ROLE OF INVENTORY MODELS ON SUPPLY CHAIN PERFORMANCE IN LARGE MANUFACTURING FIRMS IN NAIROBI COUNTY, KENYA

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Abstract: **Large manufacturing firms are key to the Kenyan economy due to their immense contribution in job creation and to the overall government revenue. The firms however have been in the recent years facing tremendous challenges as evidenced by decline in their annual sales and profits, and loss of their market share to international companies. The companies have exceedingly fallen short of customer service and satisfaction due to increased lead time, compromised quality and lack of innovation. Available evidence shows that distribution systems management through inventory models have a significant effect on the supply chain performance. This however is yet to be proven in a local context particularly among the large manufacturing firms in Kenya. We used a descriptive research design to collect and analyse data from a sample size of 384 supply chain managers drawn from the large manufacturing companies in Kenya .A structured questionnaire was used to collect the data which was analysed through descriptive and inferential statistics. The findings revealed that the inventory models (Just-in-time, Just-in-case and manufacturer dominated) positively and significantly influenced the supply chain performance of large manufacturing firms in Kenya. The study concluded that inventory models were key in enhancing the customer satisfaction through reduction of waiting time and promoting cost saving for the inventory holding. The supply chain managers ought to uphold the appropriate model of inventory as a way of ensuring proper distribution so as to achieve supply chain performance.**

Keywords: **Inventory models, Supply chain performance, Large manufacturing firms, Distribution systems.**

1. INTRODUCTION

1.1 Background of the Study

The aim of this paper was to examine the role of inventory models on the supply chain performance in large manufacturing companies in Kenya. An inventory model is a framework set to align and provide guidance on how inventory ought to be managed based on the levels of inventory to be held, the period to order and warehouses that require inventories higher than others as well as the freight mechanisms of the inventory (Sharma & Arya, 2016). Many companies' inventory policy is to hold sufficient finished stock to meet the market demand while minimizing the holding costs, and to enable them meet their objectives, computerized inventory management systems are introduced. Although commercial packages have done much to the discipline of inventory management, the mathematical techniques embodied in the software have not kept pace with developments. The systems can give the companies opportunities to maintain detailed stock records, but one of their major limitation is that they rely on accurate setting of various control parameters not calculated by the software and therefore they should be improved by calculating and monitoring the value of the relevant control parameters (Muhayimana, 2015). Automated inventory management also requires a lot of information processing within and outside the organization and the transformation, storage and communication of information about the inventory in the stock points as well as in the intermediate processes across the supply chain is highly complex.

Eroglu and Hofer (2011) by examining how the market values the firms with respect to their various inventories models, reported that firms with abnormally high inventories have abnormally poor stock returns, firms with abnormally low inventories have ordinary stock returns while firms with slightly lower than average inventories perform best over time. Inventory models give the required levels of inventories that warehouses should as well as the retailers through which the chain flows to the manufacturer (Duru, Oleka & Okpe, 2014). For distribution systems management to be successful, the inventory models ought to be clearly aligned through which supply chain performance is enhanced. Inventory models under consideration include Just in Time (JIT), Just in Case (JIC), and Manufacturer Dominated (MD) models. Just in Time (JIT) model sets the ending inventory level of all products at all members for all periods at zero. JIT aims to reduce inventory by receiving goods only as needed, thereby reducing holding cost and cash requirement. Just in Case (JIC) model allows ending inventory level to be set optimally at any member for any product for any period. Manufacturer Dominated (MD) model sets the ending inventory level of all products for all periods at manufacturer to be zero (Zhao, Wu & Yuan, 2016).

Application of SCI by the manufacturing companies in Kenya has spurred accomplishment of the organizations' strategic goals, decrease in risks as well as enhancement of internal and external synchronization of management process. Supply chain performance is an overall performance measurement that depends on the performance of the supply chain stages. The performance of supply chain can be defined by supply chain profitability, which has only one source of revenue: the customer (Prajogo & Olhager, 2012). According to Singh and Sohani (2011), supply chain performance is the degree to which a supply chain fulfils end user requirements concerning the relevant performance indicators at any point in time and at what total supply chain cost. On the other hand, Thatte and Agrawal (2017) define large manufacturing firms as those that share a market share of 3% or more based on their location and have over 100 employees. However, this limitation is based on the specific assumptions given by the relevant bodies governing the manufacturing firms in specific countries (Thatte & Agrawal, 2017; and Piery, 2011). The study only focused on the large manufacturing firms.

1.2 Statement of the Problem

The large manufacturing companies in Kenya have in the past four years reported close to 32% decline in profits as a result of poor distribution systems which have seen their customer drop by over 40% while opting to other suppliers (GOK, 2016). According to Awad and Nassar (2010), lack of integrated supply chains has continually affected most of the manufacturing companies negatively by increasing the lead-time, increasing the inventory and not meeting customer needs.

Inventory models have been regarding as a key strategy towards enhancing the supply chain performance. The inventory models uphold the need for integrating the distribution process to minimize the inventory levels while at the same time reducing lead-time and meeting customer needs is the sole aim of distribution systems management. Locally, very little has been done with regard to the inventory models and how the influence the supply chain performance. Moreover, no available study locally that has addressed the aspect of inventory model in the large manufacturing firms despite the challenges the firms face and their immense role in the economy. This paper therefore sought to fill the existing gaps by assessing the role of inventory models on the supply chain performance in large manufacturing companies in Nairobi County, Kenya.

1.3 Specific Objective

i. To examine the role of inventory models on supply chain performance in large manufacturing companies in Nairobi County, Kenya.

1.4 Research Question

i. What is the role of inventory models on supply chain performance in large manufacturing companies in Nairobi County, Kenya?

2. LITERATURE REVIEW

2.1 Theoretical Review

Lean Theory

Coined by Krafcik in 1988 (Ohno, 1988) and defined by Womack, Jones and Roos (1996), lean theory of supply chain upholds the need for inventory management policies and practices to steer effectiveness and efficiency in the supply chain. Lean theory is an extension of ideas of just in time. Dombrowski and Mielke (2014) elaborate just in time as a pull-

based system designed to align the production and business processes throughout the supply chain. Green and Inman (2005) assessed the impact of lean theory on financial performance. They say that theory may eliminate buffer stock and minimize waste in production process. Eroglu and Hofer (2011) found that leanness positively affects profitability of a business firm. They argue that inventory leanness is the best inventory control tool. The theory elaborates on how manufacturers gain flexibility in their ordering decisions, reduce the stocks of inventory held on site and eliminate inventory carrying costs. At the aggregate level, the empirical strength of the lean explanation lies both in the timing and the magnitude of the adoption. However in the theory, inventory constrains a firm's ability to respond to fluctuations in demand. Scholarly studies indicate that companies successfully optimize inventory through lean supply chain practices and systems to achieve higher levels of asset utilization and customer satisfaction leading to improved organizational growth, profitability and market share (Green & Inman, 2005).

According to Goldsby and Martichenko (2005), Lean Theory explains inventory policies as a major component of any supply chain irrespective of whether it is product or service supply chain. Inventory policies play an important role in matching demand and supply within the each and every partner in the entire supply chain, ultimately providing flexibility in coping up with external and internal events of the today's uncertain, globalized business environment (Isaksson & Seifert, 2014). Ineffective inventory control is a major problem faced by industries in developing countries and that even the very basic inventory control concepts and techniques are not used by the majority of the companies studied. Due to the heavy reliance on imported industrial raw materials and parts, and the endemic bureaucratic delays and associated communication problems in developing countries, order lead times cannot be computed with any degree of accuracy (Womack, & Jones, 2003).
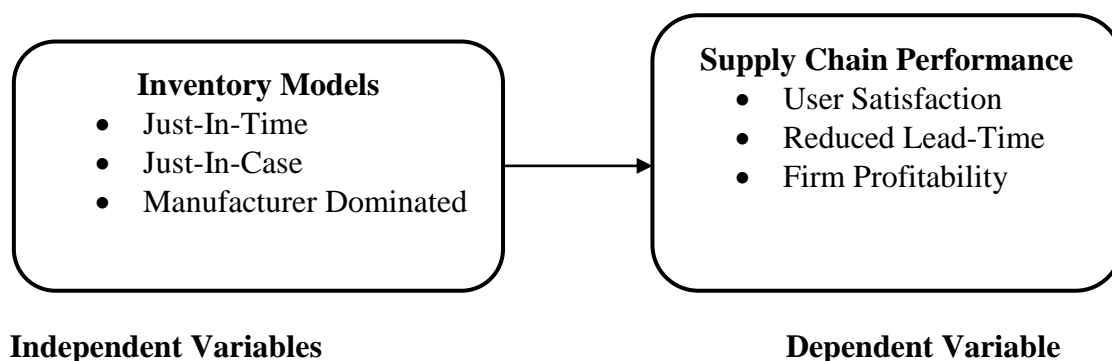
2.2 Conceptual Framework

Figure 1: Conceptual Framework

2.3 Empirical Review

Inventory Models and Supply Chain Performance

Distribution systems are key to organization performance through enhanced customer satisfaction and cost saving (Sekeroglu & Altan, 2014). This however requires an integrated system to ensure the inventory levels are well monitored not to be too high or low in line with customer needs and saving on inventory holding costs. Inventory models is an aspect of distribution systems management that shows the limits of inventory levels and how to keep the flow as effective with the focus on customers and cost saving.

In a study on the review of inventory management strategies, Priyanka and Hemant (2015) proposed that coming up with inventory models is one of the best approaches towards enhancing effective flow of inventory and ensuring the customer needs are met. Kaorapapong and Yenradee (2018) analysed the impact of pricing and inventory models with benefit sharing mechanism on supply chain performance. The study sought to assess how inventory models and pricing affected the supply chain performance. The scholars established that the inventory models such as Just-In-Time and manufacturer dominated policies influenced the flow of inventory thus determining the success of supply chain. They concluded that distribution systems are dependent on the inventory models through which the manufacturer, the warehouses and the retailers are aligned to integrated inventory flow.

Samvedi and Jain (2011) studied the impact of various inventory policies on a supply chain with intermittent supply disruptions in India. The study sought to assess the effect of inventory models on the recurrent disruptions on the supply chain. The findings revealed that inventory models such as the ordering quantity and the inventory flow framework influenced the supply chain disruptions through lack of consistency and alignment of the models towards the specific needs of different supply chains and customer needs. According to Samvedi and Jain (2011), the inventory models show the mainstream of inventory and how goods flow to the final consumers through a properly aligned chain towards the success of the supply chain. The scholars suggest that the main models that should be put in place when managing inventory are the costs and the inventory review period. They argue that having more inventory will definitely cost more and with increasing review period there will be less inventory replenishments and thus the inventory costs will come down (Samvedi & Jain, 2011).

3. RESEARCH METHODOLOGY

A descriptive research design method was adopted in the study. The method includes the phenomena explanation, proportion estimation of a population that contains similar characteristics and establishing the occurrence relationship relating to the variables under study (Myers, 2013).

The population targeted for the study incorporated of the large manufacturing firms (more than one branch, an annual turn-over of more than Kshs. 100 million or more than 50 to 500 employees) in Kenya (Waweru, 2018). According to KAM (2017), there are approximately 454 large manufacturing firms in Nairobi as at July 2017. The following sampling formula by Mugenda (2008) was adopted to obtain the appropriate sample size for the study.

$$n = \frac{Z^2 pq}{d^2}$$

$$n = 384$$

The study adopted self-structured questionnaires to gather data from the respondents. Primary data was collected through the administration of questionnaires to the procurement or supply chain managers or their representatives at the manufacturing firms.

Mixed method of data analysis was applied in various stages of the study whereby both quantitative and qualitative techniques were adopted in the analysis. The acquired data was examined and scanned for any errors and later coded in the SPSS version 24 program. Through use of the coded data, the researcher generated statistical features such graphs, tables, and pie-charts which later was used in presenting the results of the study. Qualitative data was checked through and compared based on the relevancy and presented in form of explanations.

A multiple regression model was used to test for the relationship between the variables. The model combines the influence of the main independent variables on the dependent variable. The model was of the form;

$Y = \beta_0 + \beta_1 X_1 + \varepsilon$

Where;

Y = Supply Chain Performance of Large Manufacturing firms

β_0 = Constant Term

β_1 = Constant regression coefficient representing the condition of the independent variable to the dependent variable (Beta coefficient)

X_1 = Inventory Models

ε = (Extraneous) Error term

4. RESEARCH FINDINGS

4.1 Inventory Models

The study sought to assess the influence of inventory models on supply chain performance in large manufacturing firms in Nairobi County, Kenya. The study sought to find out the rating of the main aspects of inventory models which included just-in-time, just-in-case and manufacturer dominated. The findings imply that most of the large manufacturing countries upheld just-in-time model of inventory management which encompasses on production and distribution of only what is needed, when it is needed and to the needed quantities to minimize costs, wastes and defaults. The findings further revealed that most of the companies had not embraced frequent monitoring to ensure the inventory policy applied was effective and leading to effective flow of gods to the customers and this could negatively affect the adherence to the inventory policies and models and so is to the supply chain performance.

Table 1: Level of Agreement with Statements on Inventory Models

Statement	N	Mean	Std. Deviation
The company has embraced Just-In-Time policy as a way of eliminating costs and enhancing efficiency	259	3.57	1.30
Just-In-Case policy is used in our company when the future demands are projected to increase	259	3.42	1.38
Our company mainly relies on how well the plant is able to manufacture and this is the level of inventory held	259	3.63	1.15
Through the inventory policies were are able to minimize costs and meet lead time for customer satisfaction	259	3.52	1.27
There are frequent monitoring to ensure the inventory policy applied is effective and leading to effective flow of gods to the customers	259	3.27	1.47

4.2 Supply Chain Performance

The study sought to find out the supply chain performance of large manufacturing firms in Nairobi County, Kenya. The main aspects of supply chain performance considered in the study included lead time and customer satisfaction. The findings show that for the large manufacturing firms to regain their competitiveness they ought to strive to enhance customer satisfaction through effective distribution systems.
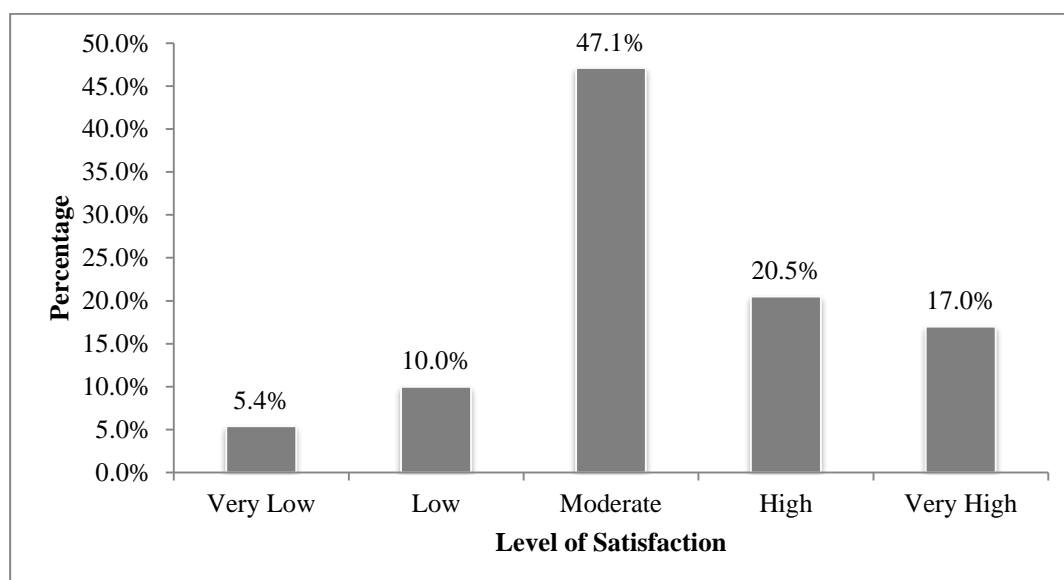

Figure 2: Customer Satisfaction

The study further sought to find out the supply chain performance in terms of lead time. This is the ability of the companies to deliver the customers' orders at the expected time. The findings as shown in Figure 3 revealed that 41.7% of the firms had met the lead time to a high extent while 20.5% had met the lead time to a very high extent. This is an indication that the manufacturing firms had enhanced minimization of lead-time which is a key step towards achieving customer satisfaction and enhancing the overall firm performance and competitiveness.
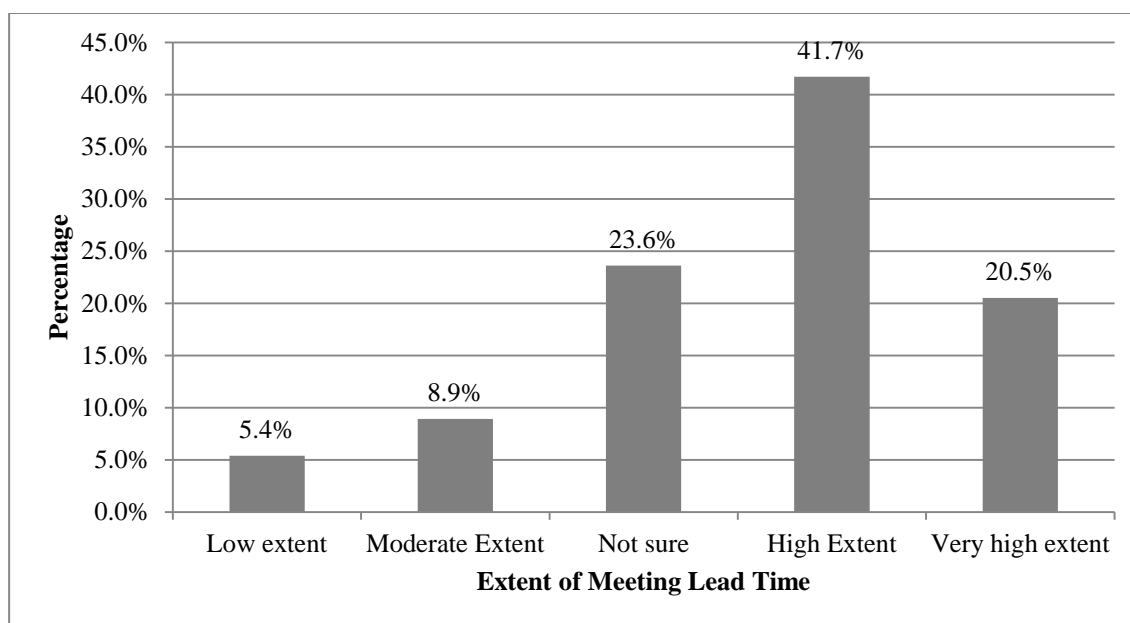
Figure 3: Lead Time

4.3 Inferential Results

The inferential results for the model are as shown in Table 2. As the results show, the R square (R^2) for the model is 0.692 which means that 69.2% variation in supply chain performance was due to variations in inventory models, with 30.8% of variation in supply chain performance being explained by other factors.

Analysis of Variance (ANOVA) consists of calculations that provide information about levels of variability within a regression model and form a basis for tests of significance. From the findings, the significance value is .0000 which is less than 0.05 thus the model was statistically significant in predicting how inventory models influenced supply chain performance.

The regression coefficient results show that holding inventory models constant at zero, supply chain performance would be 6.431. A unit increase in inventory models would lead to a 68.0% increase in supply chain performance. At 5% significance level, inventory models had a p=0.0004 which is <0.05, and hence the inventory model has a significant influence on supply chain performance in large manufacturing companies.

Table 2: Inferential Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.832[a]	0.692	0.691	.8843

Predictors: (Constant), Inventory Models

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	489.644	1	489.644	626.109	.0000[a]
1	Residual	218.190	257	.7820		
	Total	707.834	258			

a. Predictors: (Constant), Inventory Models

b. Dependent Variable: Supply Chain performance c

Regression Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	6.431	.712		9.032	.0000
Inventory Models [X_1]	0.680	.188	.645	3.617	.0004

a. Dependent Variable: Supply Chain Performance

5. DISCUSSION

The findings revealed that the major aspects/models of inventory were Just-In-Time, Just-In-Case and manufacturer dominated. Most of the firms had embraced Just-In-Time which upholds the production and distribution of what is needed, when it is needed and in the quantities that are needed as a way of minimizing costs and enhancing quality which is key to the supply chain performance among the large manufacturing firms. Majority of the respondents agreed that their respective companies embraced Just-In-Time policy to steer their supply chain and efficient distribution system towards enhancing the supply chain performance. It was however established that monitoring of the inventory models was not effectively done to ensure the right policies/models were adopted and adhered to. The inferential results from the regression model confirmed that indeed inventory models had a significant and positive impact of the supply chain performance of the large manufacturing firms.

6. CONCLUSIONS

The study concluded that inventory model had a significant effect on the supply chain performance among the large manufacturing companies. The companies relied on Just-In-Time inventory model to reduce the cost of operations and enhance the distribution effectiveness towards meeting the customer needs.

7. RECOMMENDATIONS

The study recommends that the management of the large manufacturing firms ought to embrace inventory models as a way of enhancing the supply chain performance. Through Just-In-Time model and other effective inventory models, the distribution will be enhanced while saving on inventory-holding costs and improving the quality of supplies.

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