

**SUSTAINABLE INVENTORY MANAGEMENT TECHNIQUES  
AND PERFORMANCE OF A BREWERY IN OSUN STATE,  
NIGERIA**

**Ebenezer Adebisi Alo<sup>1\*</sup>, Olumuyiwa Oluseun Adeoye<sup>2</sup>, Samuel Taiwo Toluyemi<sup>3</sup>,  
Solomon Agada Agada<sup>4</sup>**

<sup>1,2</sup>Department of Business, Administration Adeleke University, Ede, Osun State, Nigeria

<sup>3</sup> Department of Business Administration, Ojaja University, Eyenkorin, Kwara State, Nigeria

<sup>4</sup> Department of Business Administration, Redeemer's University, Ede, Osun State, Nigeria

\*ebenezer.alo@adelekeuniversity.edu.ng.

**ABSTRACT:** The study evaluated the effect of inventory management strategies on the financial outcomes and customer contentment of International Brewery Plc, Ilesa, Osun State, Nigeria. The objectives of the study were to: (i) examine the relationship between Economic Order Quantity (EOQ) and the financial performance of the brewery in Ilesa, Osun State, Nigeria (ii) evaluate the correlation between Always Better Control (ABC) analysis and customer satisfaction (iii) determine the effect of Just-In-Time (JIT) on the performance of the brewery and (iv) assess the correlation between Vendor Managed Inventory (VMI) and performance of the brewery in Osun state, Nigeria. The research methodology was a descriptive survey. A questionnaire was the instrument used to obtain information from the participants. The sample size utilized for this study was 194. The Spearman correlation coefficient was employed to evaluate the correlation between inventory management techniques and performance of the brewery. Findings revealed that EOQ, ABC analysis, JIT and VMI had significant positive correlations with the performance of the brewery. The study concluded that the brewery should adopt EOQ, ABC analysis, JIT and VMI to sustain and maintain proper, effective and optimal inventory management in an effort to attain economic viability. The study recommended that the brewery industry, especially International Breweries Plc, Ilesa, should encourage the adoption of EOQ, ABC analysis, JIT and VMI in their operations to enhance a sustainable and efficient inventory management system, which will increase profitability and performance.

**Keywords:** Economic Order Quantity, Just-In-Time, ABC analysis, Vendor Managed Inventory, Performance

## **INTRODUCTION**

The acquisition, application, supervision, and synchronization of accessible resources within a company constitute inventory management. In today's challenging and dynamic business climate, an organisation's ability to maintain an inventory level is critical to its success. Maintaining just enough inventory at the appropriate location, at the ideal time, for the proper price, to produce the necessary number of goods is known as inventory management. In any manufacturing organisation, inventory control is crucial. It entails organising tasks to guarantee that the right supplies are obtained at the appropriate time, location, and quality (Birt, 2020). To prevent stock outs of materials, which can lead to a loss of revenue, a manufacturing

company must maintain adequate stocks to meet the demands of its clients (Ubabudu et al., 2024). Therefore, a company should avoid maintaining excessive inventory, as this would inevitably result in higher carrying or holding costs and a decrease in earnings.

Controlling inventories ensures a quicker churn of stock. To keep manufacturing from running out of materials or goods, stocking administration is necessary at multiple stages of a business or at different points in a supply chain. Production will run more smoothly in manufacturing companies with enough stockpiles. Sustaining a stock level that will strike a blend between minimal inventory and substantial yield on investments is the fundamental goal of inventory administration. One of the most fascinating domains for improving organisational materials, according to Alam, et al., (2024), is inventory levels. A company that manages its inventory well can grow and thrive; prudent inventory control reduces waste, theft, and depreciation while ensuring that the resources are available when needed.

According to Napa, (2023), production volume, batch efficiency, quality control, yield rate, distribution efficiency, sales growth, customer happiness, and financial success are the primary performance metrics for brewing manufacturing companies, according to Napa, (2023). Nigerian companies that manufacture beer and malt drinks create, package, and market their products. This business directly or indirectly employs more than 50,000 people which has rapidly expanded in Nigeria in recent years; accounting for more than 28% of manufactured added value (MAV; Addison & Roe, 2024).

Nigeria's brewery industry uses a range of methods, levels of automation, and product types to make beer and other beverages of various sizes. The following are a few of the well-known companies in Southwest Nigeria that manufacture beer: International Breweries, Ilesa; Nigerian Breweries Plc, Lagos; Consolidated Breweries Plc, Lagos; Life Breweries Company, Lagos; Guinness Nigeria Plc, Lagos; and Standard Breweries Nigeria Limited, Ibadan. The International Breweries Ilesa, on the other hand, was chosen for this study due to its prominence in Osun State and its role as a prominent participant in the brewery business.

Recently, the brewery industry has faced challenges recently, including material overstocking or understocking, ineffective inventory control, worker theft of materials, and order delivery delays that result in increased production costs, material waste, and stock outs (Kumar, et al., 2024). Therefore, in order to assess the efficacy of the current inventory management procedures in this specific manufacturing organisation, it is imperative to establish optimal inventory management tactics. Determined, long-lasting inventory management methods are essential for production organisations to prosper in the highly productive, rapidly changing business climate that is adversely affects the operation of many of these Nigerian manufacturing companies. Therefore, the present investigation examined how sustainable inventory management strategies influenced the performance of the chosen Nigerian brewery in Osun State. In this study, the following fundamental research questions were developed and addressed: (i). to what extent does economic order quantity impact the financial performance of the selected brewery in Osun State, Nigeria? (ii) What is the correlation between ABC analysis and customer satisfaction in the selected brewery in Osun State, Nigeria? (iii) How does just-in-time influence the performance of the brewery in Osun State, Nigeria? (iv) How does vendor-managed inventory affect the performance of the brewery in Osun state, Nigeria?

## LITERATURE REVIEW

Inventory relates to the quantity of stock of goods or scarce resources that remain idle in anticipation of a future demand for it. According to Akinlabi, (2021), inventory consists of the various components that go into manufacturing a product as well as the stock of goods that a company sells. The term "inventory" also refers to the stock of tangible items used in the manufacturing process, such as supplies, work-in-progress, finished goods, and raw materials (Okorie & Jibril, 2023). A company's policies and procedures for tracking inventory levels, volume, and replenishment that must be maintained are referred to as its inventory system as explained by Sharma and Tripathi, (2023). As mentioned by Hänninen (2024), raw materials are the necessary components of a product that has not yet undergone a mechanical or chemical procedure to become a finished item. Inventory, however, is a crucial part of the production process because of the connections it has with marketing, consumption, consumer demand, and satisfaction (Groenewald & Kilag, 2024).

Inventory management, as stated by Ubabudu et al. (2024), entails transferring in-process inventory within the company and delivering supplies and raw materials to the manufacturing site. Baker, et al., (2024) claim that inventory management is a framework that companies employ to control the investments they make in inventory. It necessitates monitoring supply levels, projecting demand patterns, and choosing when and how to make plans. According to Birt (2020), inventory administration is a procedure used by companies to organize, maintain, and replace inventories in order to guarantee a consistent supply of goods at a reduced cost. Productive inventory operation is crucial to every company's ability to run profitably, as claimed by Ahmed, et al., (2021) and to assist in fulfilling customer demands while lowering the likelihood of recurring deficiencies and maintaining a high quality of service.

For a manufacturing company to survive, expand, and be profitable, inventory management must be performed effectively and efficiently. Since meeting customer demands is a primary goal of any organisation, inventory management is essential for a manufacturing company. This is because maintaining and sustaining inventories at the appropriate quality, quantity, time, and location is necessary to guarantee customer satisfaction. The methods utilized in inventory management are as follows:

**(a) Economic order quantity (EOQ):** To reduce the overall cost of ordering and holding, the economic order quantity (EOQ) is the least expensive number of materials that can be ordered at a time (Zhao, 2019). Establishing a stock level that will reduce the overall cost of acquiring the items and the costs of maintaining them in inventory is the goal of EOQ (Muksin, 2023). The administration of stocks must be logically organized to help the company understand when and how much to request in order to sustain a productive and profitable inventory of the company (Truong, 2023). The Economic Order Quantity (EOQ) can be applied to achieve this.

**(b) Just-in-time (JIT) Technique:** Originating in Japan, the Just-in-time (JIT) process is a methodical approach to assembling. It entails having the proper materials in the ideal place at the optimum time, in the correct amount and of the appropriate quality. The just-in-time (JIT) methodology leads to lower expenses and waste products, enhanced dialog, and increases in productivity, profitability, and quality. (Okorie & Jibril 2023) define JIT as an approach that is prepared to react to inquiries immediately without having to prepare for excessive stock, whether due to a worry about inconsistency continuously or to anticipate of an application coming up.

(c) **Vendor managed inventory:** The vendor managed inventory (VMI) is a streamlined method of requested delivery and inventory supervision where the vendor takes sole accountability for replenishment of stocks depending on when it is best to give the buyers all the information (Zhao, 2019). By decreasing market-driven activity and increasing consumer responsiveness, VMIs seek to fulfil the end user's needs by delivering the required item when required (Zhao, 2019).

(d) **ABC analysis:** The acronym ABC denotes "Always (A) Better (B) Control (C)". Based on the Pareto principle, ABC analysis is a categorization technique that aids in prioritizing products for a company's inventory management (Amahalu et al, 2018). Sorting products based on their respective importance is what it entails. The three classes that the analysis separates inventories into are class A, class B, and class C. Both managerial efforts and oversights involve class A category items. While class B things are at the centre, class C items frequently receive the least attention from management (Ravinder & Misra, 2014). The brewery business benefits from ABC analysis because it gives management the ability to enforce control over the managed subjects by using selective prioritization (Amahalu et al, 2018).

A firm's performance is its firm's capacity to achieve its objectives through competent management, strong governance, and a tenacious commitment to obtaining results (Zhao, 2019). According to Caroline, et al (2019) a firm's performance reflects its efficacy through the application of different metrics, such as effectiveness, efficiency, financial viability, and stakeholder relevance used in measuring the firms' performance. However, to increase performance brewery manufacturing firms need to maintain a competitive advantage, through resources that are not only partially mobile but also contribute to their performance.

A firm's financial performance provides a detailed indications of its long-term financial performance used in assessing the stability and profitability of its finances (Caroline et al, 2017). A firm's financial health is evaluated to provide information to various internal stakeholders; who have particular information demands that motivate them to keep tabs on the business's financial performance, including bond holders, lenders, investors, employees, and management (Olusakin, 2015). Financial performance is the overall goal of a brewery manufacturing industry.

Customer satisfaction is the function of a user's appraisal of an item based on a comparison of the evaluation of the items to prepurchase beliefs (Olusakin et al. 2015). According to Eckert et al. (2022), consumer fulfilment is the measure of how happy and delighted a client is with an encounter following the purchase of a product or service. Contentment is determined by an individual's concepts, opinions, and convictions. Dr Eliyahu Goldratt's 1984 theory of constraint served as the foundation for this investigation. This managerial idea looks for ways to find the processes that are limiting the manufacturing apparatus in order to increase the system's performance as indicated by revenue [Goldratt, 2004]. To find the restriction and restructure the rest of the organization around it, the theory of constraint adopts the 'proverb' that a chain is only as strong as its weakest link' as its own. This shows that organisations and processes are susceptible since the weakest person or component can always injure them, destroy them, or at the very least hurt the outcome.

Harcourt and Ali (2021) explored the effect of handling inventories on the productivity of manufacturing businesses in Kogi State. Content analysis was used in the investigation. The results of this research demonstrated that procedures for managing inventory had an effect on

the performance of production companies in Kogi State. Ryan (2017) evaluated the impact of material control on Nigerian breweries' financial performance. The study employed a sample size of 368 firms. The study revealed that the procurement and storage of resources significantly affected the profitability of brewing companies.

The association between manufacturing companies' financial success and inventory management was assessed by Okoye et al. (2016). In this study, multiple regression analysis was used. The findings showed a highly substantial correlation between inventory management and a company's financial performance. During a ten-year span, from 2009 to 2019, Harcourt and Ali (2021) examined the performance of a few consumer product companies listed on the Nigerian stock exchange. The correlation coefficient, ordinary least squares (OLS) regression, and STATA 13 statistical software were used to analyse the data gathered for the study. The results showed a strong correlation between firm growth and the return on capital utilized.

In Rivers State, Nigeria, paint manufacturing companies' sales performance was studied by Harcourt and Ali (2021) in relation to just-in-time inventory management. Both causal inquiry and explanatory research designs were used in the study. To gather pertinent data for analysis, primary and secondary data gathering techniques were used. For the analysis, the Pearson's product moment correlation was employed. The study's conclusions showed a strong positive association between the sales success of Rivers State paint manufacturing enterprises and just-in-time inventory management.

Githinji & Wachiuri, (2023), examined the effect of inventory management strategies on business performance using Laikipia County as the case study. The study's variables included methods for estimating demand as well as IT-based inventory management systems including the JIT, VMI, and ERP. A descriptive design was utilized, and the population of interest consisted of all 60 county employees. The study revealed that Laikipia County must adopt and apply inventory management strategies to improve its performance.

Achuora, et al (2020) examined the effect of inventory management on the organisational performance of Tanzania's public sectors. The questionnaire was the instrument used for gathering data for the study. A total of 40 respondents were selected for the study through a purposive sampling technique. The findings of the study revealed that 90% of the respondents agreed that NRFAs use technology for inventory management and control; 72.5% of the respondents believed that the Economic Order Quantity was employed every time orders were placed.

The effect of inventory control management systems on organisational performance in the manufacturing sector of Tanzania was examined by Mbugi and Lutego (2022). A sample of five employees of the inventory and production department were selected and interviewed using a purposive sampling technique. The results of the Nvivo Qualitative Analysis software used to conduct a content analysis on the data revealed that the EOQ-based inventory control management system has a significant effect on the performance of the manufacturing sector in Tanzania with respect to cost savings, efficiency in production, agility and profitability.

Muyundo, (2018) investigated the inventory management and organisational performance of cement manufacturing firms in Kenya by applying a descriptive research design. The study used data from 6 cement producing companies in Kenya. The outcome of the study revealed that the majority of the cement manufacturing companies employed ABC analysis in assessing

the condition of the products in the stockpiles and established a positive and significant correlation between performance and ABC analysis. Furthermore, the impact of ABC analysis on the product quality of De United Foods Industries Limited was also investigated by Edewor and Adeniji (2021). A well-structured questionnaire was used for the study. The results of the regression analysis revealed a significant positive correlation between ABC analysis and the product quality of De United Foods Industries Limited.

Kwateng et al. (2022) examined the moderating effects of leadership and digitization on the link between vendor-managed Inventories (VMI) and business performance in the mining sector in Ghana using primary data from stakeholders in the mining industry in Ghana and found that vendor-managed inventories have a significant impact on the organisational performance of the mining industry in Ghana.

Achuora et al (2020) examined the effect of vendor-managed inventory (VIM) on the profitability of the Nairobi industry in Kenya. Just-in-time, zero-inventory, and supply chain management theories served as the foundations of this study. Both stratified random sampling and purposive sampling procedures were used in this cross-sectional survey research design. For data analysis, the multiple regression model (MRM) was employed. The study revealed that vendor-managed inventory has a positive and significant effect on the company's profitability.

### **Gaps in the Literature**

Previous researchers worldwide have examined the effect and impact of inventory management on organisational performance. However, the effect of inventory management practices on organisational performance have been explored extensively in other industries, but few studies have been conducted to explore the effect of inventory management techniques on the performance of the Nigerian Brewery industry; especially, International Breweries Plc, Ilesa and Osun State.

There are also gaps in the variables of the study. No study in the literature has investigated the combined effect of the four inventory management techniques - economic order quantity, just-in-time, ABC analysis and vendor-managed inventory - on the performance of the brewery industry in Southwest, Nigeria. This study bridges the gaps in the literature.

### **METHODOLOGY**

A descriptive survey research approach was used in this study. The technique of survey research was chosen for this inquiry because it enabled the researcher to compile participants' perspectives on the topic at one particular moment in time. The demographic data of 375 workers of International Breweries Plc in Ilesa, Osun State, Nigeria, were collected. The population was drawn from all departments and units of the brewery company. Since the population of the study was finite, the application of statistical techniques became necessary in order to determine the sample size. To determine the sample size for this study, the Taro Yamane (1967) formula was used. The formula is as follow:

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

Where:

n = Sample size  
N = Total population  
E = Error term (0.005 significance level)

Therefore,

$$n = \frac{375}{1 + 375 (0.05)^2}$$

$$n = \frac{375}{1 + 375 (0.0025)}$$

$$n = \frac{375}{1 + 0.9375}$$

$$n = \frac{375}{1.9375}$$

$$n = 194$$

Hence, the sample size for the study was 194.

The 194 printed copies of the questionnaire were distributed to the respondents from International Breweries, Ilesa using a simple random sampling method. The questionnaire comprised of 2 parts, A and B. Section A consisted of demanded questions about the participant demographics, while Section B asked questions about how the participants surveyed felt about inventory management techniques and how they affected the performance of International Breweries Plc, Ilesa, Osun State, Nigeria. The questionnaire was based on a five-point Likert scale of agreement, with the options being strongly agree (SA), agree (A), undecided (U), disagree (D), and strongly disagree (SD). Techniques from descriptive and inferential statistics were used to analyse the gathered information. The collected information was analysed using the inferential statistics (Spearman's product moment correlation coefficient) to determine the impact of methods for inventory control on the performance of International Breweries Plc, Ilesa, Osun State, Nigeria. The descriptive statistics were presented as tables, frequencies, percentages, and mean values.

## **DISCUSSION AND RESULTS**

### **Analysis of the Respondents' Responses to Inventory Management Techniques**

According to research on economic order quantity (EOQ), 66.5% of employees strongly agreed that International Breweries, Ilesa, uses EOQ when placing orders to restock inventory. A total of 83.5% of the employees stated that the company uses EOQ to determine when an order should be placed, and 93.8% strongly agreed that ordering and holding costs are always taken into account before placing an order. Additionally, a significant portion of employees (55.7%) strongly agreed that the business does not permit stock outs of materials in stock; 97.9% strongly agreed that the business has an effective inventory control system in place to reduce the likelihood of production delays; and 84.5% strongly agreed that inventory control contributes to the security of numerous economies. Ultimately, when new purchases are made, 51% of the employees strongly agreed that the order-out quantity (EOQ) is the most advantageous quantity.

To draw conclusions from the study's results, a mean value was also established. Based on the study's findings, it was determined that International Breweries, Ilesa uses order-of-quantity

(EOQ) to determine when to place an order, replenish stock, and account for ordering and holding costs prior to placing an order. Additionally, the company implemented an effective inventory control system to reduce the likelihood of production delays.

A total of 92.8% of the staff strongly agreed that the company concentrates its initiatives on the domains that need the greatest attention to detail, and all of the staff strongly agreed that materials with higher amounts but making up a small percentage of the total items are classified into the "A" category. These findings raise concerns about the impact of ABC analysis on international breeders' effectiveness. Ninety percent of the workers strongly agreed that the company employs ABC analysis to determine the precedence of stocks in stock, and all personnel agreed that inventories are classified as A, B, or C based on emphasis or relevance. Of the workers, 97.9% strongly agreed that the company requested the actual amount required for production. Therefore, based on the investments made, it was deduced that all respondents thought the ABC analysis was helpful for classifying materials into the three groups. The average values calculated also showed that International Breweries, Ilesa focused their efforts on materials with higher values that make up a small portion of all goods and were classified as the "A" category.

According to just-in-time's analysis, the organisation dedicates more than 20% of its budget to inventory maintenance. Ninety-two percent strongly agreed that carrying costs depend on the quantity of units in inventories and the length of time they remain in stock. Ninety-three percent of respondents thought that safety stock was surplus inventory that was kept on hand beyond the typical demand during the lead time. Conversely, 49.5% strongly disagreed that the business is impacted by the firm's decision on the amount of safety stock to retain. A total of 64.4% of the personnel believed that the company should retain the exact materials in the correct amount and condition at the appropriate locations and at the perfect timing. In addition, the mean value computed shows that the company spends more than 20% of its funds in maintaining inventories. The results further revealed that the amount of safety stock the firm chooses to keep has no effect on the performance of the firm.

In each response that was submitted, 97.4% of those who participated strongly agreed that vendor-controlled inventory reduces inventory-related costs. Additionally, 97.9% of respondents strongly agreed that vendor managed inventory improves inventory accuracy, forecasting, and service, supporting the idea that it helps the company achieve better inventory management. Thus, it was determined that vendor managed inventory aids the company in preventing material stock outs, which inevitably boosts revenue. The calculated mean values also showed that vendor managed inventory contributes to improved inventory management and a decrease in expenses associated with inventory.

The respondents' average values for financial performance indicated that the firm's success is measured using a variety of indicators, such as effectiveness, efficiency, financial viability, and stakeholder relevance. Therefore, the company needs resources that are only partially mobile but nonetheless improve performance in order to preserve a competitive advantage. This was further corroborated by the means of values finding, which shows that consumers are consistently happy and pleased after using the company's products.

**Table 4.1: Pearson's Correlation Analysis to Test the Effect of EOQ on Financial Performance.**

		Economic order quantity	Financial performance
Economic order quantity	Pearson Correlation	1	.782**
	Sig. (2-tailed)		.041
	N	194	194
Financial performance	Pearson Correlation	.782**	1
	Sig. (2-tailed)	.041	
	N	194	194

\*\* . Correlation is significant at the 0.05 level (2-tailed).

**Decision rule:** If the p-value falls below the threshold of the significance level, the null hypothesis is rejected if not, the null hypothesis is accepted.

The null hypothesis is accepted if the p-value is greater than the significance level, otherwise, the hypothesis is rejected. Additionally, the p-value (0.041) was below the significance level of  $\alpha = 0.05$  ( $r = 0.78$ ,  $p = 0.041 < 0.05$ ). As a result, it was determined that EOQ significantly affects international breeders' financial performance in Ilesa, Osun State, Nigeria.

**Table 4.2: Spearman Correlation for the Relationship between ABC Analysis and Customer Satisfaction**

		ABC Analysis	Customer satisfaction
ABC Analysis	Pearson Correlation	1	.681**
	Sig. (2-tailed)		.018
	N	194	194
Customer satisfaction	Pearson Correlation	.681**	1
	Sig. (2-tailed)	.018	
	N	194	194

\*\* . Correlation is significant at the 0.05 level (2-tailed).

The Spearman correlation coefficient (0.68) indicates a strong positive correlation between ABC analysis and customer satisfaction in the International Breweries, Ilesa, Osun State, Nigeria. Furthermore, since the p-value (0.018) was greater than the significance level of  $\alpha = 0.05$  ( $r = 0.68$ ,  $p = 0.018 < 0.05$ ). It was concluded that there was a positive significant relationship between ABC analysis and customer satisfaction in International Breweries, Ilesa, Osun State, Nigeria.

**Table 4.3: Spearman Correlation for the Effect of Just-In-Time on Performance**

		Just-in-time	Performance
Just-in-time	Pearson Correlation	1	.802**
	Sig. (2-tailed)		.009
	N	194	194
Performance	Pearson Correlation	.802**	1
	Sig. (2-tailed)	.009	
	N	194	194

\*\* . Correlation is significant at the 0.05 level (2-tailed).

The Spearman correlation coefficient (0.80) indicates a strong positive correlation between just-in-time and the performance of international breeders in Ilesa, Osun State, Nigeria. Furthermore, since the p-value (0.009) was less than the significant value of 0.05, ( $r = 0.80, p = 0.009 < 0.05$ ), just-in-time was found to have a major impact on international breeders' performance in Ilesa, Osun State, Nigeria.

### Conclusion and Recommendations

This research investigated the effectiveness of inventory management techniques at International Breweries, Ilesa, Osun State, Nigeria. The performance of the brewery was evaluated with respect to four inventory control techniques. The investigation showed that while making orders and restocking inventories, the company uses EOQ, ABC analysis, JIT, and VMI. It was also revealed in the study that ordering cost and holding cost are always put considered before placing an order and that the firm does not allow stock-out of materials in inventory. It was therefore concluded that International Breweries, Ilesa adopts EOQ, ABC analysis, JIT and VMI in sustaining and maintaining proper, effective and efficient inventory management in order to achieve profitability.

The study therefore recommended that breweries manufacturing firms, especially International Breweries, Ilesa should continue to encourage the adoption of the four techniques (EOQ, ABC analysis, JIT and VMI) in their operations in order to enhance a sustainable and efficient inventory system, which will increase their profitability and performance.

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