship to inventory control systems. The researchers also focused on performance driven production planning and inventory control to process choice and established that inventory tracking system can result in effective inventory management in the supply chain.

Kagiri (2006) examined the concept of how to order. The researcher examined the strategic economic order quantity model whose aim is usually to minimize the total cost by balancing the cost of ordering material against the cost of storing material. The researcher used the model to show how to manage stock levels. It was established that in setting the maximum stock level, it was necessary to consider the availability of storage space and facilities, cost of financing stock, perishability and seasonal nature of stock.

Arrow et al. (2004) notes that a reorder point/EOQ system requires that for every item stocked in inventory, a determination is made of the point at which the item will be ordered and of the most cost-efficient quantity to order. The method also assumes a fairly constant lead time. All variables except time are constant. Assumptions for using the reorder point/EOQ method include that; Item cost does not vary, order size does not vary, lead time is constant and known, and Storage costs are linear (that is, they increase steadily as space increases (Kagiri, 2006).

Keya (2013) studied inventory control systems. Some of these benefits include: cost reduction and meeting anticipated customer requirements. The researcher looked at the benefit of applying Always Better Control (ABC) inventory management system to retailers. It was established that there are many benefits that accrue in efficient utilization of inventory management systems

Chege&Kihara (2012) investigated the challenges of strategy implementation for firms in the petroleum industry in Kenya. The study was guided by the objectives: to establish strategic management practices and to identify strategy implementation challenges in the petroleum industry in Kenya. The people interviewed were senior managers only. They observed that most senior managers recommended the funding and use of inventory management systems in their strategic plans. However, this required heavy investments for those companies that had no such systems in place.

A research by Wanjiru (2010) on factors that influence relocation of multinational oil companies from Kenya sought to determine the factors that have led shell Kenya to divest. A descriptive case study design was employed in the study. Study findings indicated that shell Kenya divested due to various contributing factors the most compelling being shrinking profit margins due to poor distribution and management of oil stocks. Among the recommendations that were made was that oil companies should strengthen their upstream operations not just focusing all their resources and competencies on the downstream operations. The researcher recommended further studies to be conducted on the subject of inventory management systems and their impact on performance of the industry.

### III. METHODOLOGY

This study adopted a descriptive survey design. Upagade and Shende (2012) explain that a descriptive survey is mainly concerned with description of facts only. The design is considered suitable as it allows an in-depth study of the role of applying strategic inventory management systems on performance of petroleum marketing firms in Nairobi.

The target population of the study was the 186 managers from head offices, supply terminals and retail centers within Nairobi county of the five petroleum marketing firms with large market share in Nairobi, thus National Oil Corporation, KenolKobil, Shell, Oilibya, and Total.

The study used stratified sampling method. Employees in each retail station and from different sectors were given an equal opportunity to be selected until the number making the sample is reached. According to Orodho, (2012), the goal of stratified sampling is to achieve a desired representation from various subgroups in the population. In stratified sampling, subjects are

selected in such a way that the existing subgroups in a population are more or less reproduced in the sample. The researcher used proportionate stratified sampling whereby the sizes of the samples from different strata are kept proportional to the different sizes of the strata (Cooper and Schindler, 2011).The researchers used proportionate sampling technique to draw a sample of 60 managers as the respondents of this study.

Both primary and secondary data was collected. The study employed structured questionnaires as the tool for data collection.The permission to collect data was facilitated by a letter of introduction from the faculty of Human Resource Development, Jomo Kenyatta University of Agriculture and Technology. The questionnaires were self-administered to the respondents. This method has been used by researchers in upholding confidentiality and anonymity of respondents when information is regarded as sensitive (Mosongo, 2013).

To test the validity and reliability of the questionnaires, a pilot study was carried out. The reason of pilot testing was to establish the accuracy and appropriateness of the research design and research instrument (Bryman, 2007 & Zikmund *et al.*, 2010). Newing (2011) indicates that field piloting is important and that it cannot be overemphasized since you will most likely find that there are questions that respondents fail to understand or interpret. Cooper and Schindler (2006) point that the respondents in a pilot test do not have to be statistically selected when testing the validity and reliability of the instruments. In this study, data collection instrument, which is a questionnaire, was tested on 10% of the accessible target population to ensure that the instrument was relevant and effective.

For this study, content validity test was the most appropriate form of measuring validity of data collection instrument. Usually, content validity is assessed using experts or professionals in a certain field (Mugenda&Mugenda, 2008). This study assessed content validity using two groups of experts in a regulatory body Kenya Institute of supplies management Nairobi. The first group was asked to establish if the sets of items in the data collection instrument correctly represented the strategic inventory management systems and the second one to establish the concept of performance that the instrument was measuring. The experts were convinced that the data collection instrument would achieve the desired results.

Reliability was assessed using Cronbach alpha coefficient because it has the most utility for multi-item scales at the interval level of measurement, requires only a single administration and provides a unique, quantitative estimate of the internal consistency of a scale (Cooper & Schindler, 2006). Cronbach's alpha ranges between 0 (denoting no internal reliability) and 1.0 (denoting perfect internal reliability (Bryman, 2007). The closer the coefficient is to 1.00, the more reliable the measurement (Mertens, 2010). Zikmund *et al.* (2010) view that Cronbach's alpha between 0.8 and above are considered to have very good reliability and those between 0.7 and 0.8 good; while those between 0.6 and 0.7 indicate fair and satisfactory reliability. In this study, a single test was administered to the selected 19 petroleum marketing firm managers and variances were computed for each likert scaled items. Variance for all scores was also computed. Cronbach's Coefficient Alpha was computed using this formula.

$$\alpha = \frac{n}{n-1} \left( 1 - \frac{\sum Vi}{V_{test}} \right)$$

Where:  $\alpha$  = Cronbach's Coefficient Alpha  
 n = Number of questions.

$V_i$  = Variance of scores on each question.  
 $V_{test}$  = Total variance of overall scores.  
 The reliability results are as shown below:

**Table 3.1: Reliability Results**

	<b>Cronbach's Alpha</b>	<b>No. of Items</b>
Strategic Chip Based Fuel Management System	.834	7
Strategic Economic Order Quantity	.921	4
Strategic Always Better Control	.902	8

The findings of the pilot test showed that 'Strategic Chip Based Fuel Management System' scale had a Cronbach's reliability alpha of 0.834, 'Strategic Economic Order Quantity' scale had an Alpha value of 0.921 and 'Strategic Always Better Control' scale had an Alpha value of 0.902. The pilot test showed that the scales measuring the objectives had a very high reliability. Therefore there was no need for amending the items in any of the objectives of the study.

Data was summarized to present major characteristics of key variables as they relate among themselves. The researcher used excel Microsoft package, statistical package for social sciences (SPSS) for analysis of the findings. In addition, data and results were presented in the form of tables. The study also used multiple regressions in explaining variations. ANOVA technique was used to test the significance of the regression models.

**IV. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

This section presents the study findings, conclusions and recommendations as follows:

**1.1 Findings**

On the effect of Chip based fuel management system on the performance of petroleum marketing firms, the study established that applying strategic chip based fuel management system significantly influenced the performance of petroleum marketing firms positively. Strategic chip based fuel management system helped the organizations to track, store, manipulate and distribute information to the appropriate people when need be. The study also noted that strategic chip based fuel management system streamlines processes and ensures accuracy and timeliness of record-keeping. The system eliminates human error, assuring timely, accurate and detailed information capture for each vehicle and each fuelling session. It was also found to be promoting better security, better tracking, and operation-wide, in real time. The findings are in line with the research by Lambert and Cooper, (2008) that chip based fuel management system enhance the organization's communication, reduce human labour, support short- and long-term business goals and distribute complex information.

On the effect of strategic EOQ model on the performance of petroleum marketing firms, there was a strong positive correlation between application of strategic economic order quantity and performance of fuel marketing firms. The study noted that applying strategic economic order quantity model influenced the performance of petroleum marketing firms to a great extent. The study also revealed that EOQ allows petroleum

marketing firms to buy larger quantity in fewer orders to take advantage of discount bulk buying and minimizing order costs and that the petroleum marketing firms can maintain sufficient inventory levels to match customer demands. Further the study established that the petroleum marketing firms' experienced smooth fuel re-stocking process which results in better customer service as inventory is available when needed. Through EOQ, the petroleum firms avoid costs associated with stock outs and help in monitoring stock movements. The findings are in line with the research by Porter and Kramer (2006) that economic order quantity aids the marketing companies in forecasting more accurately according to each product and their demand behaviours. The findings also concur with the research by Lyons and Farrington (2006) that the economic order quantity allows the company to optimize each order and reduce the total cost. As a result, the company would ensure enough products are in stock to satisfy customers demand and save money.

On the effect of Strategic ABC analysis on the performance of petroleum marketing firms, there was realized a strong positive correlation between application of strategic economic order quantity and performance of fuel marketing firms. The study revealed that Strategic ABC analysis, allows the petroleum marketing firms to use its resources prioritize control of high-value inventory over inventory that has a lower impact on its bottom line, the system has considerably reduced clerical costs and ensures that stock is maintained at optimum level. Strategic ABC analysis helps in maintaining enough safety stock for C category of items. It allows proper regulation of investment in inventory which ensures optimum utilization of available funds. The study also revealed that strategic ABC inventory analysis helps in maintaining a high inventory turnover rate by developing scientific method of controlling inventories. The study results also showed that most of the firms recorded very high improvements on overall profitability, quality of customer service.

Further the study noted that petroleum marketing firms recorded improvements on positive customer compliments, level of efficiency, and customer trust and loyalty number of new customers and reduced number customer complains. The findings concur with the research by Christopher (2013) who found that ABC analysis helps management to categorize inventory based on the value contribution to total sales. The findings also concur with Flores and Whybark (2014)'s study findings that ABC classification thus helps management allocate scarce resources and budgets to manage and stock items based on their sales/consumption value.

## 1.2 Conclusions

The study concludes that application of the strategic inventory management systems; chip based fuel management system, Economic Order Quantity model and ABC analysis influence the performance of petroleum marketers positively. Each inventory management system contributes to a significant extend to the overall improvements in various operational areas of the petroleum marketing firms.

## 1.3 Recommendations

Based on the study findings, the study recommends that petroleum marketers should increase the number of services possible through chip based fuel management system. This will help to enhance quality in service delivery, efficiency accountability and consistency in operations.

Supply chain management departments of petroleum markers should embrace Economic Order Quantity models by installation of high grade features and staff training since they significantly reduce ordering and handling costs.

More investment should go into ABC analysis inventory management systems since they drive profitability. The Petroleum marketing firms should seek to integrate all strategic inventory management systems to one platform so that information sharing and duplication of system functions can be reduced.

## V. SUGGESTIONS FOR FURTHER RESEARCH

The current study focused on the role of strategic inventory management systems on performance of petroleum marketing firms in Nairobi. Future studies should focus on single inventory management system in a bid to reduce the scope but increase the depth of the research. A further study can be carried out to investigate the challenges faced by petroleum marketing firms in embracing the strategic management systems

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