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# The Effect of Inventory Forecasting on The Performance of Fast-Moving Consumer Goods Manufacturing Firms in Kilifi County, Kenya

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**Abstract:** Inventory forecasting practices are pivotal for FMCG manufacturing firms in Kenya's competitive market in order to improve their operational performance. The fast-moving consumer manufacturing firms have been experiencing performance challenges that affect their daily operations through increased production costs, increased lead-time, poor customer satisfaction. The study sought to determine the relationship between inventory forecasting practices and performance of fast-moving consumer manufacturing firms in Kilifi County, Kenya. The study targeted 11 Fast-moving consumer manufacturing firms in Kilifi County, Kenya as unit of analysis while procurement officers, logistic officers, transport officers, distribution officers and warehouse officers were the unit of observation. The target population was 2922 and therefore the sample size of 351 respondents was determined using Yamane 1967 sampling formula. The study adopted stratified random sampling. The research was anchored on two theories Systems Theory and the Theory of Economic Order quantity (EOQ). The study used descriptive research design, the study targeted 351 respondents comprising of procurement officers, logistic officers, transport officers, ware-housing officers. Primary data was collected through structured questionnaires. Data was analysed using SPSS version 31 where descriptive statistics such as means, standard deviation, frequencies and percentages were used. Correlation analysis was done to test the strength and direction of linear relationship between variables. Multiple regression analysis was conducted to determine the relationship between independent and dependent variables. A pilot test was conducted with 10% of the sample size and it showed strong reliability (Cronbach's alpha = 0.795) The pilot test results revealed that the data collection instruments used in the study were both valid and reliable. Inventory forecasting demonstrated a strong positive relationship with performance. The study concluded that effective inventory forecasting plays a key role in boosting the performance of FMCG manufacturing firms in Kilifi County.

**Key words:** Inventory Forecasting, Performance, Manufacturing firms, Consumer Goods

**Background of the study**

## I. Introduction

Performance of Fast-Moving Consumer Goods (FMCG) manufacturing firms is integral to both global and national economy, encompassing a wide range of products that are consumed on a daily basis such as food, beverages and personal care products. Despite the contribution of FMCG firms to the Gross Domestic Product (GDP), These firms are facing operational performance challenges caused by fluctuations in consumer demand which leads to inventory imbalances and stockouts, short shelf lives, requiring rapid inventory turnover and efficient distribution, poor customer service caused by delayed deliveries and increased production cost associated with poor inventory practices and execution. (KNBS 2023) report.

In a perfect world, a company could keep all of its inventory in every location that serves every client, but very few commercial operations could afford to take on the risk and expense of such a costly inventory deployment strategy (Bowersox et al., 2020). Excessive inventory ties up capital and incurs holding costs and by managing inventory effectively, manufacturing firms can avoid overstock situations, freeing up resources for other business needs (Disney, Maltz, Wang & Warburton, 2016). Simiyu and Osoro (2024) reasoned in their study on inventory management practices that poor inventory management systems in FMCG are wanting and that a lot of attention should be attached to it so that performance can be improved. According to Bowersox et al. (2020), a competitive inventory management strategy necessitated combining five elements of selective deployment: transportation integration, time-based performance, product profitability, core customer segmentation, and competitive performance.

Globally, numerous research been studied in the world. According to a study by Afrifa et al. (2021) on abnormal inventory and how it affects manufacturing companies in the United Kingdom, it's important to balance abnormally high and low inventories because they have an impact on a company's performance. Chinello et al., (2020) assessed inventory optimization among Danish companies in the toy manufacturing industry and noted that poor inventory optimization may lead to inconsistent ordering patterns, straining ties with vendors and potentially affecting future collaborations and associations. Moreover, performance. Managing inventories effectively directly impacts achievement in a number of areas, including cost efficiency, customer satisfaction furthermore operational productivity. Crooymans et al., (2021) in a study in Europe about inventory management in the Office Depot recommended that putting a lot of emphasis on inventory control systems is therefore essential for manufacturing companies'

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performance. According to Amosu et al. (2025), adequate inventory levels, including safety stock, help prevent stockouts. Without stockouts, production can continue smoothly, reducing delays and ensuring products are available when needed, thereby improving organizational performance. This study examined the impact of inventory management and procurement practices in Indonesia's Halal logistics.

Regionally, there are studies that have been undertaken. Akinlabi (2021) conducted a regional study on flour milling companies in Nigeria, finding that maintaining adequate stock levels to satisfy both customer needs and production requirements is essential for enhancing operational performance. Makorava (2021) studied inventory optimization in South African manufacturing firms and emphasized that effective inventory optimization is integral to streamlining operations, reducing costs and enhancing the overall agility of manufacturing firms. The consequences of lack of inventory management techniques in inventory optimization especially in manufacturing firms can be detrimental to a business and its overall operations and performance as well. Mbugi and Lutego (2022) carried a study in Tanzania among manufacturing firms particularly on how inventory control management affect their performance and stated that the success of inventory optimization depends on a thorough understanding of demand patterns, strong supply chain management procedures and efficient technology use.

Turgay and Dincer (2023) explored inventory allocation optimization in the fast-moving consumer goods (FMCG) sector and found that adopting stochastic models can effectively address the challenges and complexities within supply chain systems. Similarly, Olutimehin et al. (2024) investigated strategic operations management in FMCG firms and concluded that implementing best practices such as Implementing a just-in-time approach effectively cuts down the expenses tied to inventory storage. Eze et al. (2024) looked into how Nigerian FMCG companies' The efficiency of inventory systems directly impacts the operational outcomes of manufacturing enterprises. Their research made clear that one of the main factors influencing increased operational efficiency is effective cash flow management. Amosu et al. (2025) investigated inventory strategies and manufacturing companies' business performance and noted that efficiently optimized inventory is key to ensuring enhanced business performance among FMCGs. After using a descriptive research approach and gathering information via questionnaires, they further came to the conclusion that effective inventory control systems directly and favorably affect production.

Locally, studies have equally been done on inventory optimization and performance. A well-optimized inventory management system can help minimize lead times, improve general supply chain efficiency, and improve responsiveness to market demands, all of which can have a positive impact on an organization's performance. According to Kazungu and Ochiri's (2019) study on the optimization of inventory on state corporation performance in Kenya. Munyua and Wambua (2023) assessed the factors that influence inventory control in in the public sector in a case study of ministry of health and concluded that inadequate inventory control may lead to stockouts, disappointing customers and potentially causing them to seek alternatives and affect organizational performance. Muiruri and Ochiri (2019) emphasized in their study on inventory control procedures among manufacturing firms in Nairobi that top management contributes significantly to the administration and optimization of inventory. It has been noted that inventory levels have a significant effect on the lead time (Amosu et al., 2025). Barongo and Moturi (2025) on their study on inventory control noted that level of control systems concerning inventory is very essential. Even though lead time can be unpredictable due to various things like supplier delays or unexpected demand spikes, efficient handling of inventories including safety stock strategies, helps mitigate the result of lead time variability (Barongo and Moturi, 2025).

**Statement of the Problem**

Kenya’s rapidly expanding fast-moving consumer goods (FMCG) segment has been a major driver of industrial growth, benefitting from the particularly increased demand for food and beverages(F&B) and personal care products (KPMG 2019) as evidenced by the market entry of international firms and increased investments on the existing firms among them Pepsi, Coca cola and Wrigley’s Kenya (KPMG Report,2023).The manufacturing sector is the largest contributor of the GDP to the Kenyan economy (KAM 2023). Despite this attraction of international key players into the country and the potential future growth of these firms, some of the FMCG such as Cadbury Kenya closed down its Nairobi plant operations in 2021 due to poor performance (Okumu&Kariuki,2021). Eveready East Africa also closed down its plant in Nakuru, Kenya due to poor performance and increased production costs.

Kenya Association of Manufacturers (KAM) 2022 report, FMCG contributed the highest share to the national GDP, although this share was lower than in previous years 44.22% in 2017, 2018, and 2019, and 43.44% in 2020. In light of this, FMCG manufacturing firms have been experiencing challenges like increased production cost, increased led time associated with poor inventory optimization which affects their operational performance and forcing them to scale down operations or close completely.

Several studies have explored the effect of inventory forecasting. Kwakami et al., (2021) studied seasonal inventory management model in the steel industry in material management; Goltsos, Syntetos, Glock and Ioannou (2022) assessed inventory forecasting with the aim of minding the gap; Mbugi and Lutego (2022) studies the effects of inventory control management systems on organization performance among beverage manufacturing firms; while Turgay and Dincer (2023) assessed the optimization of inventory allocation for fast moving consumer goods. Nevertheless, none of these studies showed the relationship between inventory optimization practices and operational performance of fast-moving consumer goods manufacturing firms (FMCG) in Kilifi County, Kenya. To fill the highlighted gaps, the current study sought to establish the relationship between inventory optimization practices and operational performance of fast-moving consumer goods.

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**Objective of the study**

To establish the effect of inventory forecasting on the performance of FMCG manufacturing firms in Kilifi County, Kenya.

**Research Hypothesis**

**$H_{01}$**: There is no statistically significant effect of inventory forecasting on performance of fast-moving consumer goods manufacturing firms in Kilifi County, Kenya.

**Theoretical Framework.**

The study was anchored on two theories: systems theory and theory of economic order quantity (EOQ).

**System Theory**

Ludwig von Bertalanffy introduced systems theory in 1936, offering a framework for understanding organizations as collections of interconnected and interdependent components. These systems, whether simple or complex, work together to achieve performance objectives (Oberg et al., 2019). Essentially, they are a series of coordinated activities designed to fulfill organizational goals and can be categorized as either open or closed systems.

A good example is inventory optimization systems, which organizations use to streamline operations and improve efficiency. Systems theory is grounded in two core assumptions. The first is the epistemological hypothesis, which proposes that groups will inherently utilize established processes and allocated resources within their environment to produce desired outcomes. Secondly, ontological postulation that the external environment plays a significant role in determining the output of the business (Oberg et al., 2019). Budget systems are crafted in a manner that reflects the operations of the organization. It provides an approach where the nature of the systems is able to basically be understood. Smaller systems or subsystems in the organization equally change from time to time depending on the dynamics of the business environment.

It is sensible to point that the logistics management is supposed to ensure effective and efficient goods and services delivery (Claro & Loeb, 2019). Systems theory suits this study since in manufacturing firms, there is contacts with external world as they regularly use systems and distribute or apply for supplies in various organizations sometimes seeking means of reduce cost, lead Time, inventory turnover and improved customer Service. Various parts of the manufacturing companies have internal contacts within in order to have material and information exchange. Inventory visibility and order processes are part of the systems in the organization and hence this theory applies to the variables (Mikhago et al, 2024)

One of the advantages of systems theory is that it supports sharp understanding of processes within an organization which is useful in inventory optimization because the different departments like procurement, warehousing and logistics have to work together. In addition to this, it pays attention to feedback and adaptability as important organizational features. Its main weakness however, is that it can be too vague with abstract concepts and is lacking in tools or methods for practical implementation. Flood (2021) observed that it may lack consideration for human dynamics impacting organizational decision making such as conflict over authority or change aversion because it assumes organizations function solely as rational systems.

**Theory of Economic Order Quantity (EOQ)**

The theory of Economic order quantity was first developed in 1913 by Ford W. Harris and last modified by Coleman (2002) and Ogbo (2011) EOQ model focus on ordering portions that minimizes the stability of the cost between the inventories holding costs and re-order costs. The model makes an assumption that all other variables are constant and disregards the fact that uncertainties are frequent and ordinary in all firms. For instance, uncertainties comprise of change in the level of demand, damage while transporting an item and holdups during the delivery process. In this case, uncertainty in the level of demand would consequently compel EOQ to be adjusted so as to shield against uncertain business situation Barongo & Moturi, 2025).

One weakness of EOQ is that it tends to ignore the necessity to have shield safety stocks, which are preserved in order to cater for deviations during led-time and demand making and as such, this make it complex to be practiced Oboge et al, 2024). This theory supports the variables on inventory forecasting and safety stock-levels which are crucial to ensure continuity of the firm's production in the event of supply chain disruptions**.**

Like any other model created for real life problems, EOQ seeks to limit costs and overhead associated with items in stock by splitting inventory expenses between ordering and holding (Mikhago & Atieno, 2024). The EOQ model is best suited for relatively stable operating conditions where demand as well as lead times are easy to predict. However, this is also its biggest limitation. The model demands constant order quantities, set timeliness prerequisite intervals before restocking can happen followed by instant full stock replacements which almost never happen amidst modern day supply chain realities especially in fast paced sectors like FMCG. Barongo and Moturi (2025) noted that it also does not capture dynamic factors such as seasonal shifts, abrupt changes or layered stock environments thus restricting use in more flexible enhanced technologically sophisticated spaces.

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## II. Literature Review

### Inventory Forecasting

Inventory forecasting involves predicting the future needs of the inventory. Data is therefore essential in giving guidance and coming up with forecasting techniques that is best suited for te organization. Knowing the right stock levels is vital to maintaining sufficient inventory to meet customer needs, and this depends on accurate inventory forecasting (Goltsos et al., 2022). Inventory optimization is a key element of effective inventory management, helping to control costs, improve customer service, and build a more responsive and resilient logistics system (Adinortey, 2015). Maintaining accurate inventory levels helps businesses avoid excess storage costs while ensuring product availability when needed.A solid inventory management approach is guided by five strategic principles: core customer segmentation, product profitability, integration with transportation, time-based performance, and competitive positioning (Bowersox et al., 2020). Poor inventory management, particularly in manufacturing, can lead to serious disruptions in logistics and negatively affect the entire business operation.

Using a dependable technique in demand forecasting is useful and there is need to consider supply chain seasonality as well as reliability (Tadayonrad & Ndiaye, 2023). Forecasting demands for the materials for production and other manufacturing matters in addition to distribution elements. Poor techniques in demand forecasting will have an effect on inventory forecasting and the eventual inventory and logistics performance (Nallusamy, 2021). Bayraktar et al., (2020) on the other hand assessed supply chain performance where they did a causal analysis and the findings indicated that retailers were influenced by seasonality and trends in inventory forecasting. Kwakami et al., (2021) studied seasonal inventory management model in the steel industry in material management and emphasized on the need to calculate the seasonality trend in order to have a desired and standard inventory level.

Deng et al., (2023) found out that demand forecasting helps in reducing inventory cost. Tang et al., (2022) on the other side assessed integration of demand forecasting and manufacturing management and concluded that integration of smart warehousing ensures the use of modern forecasting techniques which allows for desirable inventory. Understanding the industry and the trends in the buyer behavior is a key ingredient in forecasting inventory levels and enhancing supply chain performance (Rubel, 2021). Having and ERP systems makes it easier for information sharing that will enhance inventory forecasting (Shafiee et al., 2021).

## III. Research Methodology

This study adopted a descriptive design, focusing on supervisors and managerial personnel working within FMCG manufacturing companies located in Kilifi County. A descriptive approach was suitable as it allows for the detailed examination of the characteristics of the phenomenon under investigation. This approach was ideal for assessing the impact of inventory optimization on operational performance. The target population was 2922 and therefore the sample size of 351 respondents was determined using Yamane 1967 sampling formula. The study adopted stratified random sampling.

$$n = \frac{N}{1+Ne^2}$$

Where: $n$ = the calculated sample size; $N$ = the total population size; $e$ = the margin of error, set at 5%

$$= \frac{N}{1 + N(e^2)}$$

$$n = \frac{2922}{1 + 2922(0.05^2)} = 351$$

## IV. Results and Discussion

The study involved issuing a total of 351 questionnaires to the targeted respondents. Out of these, 343 were successfully completed and returned thereby representing an impressive response rate of 97.7%. This high response rate can be attributed to effective data collection strategies, including proper follow-ups and clear communication of the study's purpose. The response rate of 97.7% significantly exceeds the generally acceptable threshold for survey-based research which is often around 70% (Creswell & Creswell, 2018

**Inventory forecasting** Descriptives Statistics

Table 1: Inventory forecasting

| Statement | N | Mean | Std. Deviation |
|---|---|---|---|
| Appropriate inventory forecasting technique are used in the organization | **343** | **4.2741** | **.63577** |
| Forecasting technique used provide accurate predictions on inventory stock | **343** | **3.2012** | **.78196** |

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| | | | |
|---|---|---|---|
| Demand forecasting is useful in forecasting inventory for the firm | **343** | **3.9184** | **.66164** |
| Forecasting techniques employed allow us to optimize inventory levels and minimize stockouts | **343** | **4.0583** | **.58946** |
| I am satisfied with the ability of forecasting techniques to handle unexpected changes in demand | **343** | **2.8484** | **.68423** |
| Our inventory management system adequately accounts for seasonal fluctuations in demand | **343** | **2.2974** | **.74077** |
| Market analysis determines the inventory amount | **343** | **4.2478** | **.62111** |
| Valid N (listwise) | **343** | | |

Source (Field data, 2025)

The data reflects responses from 343 individuals on inventory forecasting techniques. Overall, respondents believe that appropriate forecasting methods are used (mean = 4.27), and market analysis plays a key role in determining inventory (mean = 4.25). However, they feel the forecasting techniques lack accuracy (mean = 3.20) and are dissatisfied with their ability to handle unexpected demand changes (mean = 2.85). Additionally, the system struggles with seasonal fluctuations (mean = 2.30). The standard deviations show varying levels of agreement, with some areas like market analysis being more consistent, while others like seasonal fluctuations show greater variability.

**Performance of FMCG manufacturing firms**

**Table : Performance of FMCG manufacturing firms**

| **Statement** | **N** | **Mean** | **Std. Deviation** |
|---|---|---|---|
| The material cost has effects on cost of production | **343** | **4.0222** | **1.01761** |
| Lead time variability happens as a result of inventory optimization | **343** | **3.9534** | **0.73599** |
| Inventory turnover is satisfactory according to organization expectations | **343** | **3.6531** | **0.59164** |
| Customer service has greatly improved due to effective inventory optimization | **343** | **3.2822** | **0.47252** |
| Financial performance of the organization has increased due to inventory optimization | **343** | **4.4082** | **0.75094** |
| Inventory optimization affects performance of manufacturing firms | **343** | **4.1458** | **1.04952** |
| Valid N (listwise) | | | |

Source (Field data, 2025)

The data in table 2 indicates that the respondents largely concur with the fact that optimal inventory has positive effects on the FMCG manufacturing companies. It is observed that material costs have a strong implication of production costs (mean = 4.02) and inventory optimization is also considered to impact the lead time variability (mean = 3.95). On the one hand, inventory turnover increases to the level expected in the organization (mean = 3.65). On the other hand, customer service based on inventory optimization is viewed as average (mean = 3.28). Financial performance is closely connected to the optimization of inventory (mean = 4.41), and inventory optimization, in general, is perceived to be a positive asset to performance of a firm (mean = 4.15). The standard deviations depict that agreement on some topics will not differ dramatically and certain areas will exhibit more consensus as in financial performance. According to the implications of the data, it seems that although FMCG manufacturing companies at large are aware of the beneficial effect of inventory optimization, there is still room that can be optimized. Companies might also have to improve the nature of their inventory management policies with the aim of achieving greater precision in meeting organization requirements and in satisfying customer needs at large

**Inferential statistics**

This study employed inferential statistics, including correlation analysis, regression analysis, and hypothesis testing.

**Regression Model of inventory optimization and operational performance of FMCG**

| **Model** | **R** | **R Square** | **Adjusted R Square** | **Std. Error of the Estimate** |
|---|---|---|---|---|
| 1 | 0.752 | 0.565 | 0.556 | 0.610 |

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The given regression model explores the relationship between inventory optimization and operational performance in FMCG firms. The correlation coefficient (R) of 0.752 indicates a strong positive relationship between these two variables. This suggests that as inventory optimization improves, operational performance tends to improve as well.

The R square ($R^2$) value of 0.565 means that 56.5% of the variation in operational performance can be explained by inventory optimization. While this is a significant portion, it also implies that there are other factors not included in the model that contribute to operational performance. The Adjusted R square of 0.556 slightly reduces the $R^2$ value to account for the number of predictors in the model, ensuring that the model isn't overfitting. This indicates that after adjusting for model complexity, inventory optimization still explains a substantial portion of the variation in operational performance.

Lastly, the Standard Error of the Estimate is 0.610, which represents the average deviation of the actual performance from the predicted values. This suggests a moderate level of prediction error, meaning that while the model provides useful insights, there is still some room for improvement in its accuracy. Overall, the model indicates a strong link between inventory optimization and operational performance but acknowledges that other factors may also play a role.

## V. Conclusion

The study findings revealed that inventory forecasting plays a crucial role in operational efficiency within fast-moving consumer goods manufacturing firms. A majority of respondents expressed confidence in the adoption of appropriate forecasting techniques within their organizations, with a high mean score reflecting strong agreement. This suggests that firms are making significant efforts to implement accurate forecasting methods to minimize stockouts and overstock scenarios. Nevertheless, despite the overall positive perception, some respondents raised concerns regarding the accuracy of inventory forecasting. The relatively lower mean score on forecast precision indicates lingering uncertainties, likely due to the unpredictable nature of consumer demand. This highlights a need for continuous improvement in forecasting accuracy to address demand fluctuations effectively.

Further, respondents acknowledged the positive effect of demand forecasting on inventory optimization, particularly in managing stock levels and reducing discrepancies. Nonetheless, the results also pointed out a gap in forecasting techniques' responsiveness to sudden demand changes and seasonal variations. The results are in line with Bayraktar et al., (2020) who assessed supply chain performance where they did a causal analysis and the findings indicated that retailers were influenced by seasonality and trends in inventory forecasting. Lower mean scores in these areas suggested that current forecasting methods may not be adequately adaptive to dynamic market conditions.

Inventory visibility emerged as an essential component of effective inventory management, significantly influencing operational performance. The study revealed mixed perceptions regarding the effectiveness of technology integration into inventory optimization systems. Although some respondents acknowledged the presence of inventory tracking systems, the relatively moderate mean score indicates that there is room for improvement in leveraging technology to its full potential. Especially, the low mean score for automated alerts and notifications signals a gap in proactive inventory management practices. Automation remains a vital element in minimizing human error and ensuring timely responses when stock levels reach critical points.

Despite the results, there is room for further studies. There is an opportunity to look beyond inventory optimization and examine additional factors that could influence performance. Variables like technological advancements or collaborative supply chain practices might also play a significant role. By considering these aspects, future research could develop a more comprehensive view of what truly drives performance improvements.

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