IRJEMS International Research Journal of Economics and Management Studies
Published by Eternal Scientific Publications
ISSN: 2583 – 5238 / Volume 3 Issue 1 January 2024 / Pg. No: 399-413
Paper Id: IRJEMS-V3I1P145, Doi: 10.56472/25835238/IRJEMS-V3I1P145

Original Article

Effect of Inventory Management on the Production Efficiency of Manufacturing Firms in Nigeria

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Received Date: 02 January 2024 Revised Date: 11 January 2024 Accepted Date: 16 January 2024 Published Date: 26 January 2024

Abstract: *The general objective of this study was to examine the effect of inventory management on the production efficiency of manufacturing organizations: A study of selected manufacturing firms in Nigeria. The study specifically set out to examine the effect of inventory availability on the production efficiency of selected manufacturing firms in Calabar, to determine the effect of inventory accuracy on the production efficiency of selected manufacturing firms in Calabar, and to examine the effect of inventory coverage on the production efficiency of selected manufacturing firms in Calabar. The study adopted the descriptive research design. The population of this study was seven hundred seven (707), cutting across management and non-management employees in the selected companies, respectively, and a sample size of 370 was selected using the Taro Yamane formula. The study adopted a stratified random sampling technique, while a standardized questionnaire was used to gather responses from the research participants. Using SPSS 27.0, quantitative and qualitative data were analyzed. The results were summarised using descriptive statistics and Ordinary Least Squares regression. The regression analysis revealed that inventory availability (β1=0.668, p=0.000, t=8.055) had a significant and favourable influence on the organizational production efficiency of the selected manufacturing businesses in Calabar. The study also discovered that some manufacturing companies in Calabar might enhance their production efficiency by assuring the accuracy of their inventory (o1=0.267, p=0.000, t=3.777). The study revealed that inventory coverage had a substantial influence on production efficiency (β1=0.117, p=0.000, t=2.297) for certain industrial companies in Calabar. Based on the study findings, it is recommended that top management give priority to implementing efficient inventory management techniques and measuring variances in efficiency. This will help identify specific areas where improvements are needed in inventory management.*

Keywords: *Inventory management, Manufacture, Economic Order Quantity (EOQ), Work in progress (WIP).*

I. INTRODUCTION

A) Background of the Study

The adoption of management methods that enhance the effective and successful delivery of services to stakeholders and customers has become more popular in order to meet the growing demand for products and services in all sectors of the economy. Through the use of an inventory management system, a firm may guarantee the maintenance of an adequate stock of items at all times. The significance of inventory management as a means to optimize resources and enhance overall organizational efficiency is increasing across all industries (Akindipe, 2014).

The subject of inventory management in contemporary firms is a significant area of interest for scholars from the business sector. As stated by Ballou (2020), global inventory is the fundamental and vital component of any production system, playing a crucial role in the efficient functioning of any manufacturing firm. Lysons (2016) defines inventory management as the process of monitoring the constant flow of units entering and leaving a current inventory. Usually, this process involves monitoring the movement of goods to maintain optimal inventory levels, hence safeguarding the company's operations. Inventory management is used to examine product sales, identify popular goods in stock, and ensure quick fulfillment of client purchases (Alibaan, Madaan, Chan, and Kannan, 2012). Ali et al. (2012) suggest that organizations may reduce inventory costs and establish a reputation for efficiently completing custom requests by using inventory management systems that monitor sales, limit product quantities, and recognize special orders. Ali et al. (2012) state that good inventory management ensures firms maintain accurate knowledge of their stock levels. This leads to better customer information, enhanced corporate reputation, and superior customer service. Efficient inventory management will consistently provide the firm with a competitive advantage.

Globally, effective inventory management is essential for all businesses. An inadequately administered inventory system may result in customer and sales losses, but an efficiently managed inventory system can enhance sales and have a favorable effect on a company's performance (Mohamad, Suraidi, Abd. Rahman & Suhaimi, 2016). Oliveira and Rodrigues (2018) assert that inventory management has a substantial influence on both organizational performance and financial standing. Sumil and

Sameer (2017) argue that for a firm to succeed in the competitive business environment of today, it is essential to have robust, streamlined, and synchronized inventory control management procedures.

The study indicates that modern management continually aims to achieve optimal customer and shareholder satisfaction by periodically evaluating inventories. This strategy effectively reduces the amount of capital invested while maintaining cost and user satisfaction (Kareem, 2017). Irrespective of whether their firm is in the retail, wholesale, or service sector, most marketing and supply managers prioritize the optimization of inventory management (Weele, 2020). According to Awatey (2014), efficient and prosperous companies heavily rely on inventory management systems to ensure that there is enough amount of inventory available to fulfill customer demand. While a company's inventory systems may seem distinct, they have a similar objective: cost reduction. However, as stated by Jones and Riley (1985), the process of creating inventory management systems is intricate. Inventory management impacts several departments within a business, each responsible for distinct and varied activities (Angulo, 2019). Power (2015) highlights the challenge businesses have in establishing linked inventory systems while developing inventory systems. Despite the initial expenses involved in installing an inventory management system, Cagliano, DeMarco, Rafele, and Volpe (2011) assert that these expenditures will ultimately provide benefits for the organization. The study enumerates many benefits, such as enhanced operational efficiency, reduced lead times, decreased inventory, and lower operational and institutional costs (Cagliano et al., 2011).

Eneje, Nweze, and Udeh (2012) argue that a company's ability to produce efficiently in the long run is jeopardized if it fails to manage its inventory effectively. Moreover, they contend that a firm may accomplish a substantial reduction in inventory levels without adversely affecting production or sales. Panigrahi (2013) asserts that inadequate management of working capital may result in the immobilization of assets and the depletion of cash reserves, hence diminishing liquidity and impeding the firm's ability to invest in productive assets such as equipment and facilities. Famurewa and Orekoya (2019) assert that effective inventory management is crucial for an organization's success or failure since it helps prevent unnecessary expenditures. An investigation was carried out on selected Nigerian manufacturing companies to assess the influence of inventory management on production efficiency.

B) Statement of the Problem

The significance of efficient inventory management cannot be overstated. By implementing an effective inventory management system, every firm has the potential to expand its customer base and boost its financial earnings. Effective inventory management directly contributes to higher sales, which in turn directly affects the company's profitability. An efficient inventory management system provides valuable information that enables effective control of material flow, optimization of human resources, coordination of internal activities, and communication with customers.

The increasing demand from customers and shareholders has elevated the inventory management system as a crucial issue that has to be addressed in Nigeria. Organizations exert great effort to meet consumer expectations, hence augmenting the intricacy of inventory management systems used to accommodate consumers' continuously changing lifestyles. Businesses engage in experimentation with different inventory management techniques, a significant number of which become outdated due to the changing tastes of consumers. Developing a new system requires a significant investment of time and money, potentially affecting the workforce and other resources. However, it may also result in ineffective inventory management, which hinders corporate growth.

Furthermore, shareholders have a continuous need for the firm to achieve gradual growth by expanding its market presence and enhancing its operational effectiveness, in addition to adapting to the constantly changing tastes of consumers. Shareholders develop various inventory systems in order to ensure the company's robust performance, irrespective of the amount of competition. However, it is uncertain if these methods really enhance production efficiency in the long run. The repercussions of this might include a significant decline in sales volume, reduced production efficiency, and a negative impact on the overall development of the organization. This study aimed to investigate these concerns by analyzing a specific group of Nigerian manufacturing companies to ascertain the impact of inventory management on production efficiency.

C) Research Hypotheses

The study was guided by the following hypotheses:

Ho_1: There is no significant effect of inventory availability on the production efficiency of selected manufacturing firms in Calabar.

Ho_2: Inventory accuracy does not have a significant effect on the production efficiency of selected manufacturing firms in Calabar

Ho_3: There is no significant effect of inventory coverage on the production efficiency of selected manufacturing firms in Calabar

II. LITERATURE REVIEW

A) Conceptual Framework

a. Concept of Inventory

A company's inventory comprises its raw materials, work in progress (WIP), and finished goods, all of which are valuable assets that are either now available for sale or will be in the near future. The inventory of a corporation is one of its most significant assets since it generates revenue and profits for investors via the sale of items (Chambers & Lacey, 2011). The word "inventory" encompasses a range of tangible goods that have financial value and are now held by an organization, awaiting packaging, processing, transformation, use, or future sale (Ogbo 2014).

For the purpose of promoting future consumption and sales, it is necessary for any organization engaged in the production, trade, sale, or service of a product to keep a varied inventory of physical resources. Businesses maintain inventory for several purposes, such as speculation, utility, physical requirements, and needs. Inventory is an important component of any company.

The given definition emphasizes the following characteristics of inventory:

1. Every firm engaged in the production or sale of commodities has a stock of inventory.
2. Inventory may exist in two distinct states: complete and incomplete.
3. Possessing things facilitates their use, sale, or processing, hence enabling future value addition.
4. All resources that are maintained by the firm are considered assets due to their monetary value.

b. Types of Inventories

The three primary categories in a conventional inventory system are raw materials, work-in-progress (WIP), and finished goods. According to Ile (2012), there are three clearly different types of inventory.

Raw Material inventory: All items purchased by a corporation for the purpose of processing are included in this category. An illustration of raw materials inventory may be seen in a confectionery enterprise, including essential items such as flour, yeast, eggs, and so forth. Raw materials refer to the products that form the basis for production. Automakers procure metal, food manufacturers store ingredients, and refineries stockpile crude oil as instances of raw materials.

Work-in-progress inventory: This may be referred to as the inventory of items at the manufacturing stage. This stage is known as the inventory phase, during which the factory is engaged in handling raw materials prior to proceeding to the subsequent processing step. Ille (2012) states that these minerals have undergone partial processing. Work in progress, in the context of manufacturing, refers to unfinished objects that are now undergoing a process of transformation. An aircraft in an unfinished state or a vessel that is still being built are both instances of work in progress.

Finished goods inventory: This is the current state of the inventory. The inventory of finished goods is influenced by the level of collaboration between the company's manufacturing and sales departments (Johnson, 2014). These items may either be stored in the warehouse or prepared for shipment. Finished products, such as fully assembled airplanes, vehicles, and electronics, are those that have undergone all phases of manufacturing and are now ready for sale. Manufactured goods that have been completed and are available for immediate resale are often referred to as "merchandise" by merchants in their inventory. Retailers often stock a variety of items in their inventory, such as apparel, automobiles, and computer equipment (Ile, 2012). Furthermore, corporations often maintain an inventory of replacement components alongside raw materials and finished products to address any product malfunctions. According to Johnson (2014), any products that have defects, damaged parts, or are deemed trash are classified as inventory as long as they are properly documented in the company's records and have a monetary value.

Vohra (2018) classified inventories according to their intended use. He further said that there are several rationales for maintaining inventory, but typically, companies use five distinct types of inventories for these purposes:

Movement inventories: Another term for this is transit inventories. The rationale for this is that the transportation of substantial quantities of resources, such as goods, necessitates a significant amount of time, during which they are unable to provide to their clientele (Vohra, 2018).

Buffer inventories: An alternative term for this is surplus inventory. During periods of abundant supply and low prices, the government accumulates a reserve of essential goods, which it then utilizes to establish price levels during times of scarcity. Businesses maintain buffer inventories as a precautionary measure to mitigate the impact of supply and demand fluctuations. Many firms are cognizant of the average and have the ability to exceed it (Vohra, 2018) greatly.

Anticipation inventories: These stocks are kept in expectation of the probable future demand for a commodity. This occurs when a corporation begins the production of a certain product far ahead of the peak demand period. For example, when the rainy season approaches, umbrellas and raincoats are manufactured in large quantities (Vohra, 2018).

De-coupling inventories: The objective is to disable certain elements of the production process. The objective of maintaining inventory across machines is to render their processing capabilities inactive. In order to ensure uninterrupted labour in the event of a machine failure, it is customary for people and machines to perform at different rates. (Vohra, 2018).

Cycle inventories: The purpose of this stock is to facilitate bulk purchases instead of acquiring individual things as needed in real-time. Cycle inventories would be unnecessary if all purchases were synchronized with the exact time an item was required (Vohra, 2018).

c. Concept of Inventory Management

The purpose of efficient inventory management is to maintain an optimal quantity of items in stock while minimizing costs in alignment with other relevant management goals and objectives (Jessop, 2019). Management of inventory-focused organizations should prioritize satisfying client demands while minimizing inventory costs. Inventory expenditures include holding costs, ordering costs, and shortfall costs (Drury 2014). Holding costs refer to the expenditures incurred in the upkeep of a physical inventory. Insurance, obsolescence, and the opportunity cost of holding money in inventory instead of using it elsewhere are all included under this category. Ordering costs refer to the financial outlays associated with the procurement of goods via the ordering procedure. Estimation of requirements, generation of bills, transportation costs, and inspection charges are all integral components of this process. Shortage costs occur when the demand for inventory exceeds the available supply. The expenses mentioned include the loss of potential sales, customer satisfaction, penalties for late payments, and similar costs (Jessop, 2019).

Armstrong (2015) states that physical structures and equipment are the primary assets recorded on the balance sheet of some corporations, followed by inventories. According to Jessop (2019), inventory refers to a certain amount or supply of products that are kept for a particular reason or use. The objective of inventory management, commonly referred to as inventory control, is to achieve a harmonious equilibrium between fulfilling inventory demand and minimizing expenses (Eneje, Nweze & Udeh, 2012). Eneje, Nweze, and Udeh (2012) define “inventory management” as the set of procedures used by a corporation to facilitate the seamless movement of both raw materials and completed products into the production process. As stated by Panigrahi (2013), a company’s inventory encompasses all the accessible products and components that may be bought.

George (2015) defines inventory management as the systematic process of regulating the quantity of stock retained by businesses in order to fulfill internal and external demand at the appropriate intervals efficiently. There are several further definitions of this kind in the current body of literature. Inventory management involves overseeing the storage and movement of raw materials, semi-finished items, and completed goods. The goal is to ensure that there is always an adequate supply of inventory and to minimize related expenses (Kotler, 2012). Inventory management systems, as described by Gerald (2016), are methods designed to fulfill consumer expectations while minimizing investment costs. In order to reduce instances of stock shortage loss due to spoilage or theft and ensure correct financial records, firms must maintain well-organized inventory, which often represents 45-90% of total expenses (Khan & Thomas, 2017).

Fried, Lovell, and Schmidt (2018) argue that an efficient inventory management system is only one of numerous vital elements that contribute to the overall success of a firm. Accurate documentation and timely transportation and reception are the fundamental principles of inventory management. Kambua, Okibo, Nyang’Au, and Ondieki (2015) conducted research that indicates a well-managed inventory system may have an impact on a company’s production efficiency, customer satisfaction, and organizational growth.

d. Objectives of Inventory Management

The primary objective of inventory management, as stated by Magad and Amos (2019), is to improve customer service. This is accomplished by mitigating the risk of stock shortages resulting from variations in market demand. The objective of inventory management, as stated by Kothari (2012), is to enhance industrial efficiency. Inventory management enables efficient materials control, which is intricately linked to the process of production control. Magad and Amos (2019) argue that the main priority in creating inventory rules should be to minimize costs. The objective of inventory management is to minimize inventory investment. Efficient inventory management leads to a positive outcome of enhanced productivity for managers in all areas.

e. Inventory Management Approaches

Inventory management utilizes diverse technologies to assist organizations in monitoring their purchased resources, strategizing the manufacture of certain items and their quantities, and satisfying both present and future client demand while minimizing expenses. Therefore, it is vital for a company's operations to possess a proficient inventory management system.

Graman and Magazine (2016) argue that the cost of maintaining substantial quantities of completed products is exorbitant. This is particularly true in dynamic marketplaces, where the fast increase in the number of products and their subsequent obsolescence are significant problems. Consequently, commodities that are in great demand are allocated safety stock. However, many organizations own a multitude of low-demand goods that make it impractical to maintain any inventory of such items. Consequently, it is recommended that firms prioritize delivering exceptional service while maintaining little inventory. Therefore, inventory management systems are essential for any organization.

f. The Economic Order Quantity (EOQ)

Schroeder (2020), Dervitsiotis (1981), Monks (1996), and Lucey (1992) together define the Economic Order amount (EOQ) as the optimal amount for ordering that achieves a balance between the costs associated with inventory holding and reordering. The EOQ technique operates on the assumption of constant demand and a steady reduction of inventory until it reaches a predetermined level. Subsequently, the model assumes instantaneous replenishment, resulting in the restoration of the system to its original level. Based on our observations, there are many factors that hinder the ability of impoverished countries to fully capitalize on the Economic Order Quantity (EOQ) concept (Lyson, 2016).

Predicting the demand for a product is challenging due to its dynamic nature and susceptibility to change, influenced by several factors like price, quality, and availability. Through a complex analysis, this technique aims to determine the absolute minimal number of things needed to complete the activity while simultaneously reducing inventory costs. The ideal order number is calculated by reducing the overall cost, which occurs when the costs of ordering and holding reach equilibrium. To minimize inventory expenditures, such as holding costs, ordering costs, and stock-out costs, enterprises should include an economic order quantity (EOQ) in each inventory order (Imeokparia, 2013).

The Economic Order amount (EOQ) model is a technique used to determine the most efficient amount to order in order to minimize total inventory costs, which include both holding and ordering charges. He contends that the carrying cost escalates with larger purchases since the company must maintain a higher inventory level to meet the increased demand for items. In contrast, when the number of purchases increases, the costs associated with ordering decrease.

g. Vendor Managed Inventory

If all parties are in agreement, this approach entails the purchasing organization relinquishing inventory management to the supplier (Adeyemi & Salami, 2010). The purchasing organization possesses legal ownership of the commodities; however, the supplier retains physical possession of the things and delivers them to the buyer's premises according to the quantity purchased. VOI, or Vendor-Managed Inventory, has arisen as a consequence of modern advancements. In this model, the vendor keeps the inventory at the buyer's premises, and the client is only charged for the inventory that has been used.

As per Baily, Farmer, Barry, Jessop, and David (2018), in a Vendor Managed Inventory (VMI) system, the producer is given the responsibility of producing and, in some cases, overseeing the retailer's inventory levels at both the distribution center and, in certain instances, the stores. The push stock management processes include Vendor Managed Inventory (VMI). As stated by Irungu and Wanjau (2011), these operations are often started by a tea processing firm when they anticipate a rise or fall in the demand for their inventory. A well-designed and executed Vendor Managed Inventory (VMI) strategy may lead to reductions in supply chain inventory and provide secondary savings via streamlined processes and procedures (Rushton, Croucher, & Baker, 2011). If supplies are not obtained on time, it might have a detrimental effect on the business's efficiency and profitability since it would impede the cash-to-cash cycle.

VMI not only enhances the visibility of real demand but also facilitates enhanced collaboration between manufacturers and merchants. The supplier takes on the duty of operational inventory management within a framework of performance targets that are agreed upon and, regularly evaluated and updated to promote a culture of ongoing improvement. According to Emmett and Granville (2017), providers experienced enhanced customer loyalty and a better understanding of changing demand patterns, while customers benefited from improved service levels and cash flows. Reduce administrative costs by eliminating manual data entry, reordering, and level monitoring using paper-to-computer systems (Farrington & Lysons, 2016).

h. Just In Time (JIT)

The underlying principle of this inventory management strategy is to ensure the optimal quantity of raw materials is available at the precise time to facilitate seamless manufacturing. There has been a specific alteration to the production process, affecting both the quantity and duration. JIT, or Just-in-Time, is a production method where the production requirement is determined by the demand for the product, making it a demand-pull system. The company views inventory as a burden on resources that should be managed to the greatest degree possible. The benefits of Just-in-Time (JIT) include less inventory, reduced lead times, and cheaper expenses. The adoption of Just-in-Time (JIT) has led to higher employee turnover rates and lower costs for maintaining inventory in companies. Advocates of the just-in-time philosophy argue that accumulating inventory is a financial inefficiency. The JIT technique aims to mitigate this concealed expense by focusing on the exact time, location, and amount of material requirements.

In their work, Eroglu and Hofe (2011) contend that Just-in-Time (JIT) operations pose a risk and censure them for subjecting suppliers and downstream consumers to supply shock resulting from significant variations in demand. The author illustrates the disruption of a company's production flow caused by the removal of inventory by drawing a parallel to the act of lowering the water level of a river to expose the underlying rocks. Customers often demand changes, and supply shortages may have a substantial negative impact on sales, making the just-in-time method unfeasible. Another critique directed against just-in-time is its failure to conform to the quantity discount model, which enables companies to save costs by capitalizing on discounts offered for purchasing goods in big quantities. As a consequence, organizations are exposed to these risks, and just-in-time is commonly seen as a consequence of this vulnerability. In order to achieve effectiveness, Just-in-Time (JIT) depends on two key aspects. It is essential that all components be delivered to their assigned places promptly and in the exact quantity specified (Eroglu & Hofe, 2011).

i. ABC Inventory Management Model

Inventory management often involves a diverse array of items, ranging from moderately costly to possibly very expensive. Inventory management is used to handle items that significantly contribute to the increase in capital cost since inventory represents unutilized capital (Farrington & Lysons, 2006). ABC is a framework used to categorize objects. Group A often comprises the organization's most important and expensive goods, along with those that are frequently consumed. Consequently, consumers will obviously be displeased if these things are ever unavailable. These items are often scarce, but they have a significant impact. Group B comprises items that have little impact on the company, and they are often subject to moderate regulation.

All other items are categorized as class C, denoting low-value goods that get little care or attention. Effective inventory management is crucial for Class A commodities due to their scarcity and high value. Class B, the subsequent tier, permits the implementation of a more restricted inventory system. Items in Class C should be given the lowest priority. When considering inventory management, the first step in establishing the optimal approach for managing inventory is to use ABC analysis (Eroglu & Hofer, 2011).

j. Fixed Order Point System or Two Bin System

A continuous review system is a method of inventory management where the stock level is always checked. When the stock goes below a certain threshold, the firm promptly makes an order to refill the stock, always maintaining the same amount (Howard, 2019). This system operates under uncertain demand conditions and incurs fixed lead time costs. Its purpose is to continuously track the remaining inventory of an item and determine the optimal timing for replenishment with each withdrawal. As to Madaba (2015), this method entails partitioning the supply into two containers. Once the stock in the first bin is exhausted, a request is generated. This method entails examining inventory levels at pre-established intervals, such as weekly or monthly. This method, referred to as economic order internal systems, entails performing regular evaluations at fixed intervals, such as weekly or monthly, as specified by the organization. As to his statement, this technique enables the regular replenishment of items up to a certain threshold.

k. Concept of Productivity and Production Efficiency

Efficiency and productivity have been the central emphasis for several governments, corporations, and individuals in recent years. The citizens' quality of life is closely linked to the rate of inflation and national income, which, in turn, are impacted by improvements in efficiency and production (Rogers, 2018). Productivity and efficiency, in the context of companies, are metrics that assess overall performance. The financial fortunes of stockholders may fluctuate as a consequence of this. Establishing and measuring efficiency and productivity is of great importance to governments, economists, and professionals alike.

Productivity, in its most basic form, is an examination of the relationship between input and output in a certain industrial process (Coelli, Rao, & Battese, 2018). Productivity is quantified by comparing the result to the input in a

formula used to assess industrial activities. The definition of output takes into account the resources used rather than only focusing on the quantity of output. The concepts of efficiency and production are closely interconnected. Although sometimes used interchangeably, the concepts of productivity and efficiency have distinct meanings. Although comparing inputs and outputs is one approach to describing efficiency, the concept of an ideal scenario refers to the most productive utilization of each input. Coelli, Rao, and Battese (2018) define a company's efficiency as the extent to which it can effectively use its inputs to maximize its output. Rogers (2018) defines efficiency in a corporation as the ability to maximize output while using resources effectively.

Two alternate techniques to enhance a firm's productivity include reducing inputs while producing goods and services or increasing output with the same number of inputs. Rogers (2018) states that an increase in productivity may be achieved by either producing more output with the same number of inputs or by using fewer inputs to get the same level of output. When a certain quantity of input yields the maximum possible output, we have reached the optimal point, the apex of production. Rogers (2018) asserts that increased process efficiency directly correlates with elevated production levels. Therefore, enhancements in effectiveness are included within a more comprehensive interpretation of the expansion of production. Hence, a corporation exhibits superior efficiency and performance when its rate of productivity development surpasses that of its competitors or other enterprises (Pritchard, 2020).

Productive efficiency for a firm is achieved when the average cost intersects with the marginal cost. Efficiency may be divided into two main components: technical efficiency and allocative efficiency (Coelli, Rao, & Battese, 2018). When individuals discuss efficiency, they often refer to it in a technical context. When a corporation maximizes the productivity of its resources, it is said to be technically efficient. Allocative efficiency refers to the selection of the most advantageous combination of inputs by a firm, taking into account price levels and production technology levels (Coelli, Rao, & Battese, 2018). Allocative inefficiency refers to the situation when a corporation, despite its technological efficiency, fails to choose the optimal combination of inputs at a given price level (Pritchard, 2020). The achievement of total efficiency is contingent upon the harmonious collaboration of both technical and allocative efficiency (Coelli, Rao, & Battese, 2018). Overall efficiency refers to the extent to which a firm can optimize its output per unit of input while reducing input expenses.

III. THEORETICAL FRAMEWORK

This study was anchored on the Lean Inventory Theory and Transaction Cost Theory.

A) Lean Inventory Theory

Henry Ford conceived this concept in the 1450s at the Arsenal in Venice as a result of his theories on the interconnected manufacturing process. The lean inventory hypothesis, derived from just-in-time manufacturing, posits that firms should maintain inventory levels that precisely align with the needs of their production processes (Edwin & Florence, 2021). Womack et al. (1990) introduced the concept of maintaining decreased inventories in businesses, which is today referred to as lean inventory theory. Advocates of a lean inventory system argue that it enhances production efficiency by decreasing the costs associated with inventory storage. The core focus of lean inventory theory is to decrease costs in organizational inventory systems by making decisions related to production, storage, and the whole supply chain (Egbunike, 2007).

Njeru (2016) asserts that the concept of Economic Order Quantity (EOQ) has significant importance in Lean theory. The objective of EOQ is to optimize inventory efficiency by determining the most favourable quantities of inventory to be ordered at any given time. According to the evidence we have seen, the concept implies that both production and the inventory tracking system may be adaptable since various items in stock may need different methods. Lean inventory theory may provide a competitive advantage and boost profitability for companies operating in a highly competitive market by reducing the negative impact on net cash flow caused by excessive inventory levels (Lydiah, 2016). Furthermore, it assists businesses in improving their return on investment by decreasing the amount of inventory held by companies and the associated carrying costs.

B) Transaction Cost Theory

While Ronald H. Coase first highlighted the need to understand transaction costs in 1937, the formal development of transaction cost economics (TCE) did not really begin until the late 1960s and early 1970s. The objective was to use empirical methods to elucidate and forecast the optimal structure of an intricate contractual arrangement, with the aim of minimizing inefficiency and maximizing the value of transactions (Mikko & Joseph, 2017). Coase (1937) posited that a corporation has the ability to grow if it is able to reduce its operating expenses. Transaction Cost Theory (TCT) has been widely used in the realm of information and automation technology. As to Vijay (2014), automation refers to the process of mechanizing business activities to enhance the accessibility and affordability of firm services.

For manufacturing firms, where the majority of operational costs are incurred, this division is of utmost importance. Due to the adverse impact of manpower on revenues, several corporations have opted to automate a significant portion of their production operations to attain their objective of maximizing revenue. According to the cited scholars, automation is the most

attractive approach to reducing costs, especially for labor-intensive enterprises with high labour expenditures, leading to increased profitability (Ken, 2010).

Outsourcing organizations that experience frequent fluctuations in demand consider transaction cost economics to be the most effective technique for predicting and addressing high-demand periods. One contributing factor is the possible economic strain linked to changing jobs and renegotiating contracts (Williamson, 2019). When using novel manufacturing techniques, which may entail varying production expenses, a product undergoes a metamorphosis from one state to another, leading to the emergence of transaction costs. Transactional costs are incurred when resources are transferred to the external environment. Unforeseeable supplementary costs may account for a significant amount of the income instability seen by several firms.

C) Empirical Review

Eneje, Nweze, and Udeh (2012) assessed the influence of raw materials inventory management on the profitability of brewery operations in Nigeria using cross-sectional data obtained from their annual reports spanning from 2008 to 2017. Beer manufacturers analyzed profitability data and established correlations with proxies for managing raw materials inventories. The research used the Ordinary Least Squares (OLS) technique, which is formulated as a multiple regression model. The study revealed that the profitability of Nigerian breweries is influenced by a local factor known as raw materials inventory management. This factor aims to measure the effect of a company's efficient management of its raw material inventory on its profitability. These variable exhibits resilience and consistently show positive values.

Kairu (2015) conducted a study to assess the influence of strategic inventory management on the performance of manufacturing firms in Kenya. More precisely, he focused his attention on a total of 155 individuals employed in DECAL's supply chain department. A stratified selection strategy was used to get 51 respondents from the population. The primary data was collected using a well-organized questionnaire that included both closed- and open-ended inquiries. A total of forty-eight questionnaires were filled out and returned for examination. The gathered data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 20, which allowed for both qualitative and quantitative analysis.

Furthermore, the statistical analysis included the use of advanced techniques such as analysis of variance (ANOVA), correlation, and regression. According to the data, manufacturing enterprises experience poor performance due to inadequate inventory management, inefficient order fulfilment methods, reduced customer demand resulting from inaccurate forecasting, and ineffective application of information and communication technology systems. This will inevitably lead to a decrease in sales revenue.

The 2016 study conducted by Elsayed and Wahba focused on investigating the connection between inventory management and business performance from an organizational life cycle viewpoint. A portion of the firms included in the research were selected from the official lists of the most active traders on the Egyptian stock exchange, as provided by the Egyptian stock market authorities. The lists include firms that represent around 45% of the market value. We examined published compilations spanning the years 2005 to 2010, excluding enterprises operating in the financial sector. A total of 504 observations were made, including 84 firms from 18 industries, all of which possessed the required data. The results indicate that throughout the initial growth and later phases, the ratio of inventory to sales has a detrimental effect on the success of the organization. Nevertheless, during the rapid growth and rejuvenation phases, it has a favorable impact.

In their study, Namgembe and Munene (2016) examined the impact of inventory management on the procurement activities of sugar-producing firms in the western sugar belt. The participants independently completed a set of organised questions for this study. We used descriptive and inferential statistics to analyze the data. The findings indicate a significant association between the performance of the procurement function and the inventory management strategies in sugar-producing firms located in the western sugar belt.

Lyndon and Paymaster (2016) examined the financial performance of Nigerian brewers listed on the stock market after the use of inventory cost management measures. The expenses incurred for raw materials, work in progress (WIP), and finished products were used as indicators for inventory management. These indicators were then analyzed in relation to the gross profit margin, which was used as an indicator of profitability. The researchers gathered secondary time series data from the annual reports and accounts of selected brewing enterprises in the years 2005-2014, obtained from the NSE. To evaluate the NSE data, a multiple regression methodology was used. The study revealed that work-in-progress (WIP) had a beneficial impact on the profitability of Nigerian brewers.

Okoye, Amahalu, Nweze, and Obi (2016) conducted a study to examine the relationship between the inventory levels of manufacturing enterprises and their financial outcomes. The researchers conducted a study using multiple regressions to examine 52,254 enterprises over a span of 25 years, from 1980 to 2005. The objective was to determine the correlation between various inventory levels and financial performance. Financial performance metrics included gross and operating profit, as well

as inventory levels for raw materials, semi-finished items, and completed goods. The research indicates that there is a favourable correlation between a company's financial performance and its inventory management. They said that there are varying levels of correlation between various kinds of inventories and financial success.

Ryan (2017) conducted a study using a sample size of 368 organizations to examine the impact of materials management on the profitability of Nigerian brewing companies. The study included interviews and questionnaires as data collection methods. The study demonstrated that the storage and procurement of materials had a substantial influence on the profitability of breweries. The study found that materials inventories and interdepartmental communication were other elements that had a role in the profitability of brewing firms. The research emphasizes that effective materials management is crucial for the financial performance of brewing enterprises.

Alrjoub and Ahmad (2017) aimed to identify four distinct kinds of inventory, namely raw material stock, in-progress inventory, finished stock, and total stock, in order to elucidate their respective influences on a company's performance. In addition, they sought to tackle other variables, such as capital expenditure, which had previously been overlooked. This study especially focuses on such consequences. An analysis of data collected from 48 organizations over a period of six years reveals that considering different forms of inventory has a significant influence on a company's long-term profitability. This indicates a reasonable cost of capital with respect to the correlation between inventory kinds and corporate success. When selecting inventory types, companies should consider the cost of capital and make necessary adjustments to their inventory management to adapt to any changes in their business environment. Modifying the link between inventory management and the company's performance is crucial, as it is influenced by the interplay between various inventory kinds and the cost of capital.

Madishetti and Kibona (2019) state that a meticulously designed and executed inventory management system aids in enhancing production efficiency for small and medium-sized enterprises (SMEs). Their study centred on examining the impact of inventory management on the operational effectiveness of small and medium-sized enterprises (SMEs), as well as investigating the correlation between inventory coverage and production efficiency. The researchers used financial statement data from the years 2016 to 2018 to examine and evaluate 26 small and medium-sized enterprises (SMEs) in Tanzania. Regression analysis was conducted to examine the impact of inventory conversion time on gross operating profit. The results revealed a significant negative linear correlation between inventory coverage and production efficiency.

In their study, Koin, Cheruiyot, and Mwangangi (2020) examined the impact of inventory management on company results in Kenya. The study will use a descriptive research methodology, focusing on a population of 459 workers. The researcher will ensure that the sample size is sufficiently big to provide valuable insights into the research objectives. Questionnaires will be used to collect data from the company's supply chain department, as well as the many interconnected departments within the chain. A sample size of 56 workers will be obtained from the specific target population. The data will undergo analyzed using descriptive statistics and a statistical tool for analysis (specs) after questionnaires have been collected from all the heads of the different business process owners associated with the supply chain and their workforce. Based on the findings, the effectiveness of the supply chain in the manufacturing industry is somewhat influenced by order management and warehouse management and strongly influenced by inventory management systems and supplier relations.

Kamau and Assumpta (2020) conducted research on Safaricom Ltd. in Kenya to examine the impact of inventory management on organizational competitiveness. The research aimed to determine the effects of inventory loss, inventory investment, and inventory availability on the competitiveness of Safaricom Ltd. This study used a descriptive research methodology. The targeted recipients were the senior management team members of Safaricom Kenya Ltd., who work in the areas of finance, customer service, administration, and commercial (sales and marketing). The study focused on staff members in those areas who were considered the most equipped to address queries about inventory management and the competitiveness of the firm. The survey was supposed to be completed by all 103 members of management at the company's Nairobi headquarters. Stratified random sampling was used with Fisher's Formula to ascertain the appropriate sample size. A grand total of eighty individuals were polled using this methodology. The study used a survey that consisted of a combination of open-ended and closed-ended questions to collect primary data. The questionnaire was administered utilizing the drop-off and pick-up method. The survey's quantitative data was coded and then inputted into the analytical software SPSS. The data were examined using descriptive and inferential statistics. The data was shown in tabular and graphical formats and analyzed using percentages and mean scores. According to the study, inventory shrinkage, investment, and turnover have an impact on Safaricom Ltd.'s competitiveness.

Edwin and Florence conducted research in 2021 titled "A Case Study of Listed Cement Manufacturing Companies in Kenya" to examine the impact of inventory management on the productivity of cement manufacturing businesses in Kenya. This research is crucial for evaluating the influence of inventory management on the efficiency of Kenya's cement manufacturing firms, which have a substantial effect on the nation's economy. Analysed were the annual reports of three

chosen firms from the Nairobi Securities Exchange (NSE), using cross-sectional data gathered from 2014 to 2020. The relationship between inventory management and corporate output was examined by analyzing the data using Ordinary Least Squares (OLS) expressed as multiple regression models. Factors such as inventory coverage, inventory availability, storage cost, firm size, gross profit margin, return on assets, and growth are taken into account. The study indicates that there is a negative link between inventory turnover, inventory availability, storage cost, and firm productivity. Furthermore, a distinct association was seen between the magnitude of the enterprise and the expenses associated with storage, as well as the extent of inventory coverage. Based on the study findings, it is advisable for cement businesses in Kenya to minimize stock-outs and excessive holding costs by maintaining optimal inventory levels in their warehouses.

IV. METHODOLOGY

A) Research Design

This study used descriptive research to obtain data about a population or subgroup using predefined criteria.

B) Sources of Data

This study employed primary and secondary data. This research relied on questionnaires given to employees at chosen companies. Books, journals, papers, magazines, and the internet were also carefully investigated.

C) Population of Study

The population of this study covered the entire staff of both organizations under study. Lafarge has four hundred and twenty-seven (427) staff, while Niger Mills Company Limited has two hundred and eighty (280) workers. Therefore, the entire population of the study was seven hundred and seven (707), cutting across management and non-management employees in the selected companies, respectively.

D) Sample Size Determination

The sample size was calculated using Taro Yamane's formula. Taro Yamane's (1967) formula was applied to the population sizes of both firms selected in order to arrive at a sample size for the research. The Taro Yamane's (1967) formula is thus:

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

Where:

n	=	The sampıe sıze required
N	=	The total population
I	=	Constant
r	=	Tolerable error

Substituting numbers in the formula, we have;

Lafarge Africa Plc, Calabar

$$n = \frac{427}{1+427\ (0.05)^2}$$

$$n = \frac{427}{1+427\ (0.0025)}$$

$$n = \frac{427}{2.0675}$$

n = 206 staff

Niger Mills Ltd

$$n = \frac{280}{1+280\ (0.05)^2}$$

$$n = \frac{280}{1+280\ (0.0025)}$$

$$n = \frac{280}{1.7}$$

n = 164 staff

The total population was, therefore, 206 + 164 = 370

E) Sampling Techniques

Study units were recruited from a diverse population using stratified sampling. This sampling method was used since the labourer population is varied. Stratified random sampling ensured level-wide coverage.

F) Instrumentation

A standardized questionnaire was used to collect data from research participants. The survey used a five-point Likert scale. This study used the Likert scale choices SA-5, A-4, U-3, D-2, and SD-1 to assess participants' opinions on the research subjects.

G) Validity and Reliability of Instrument

Content validity dictated instrument validity. The study instrument was tested for reliability using Cronbach Alpha.

Table 1: Reliability Test

Cronbach's Alpha	Number of Items
.735	**19**

Source: *SPSS version 27.0 output, 2023.*

Table 1 indicates the survey questionnaire's reliability. The questionnaire's Cronbach's alpha rating of 0.735 indicates its reliability and suitability for research purposes.

H) Data Treatment Techniques

Using SPSS 27.0, quantitative and qualitative data were analyzed. The results were summarised using descriptive statistics and Ordinary Least Squares regression.

I) Model Specification

A multiple linear regression model was employed to assess the research topic as follows:
The model is shown below;
PE = F(IA, IC, IAC) …… (1)
Where:
PE= Production efficiency
IA = Inventory Availability
IC = Inventory Coverage
IA = inventory accuracy
In a regression form, it will become:
$PE= \beta o + \beta_1 IA_{It} + \beta_2 1C_{It} + \beta_3 1AC_{It} + \mu$ …… (3)
βo = Constant Term
β1 = Coefficient of Inventory Availability
β2 = Coefficient of Inventory Coverage
β2 = Coefficient of Inventory Accuracy
μ = Error Term

J) Data Presentation and Analysis

Table 2 Questionnaire Response Rate

S/N	Organization	Number of questionnaires distributed	Number of questionnaires returned	Percentage of questionnaires returned
1	Lafarge Africa Plc, Calabar	206	196	53
2	Niger mills Ltd, Calabar	164	132	36
	Total	**370**	**328**	**89**

Source: *Researcher's Fieldwork, 2023*

Table 2 shows questionnaire dispersion. The data shows that Lafarge Africa Plc, Calabar received 206 questionnaires, and Niger Mills Ltd 164. the workforce of Lafarge Africa Plc, Calabar, accurately completed and returned 196 questionnaires (53%), while Niger Mills Ltd, Calabar workforce returned 134 (36%). No questionnaire was left incomplete; hence, 89% were legitimate.

Table 3 Multi Co-linearity Test

	Co-linearity statistics	
	Tolerance	**Variance inflation factor (VIF)**
(Constant)		
Inventory Availability	0.390	6.091
Inventory Accuracy	0.221	7.269
Inventory Coverage	0.366	6.029

***Source**: Researcher's Computation, 2023*

Multi-co-linearity was not a concern since the tolerances were both more than 0.2 and the VIFs were less than 10. The analysis may proceed as anticipated.

Table 4 Model Summary

Model Summary					
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Durbin Watson**
1	.929[a]	.863	.861	.446	1.368
a. Predictors: (Constant), inventory availability, inventory accuracy, inventory coverage					
b. Dependent variable: Production efficiency					

***Source:** Researcher's Computation, 2023*

A corrected *R* 2 (coefficient of multiple determination) shows that inventory availability, accuracy, and coverage affect production efficiency by 0.861 (86.1% of total variation). Other variables that explained 13.9% of the variation were excluded. Durbin Statistics finds regression residual autocorrelation. This is the correlation between two or more dataset's variable values. The Durbin-Watson value of 1.368 was below 2, eliminating autocorrelation.

Table 5 ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	289.744	3	96.581	444.591	.000[b]
	Residual	45.837	325	.217		
	Total	335.581	328			
a. Dependent Variable: Production efficiency						
b. Predictors: (Constant), inventory availability, inventory accuracy, inventory coverage						

***Source:** Researcher's Computation, 2023*

Due to the P-value of 0.000, which is less than 0.05, inventory management factors affect production efficiency at 5% significance.

Table 6 Regression Coefficients

Coefficients[a]					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
1 (Constant)	.436	.108		4.032	.000
Inventory Availability	.668	.083	.683	8.055	.000
Inventory Accuracy	.267	.071	.276	3.777	.000
Inventory Coverage	.117	.058	.219	2.297	.000
a. Dependent Variable: Production efficiency					

***Source:** Researcher's Computation, 2023*

Based on the outcome of the regression analysis, the model formulated in the previous section is substituted to become:

$$PE = 0.436 + 0.668IA_{It} + 0.267IC_{It} + 0.117IAC_{It} + \mu$$

Test of hypothesis one

H_0: There is no significant effect of inventory availability on the production efficiency of selected manufacturing firms in Calabar

H_1: There is a significant effect of inventory availability on the production efficiency of selected manufacturing firms in Calabar

The regression study revealed that inventory availability favourably impacts organisational production efficiency in Calabar manufacturing businesses (β1=0.668, p=0.000, t=8.055). This data supports the alternative hypothesis that inventory availability considerably impacts Calabar industrial businesses' production efficiency and disproves the null hypothesis.

Test of hypothesis two

H_0: Inventory accuracy does not have a significant effect on the production efficiency of selected manufacturing firms in Calabar

H_1: Inventory accuracy has a significant effect on the production efficiency of selected manufacturing firms in Calabar

The regression results indicated that inventory accuracy strongly influences the production efficiency of selected Calabar manufacturing businesses (o1=0.267, p=0.000, t=3.777). This supports the alternative hypothesis that inventory accuracy considerably affects certain Calabar manufacturing businesses' production efficiency; hence we reject the null hypothesis.

Test of hypothesis three

H_0: There is no significant effect of inventory coverage on the production efficiency of selected manufacturing firms in Calabar

H_1: There is a significant effect of inventory coverage on the production efficiency of selected manufacturing firms in Calabar

A regression study revealed that inventory coverage significantly affects production efficiency in Calabar manufacturing businesses (β1=0.117, p=0.000, t=2.297). This supports the alternative hypothesis that inventory coverage significantly affects Calabar industrial businesses' production efficiency, disproving the null hypothesis.

V. DISCUSSIONS OF FINDINGS

The regression analysis revealed that inventory availability (β1=0.668, p=0.000, t=8.055) had a significant and favourable influence on the organisational production efficiency of the selected manufacturing businesses in Calabar. Edwin and Florence (2021) conducted research on the influence of inventory management on the efficiency of cement manufacturing firms in Kenya. Their findings contradicted the prevailing notion, since they focused on a specific case study including listed cement manufacturing companies in Kenya. A cross-sectional data set was gathered from 2014 to 2020 to examine the annual reports of the three chosen firms listed on the Nairobi Securities Exchange (NSE). The researchers used ordinary least squares (OLS) in the form of multiple regression models to analyze the data and ascertain the association between inventory management and corporate production. Factors such as inventory coverage, inventory availability, storage cost, firm size, gross profit margin, return on assets, and growth are taken into account. The study indicates that there is a negative link between inventory turnover, inventory availability, storage cost, and firm productivity. Moreover, there was a shown linear relationship between the size of a corporation and its inventory coverage, specifically in connection to the cost of storage.

The study also discovered that some manufacturing companies in Calabar might enhance their production efficiency by assuring the accuracy of their inventory (o1=0.267, p=0.000, t=3.777). This corroborates the findings of Okoye, Amahalu, Nweze, and Obi (2016), who examined the correlation between inventory and the financial performance of manufacturing companies. Between 1980 and 2005, researchers conducted a comprehensive study on 52,254 enterprises over a span of 25 years. They used multiple regressions to demonstrate a correlation between financial performance and various inventory levels. Financial performance metrics included gross and operating profit, as well as inventory levels for raw materials, semi-finished items, and completed goods. The results indicated a favourable correlation between efficient inventory management and financial prosperity. In addition, they observed that the kind of inventory and financial performance directly influence the level of correlation.

The study revealed that inventory coverage had a substantial influence on production efficiency (β1=0.117, p=0.000, t=2.297) for certain industrial companies in Calabar. Madishetti and Kibona (2019) found that the production efficiency of small and medium-sized enterprises (SMEs) is positively influenced by the effective design and implementation of inventory management. This conclusion is in direct opposition to their results. The study examined the impact of inventory management on the operational effectiveness of small and medium-sized enterprises (SMEs), as well as the relationship between inventory coverage and production efficiency. The researchers used financial statement data from the years 2016 to 2018 to examine and assess 26 small and medium-sized enterprises (SMEs) in Tanzania. Regression analysis was used to examine the impact of inventory conversion time on gross operating profit. The results revealed a significant negative linear correlation between inventory coverage and production efficiency.

VI. CONCLUSION AND RECOMMENDATIONS

A) Conclusion

The main objective of this study was to examine the performance of certain Nigerian manufacturing firms in terms of production efficiency with respect to inventory management. A study conducted in Calabar revealed that the presence of inventories has a favourable and substantial effect on the production efficiency of certain industrial businesses. The research further discovered that inventory correctness has a substantial impact on production efficiency for certain Calabar industrial

firms. Ultimately, the study revealed that inventory coverage had a substantial influence on the production efficiency of some industrial businesses in Calabar.

B) Recommendations

The study's findings provided the following recommendations:

1. The efficiency and efficacy of organisational production rely on the diligent oversight and control of the inventory system by management to maintain a steady output.
2. Based on the study findings, it is recommended that top management give priority to implementing efficient inventory management techniques and measuring variances in efficiency. This will help identify specific areas where improvements are needed in inventory management.
3. Furthermore, this study indicates that the senior management of the selected manufacturing organizations uses effective inventory and material management systems, such as material need planning and just-in-time production. Implementing these inventory management solutions would result in substantial enhancements to their operational cash flows and production efficiency.

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