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Impact of Inventory Management on Firm Performance in Nigeria: Using Grass Roots Opinion

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Abstract: *The main objective of our study is to determine the impact of inventory management on firm performance in Nigeria-Using Grass Roots Opinion. Other specific objectives are to determine the impact of ABC model; Low, medium, high model; and Economic order quantity EOQ models on firm performance. Our methodology applied grass roots opinion (primary questionnaire) survey design with a focus on a purposefully sampled 10 firms with populations of 710 staff strength; while Taro Yamane formulae was used to arrive at 400 staff who formed our respondents. The method of analyses applied descriptive statistics; Pearson Correlation and OLS regression. The result shows that the Adjusted R-squared value of 0.879, which is 88% of the systematic variations in the dependent variable in the pooled firms, was jointly explained by the independent variables (ABC, LMH, and EOQ) on firm stock management. The F-statistic value of 429.250 with P-value of 0.0000 shows that the OLS pooled model on the overall is statistically significant @ 5% level. Other findings of the explanatory variables are: ABC; LMH; and EOQ inventory models have positive significant impact on firm performance in Nigeria. The study concludes that inventory management model techniques tested have positive significant impact on firm performance. This study is important to the manufacturing firms in Nigeria because it provides the guidelines to the management of firms on stock management models that minimizes stock waste and impact corporate performances.*

Keywords: Inventory Management, Economic Order Quantity, ABC Model, Low, Medium High

Introduction

Background to the Study

The earliest form of inventory management dates back over 50,000 years in which people used "tally sticks" to count. But, over time, inventory management developed into slightly more accurate systems of accounting and record keeping, particularly in ancient Greek and Egyptian societies. Then in the mid and late 1990s, the known modern inventory management systems came at vogue. Today's inventory management has to apply Radio-frequency identification, with microchips that transmit product information that contains everything that's relevant to a business owner and their employees and with a mobile inventory app that can manage inventory.

Inventory Control System/techniques is the process of managing inventory in order to meet customer demand at the lowest possible cost and with a minimum of investment, (Byoungho, 2004). A successfully implemented inventory control program is stated by (Ellram, 1996) to take into account such things as purchasing goods commensurate with demand, seasonal variation, changing usage patterns, and monitoring for pilferage. Thus a fundamental step in the process of inventory control is to determine the approximate costs of carrying inventory. Langabeer and Stoughton (2001), said that costs include such expenses as storage costs, inventory risks, and the loss-of-opportunity costs 'associated with tying up capital. Stevenson (2010) defined inventory management as a framework employed in firms in controlling its interest in inventory. It includes the recording and observing of stock level, estimating future request, and settling on when and how to arrange. It was also stated by, Deveshwar and Dhawal (2013) that inventory management is a method that companies use to organize, store, and replace inventory, to keep an adequate supply of goods at the same time minimizing cost. According to Daniel Atnafu &Assefa Balda (2018), a study conducted in Kenya by Naliaka and Namusonge (2015) identified that inventory management affects competitive advantage of manufacturing firms. The same study further concludes that the firm is able to compete based on quality and delivery of customer orders on time. Competitive advantage comprises capabilities that allow an organization to differentiate itself from its competitors and is an outcome of critical management decisions (Li, Ragu-Nathan, Ragu-Nathan, & Subba Rao, 2006). Daniel Atnafu &Assefa Balda (2018)

Inventories contribute to proper functioning of manufacturing and retailing organizations (Anichebe & Agu, 2013). They may consist of raw materials, work in progress, (Moore, Lee & Taylor, 2003). It represents 33% of an organization's total assets and as much as 90% of working capital (Sawaya & Giauque, 2003). It is regarded as a major portion of total current asset of many organizations, (Moore, Lee & Taylor, 2003) inventory often represent as much as 40% of the capital of industrial organizations. Temeng, Eshun and Essey (2010) said that firms have long ignored the potential savings from proper inventory management, treating inventory as a necessary evil and not as an asset that requires a proper management. An effective inventory management is able to generate more sales for the company which directly affects the performance of the company (Mohamad, Suraidi, Rahman

and Suhaimi, 2016)

Improper inventory management models have been observed in (Wanko, 2014) as very devastating to firm performance. Several firms especially manufacturing companies have been consistently challenged of improper inventories controls and management such as: wrong estimate, pilfering, poor reaction to customers' demand, lack of proper accounting recording systems and inability to choose find the required model to handle inventory, (Wanko, 2014; Mohamad, Suraidi, Rahman & Suhaimi, 2016). Similarly, Abdulrasheed, Khadijat, Sulu and Olanrewaju (2013) observed that companies face problems of inconsistent deliveries, reduced consumer effective demand and high cost of production due to poor inventory management techniques leading to poor performance. Other authors like (Duru, Okpe & Udeji, 2014) insist that inventory is the livewire of any manufacturing firm. They maintain that because of shortage of materials to meet sudden increase in customers demand, reduction in profit margin, low returns on equity, wastages of materials, pilferage arising due to excess stock and sleep in communication chains that exist in most industries, inventory management has become mandatory on each and every manager responsible for production in an organization. Inventory is one vital resource that any corporate organization needs. Like any other business resource, inventory is limited in supply; hence it requires effective management rather than neglect. Based on some facts gathered from prior literatures there have been mixed and inconclusive results both in developed and undeveloped economy on inventory management, (Koumanakos, 2008; Juan, & Martinez, 2002; Sitienei & Memba, 2016; Mohamad, Suraidi, Rahman & Suhaimi, 2016; Prempeh, 2015; Mukopi & Iravo, 2015; Mwangi & Nyambura, 2015). Our current study focuses on impact of inventory management practice on performance of firms in Nigeria. We aim to determine whether: ABC; Low Medium, High; and Economic Order Quantity model techniques in inventory management impact on firm performance.

The broad objective of this study is to determine the proper inventory management model techniques that impact firm performance in Nigeria. Other objectives are to determine whether:

ABC model techniques in inventory management impact firm performance;
LMH, Low, Medium and High model techniques in inventory management impact on firm performance;
EOQ, Economic Order Quantity model techniques in inventory management impact firm performance in Nigeria

From the objectives we raise these questions:
To what extent does ABC model techniques in inventory management impact on firm performance?
To what extent do LMH, Low, Medium and High model techniques in inventory management impact on firm performance?
To what extent does EOQ, Economic Order Quantity model techniques in inventory management impact firm performance in Nigeria?

The posited hypotheses are as follows:
ABC model techniques in inventory management have no significant impact on firm performance;
LMH, Low, Medium and High model techniques in inventory management has no significant impact on firm performance; and
EOQ, Economic Order Quantity model techniques in inventory management has no significant impact on firm performance in Nigeria.

Review of Empirical Literature
Concept of Inventory Management
Stock and Lambert, (2001) defined Inventory as a stock or store of goods. These goods are maintained on hand at or near a business's location so that the firm may meet demand and fulfill its reason for existence. If the firm is a retail establishment, a customer may look elsewhere to have his or her needs satisfied if the firm does not have the required item in stock when the customer arrives. If the firm is a manufacturer, it must maintain some inventory of raw materials and work-in-process in order to keep the factory running. In addition, it must maintain some supply of finished goods in order to meet demand. Coyle, Bardi, and Langley, (2003), defines inventory as "raw materials, work- in- progress, finished goods and supplies required for creation of a company's goods and services". Davis, Aquilano and Chase, (2003) also defines inventory as "the stock of any item or resource used in an organization". It is an idle resource held for future use (Dilworth, 1993). Effective management of inventory is a major concern for firms in all industries (Mentzer, et al., 2007).
The issue of inventory management permeates decision-making in many firms and this has been extensively studied in the academic and corporate spheres (Rosa, Mayerle, & Gonçalves, 2010). Wanke, (2014), stated that the key questions – usually influenced by a variety of circumstances – which inventory management seeks to answer are: when to order, how much to order and how much stock to keep as safety stock (Namit and Chen 1999; Silva 2009). As regards this, Wanke (2011a), observed that inventory management involves a set of decisions that aim at matching existing demand with the supply of products and materials over space and time in order to achieve specified cost and service level objectives, observing product, operation, and demand characteristics.

Literatures have demonstrated as Wanke, (2014) said that choosing the most adequate inventory management model is essentially an empirically-based decision that may involve the use of simulation, scenario analysis, incremental cost analyses (Silva 2009; Rosa et al. 2010; Rego and Mesquita, 2011; Wanke 2011b) or qualitative conceptual schemes also known as classification approaches (Huiskonen 2001). The latter usually considers that the impact of product, operation and demand characteristics constitute intervening variables in this choice as opined by (Dekker, Kleijn, & De Rooij 1998; Botter & Fortuin 2000; Braglia, Grassi, & Montanari 2004; Eaves and Kingsman 2004; Wanke 2011b). Prior analysis of the literature dealing with inventory management model selection indicates that it originally focused on production and distribution environments in which demand and lead time tend to be more predictable or, in other words, in which it is easier to answer the questions of "what" and "how much" to order (Wanke and Saliby, 2009; Wanke 2011b; Rosa et al. 2010). However, there is a growing literature related to the specific problems raised by other models (Botter and Fortuin 2000; Silva, 2009; Rego and Mesquita 2011; Syntetos et al. 2012).

Concept of ABC model techniques in inventory management

A firm needs control system/techniques to effectively management of inventory (Pandey, 2008). The authors stated further that several control systems/techniques are at vogue from simple to very complicated systems/techniques. Small firms may opt to adopt simple two bin systems/techniques and the very large firms may choose to adopt very complicated systems such as ABC inventory control systems/techniques. Grablowsky (2005) found that only large firms established sound inventory control systems/techniques for determining inventory re-order and stock levels by application of quantitative techniques such as EOQ and Linear Programming to provide additional information for decision making.

Inventory control techniques are employed by organization within the framework of one of the basic inventory models. The model techniques to be applied depend on the type of firms and the inventory involved. However, every model adopted should cover all items of inventory and at all stages, i.e. from the stage of receipt from suppliers to the stage of finished goods and disposals. Vollmann said that 'ABC model analysis is a business term used to define an inventory categorization technique often used in materials management. It is also known as 'Selective Inventory Control.' ABC analysis provides a mechanism for identifying items which will have a significant impact on overall inventory cost; whilst also providing a mechanism for identifying different categories of stock that will require different management and controls. B. Gerald, N. King, and D. Natchek said that when carrying out an ABC analysis, inventory items are valued (item cost multiplied by quantity issued/consumed in period) with the results then ranked. The results are then grouped typically into three bands. These bands are called ABC codes. ABC CODES "A class" inventory will typically contain items that account for 80% of total value, or 20% of total items. "B class" inventory will have around 15% of total value, or 30% of total items. "C class" inventory will account for the remaining 5%, or 50% of total items. K. Lysons and B. Farrington observed that ABC Analysis is similar to the Pareto principle in that the "A class" group will typically account for a large proportion of the overall value but a small percentage of the overall volume of inventory.

Concept of LMH Low, Medium and High model Techniques

The Low, medium and high LMH model classification follows the same procedure as is adopted in ABC classification. The only difference is that in LMH, the classification unit value is the criterion and not the annual consumption value. The items of inventory should be listed in the descending order of unit value and it is up to the management to fix limits for three categories. The LMH analysis is useful for keeping control over consumption at departmental levels, for deciding the frequency of physical verification, and for controlling purchases (Gomez 2008; Teunter and Duncan 2009). However the procurement department is more concerned with prices of materials for decisions purposes such as, who will procure what based on the hierarchy and price of material. Some of the other objective can be as under Helps in taking the decision such as whether to procure in exact requirement or opt for EOQ or purchase only when needed When it is desired to evolve purchasing policies then also LMH analysis is carried out i.e. whether to purchase in exact quantities as required or to purchase in EOQ or purchase only when absolutely necessary When the objective is to keep control over consumption at the department level then authorization to draw materials from the stores will be given to senior staff for H item, next lower level in seniority for M class item and junior level staff for L class items. Cycle counting can also be planned based on HML analysis. H class items shall be counted very frequently, M class shall be counted at lesser frequency and L class shall be counted at least frequency as compared to H & M class.

Wanke (2014) describing inventory management using low consumption According to Tavares and Almeida (1983) said that very low consumption parts are those whose average consumption is less than one unit per year. According to these authors, the stock control of these items should not be performed using the usual models because, due to their particular consumption characteristic, there are not enough previous occurrences to make a precise estimate of probability distribution (Syntetos & Boylan 2001; Ghobbar & Friend 2003; Eaves and Kingsman 2004; Willemain, Smart, & Schwarz 2004; Regattieri et al. 2005; Hua et al. 2007; Gutierrez, Solis, & Mukhopadhyay 2008; Gomez 2008; Teunter and Duncan 2009). In addition, following Tavares and Almeida (1983), it is the analysis of total shortage, excess and order placement costs, given a certain service level, that makes it possible to determine whether a part should, or should not, be kept in stock, and a replenishment request made solely against an order.

Medium consumption (Wanke, 2014) described medium cost items as those with a historical consumption of between 1 and 300~500 units per year, which leads to an average daily demand close to one, as suggested by Wanke (2005). But, High

consumption items are frequently considered to be those with a historical consumption of over 300~500 units per year, roughly one unit/day (Wanke, 2005).

EOQ, Economic Order Quantity model techniques in inventory management

Economic Order Quantity (EOQ) is an inventory management system that demonstrates the quantity of an item to reduce the total cost of both handling of inventory (Handling Cost) and order processing (Ordering Cost). EOQ as a model has been introduced by Ford W. Harris 1913; and R. H. Wilson and K. Andler have been given credit for their in-depth analysis and application of the EOQ model (Hax and Candea, 1984). The economic order quantity (EOQ) formula plays an important role in inventory management. EOQ model has been practice in the fields of operations management and operations research. As noted above the Father of EOQ model is Harris (1913) describes a very simple deterministic inventory planning model with a tradeoff between fixed ordering cost and inventory carrying cost (Drake & Marley, 2014) . EOQ lays the foundation for all kinds of extensions and real world management applications, (Axsäter, 1996;
Huang, Kulkarni & Swaminathan, 2003; Khan, Jaber, Guiffrida, & Zolfaghari, 2011; Pentico, & Drake, 2011). The deterministic and the stochastic EOQ models were developed as in (Axsäter, 1996; Pentico, & Drake, 2011; Rao, & Bahari-Kashani, 1990; Zhang, Kaku & Xiao, 2011; Brill & Chaouch, 1995.
In practice, the size of required Q is determined by the Economic Order Quantity formula (Harris 1913) and the reorder point is defined so as to assure a specific service level measure (Eppen and Martin 1988; Rego et al. 2011). In inventory management, the EOQ is the number of units that a company should add to inventory with each order to minimize the total costs of inventory—such as holding costs, and shortage costs. EOQ is applied as part of a continuous review inventory system in which the level of inventory monitored at all times and a fixed quantity is ordered each time the inventory level reaches a specific reorder point. The EOQ provides a model for calculating the appropriate reorder point and the optimal reorder quantity to ensure the instantaneous replenishment of inventory with no shortages. EOQ model assumes that demand is constant, and that inventory is depleted at a fixed rate until it reaches zero. Thus, the cost of inventory under the EOQ model involves a tradeoff between inventory holding costs (the cost of shortage, as well the cost of tying up capital in inventory rather than investing or using it other purposes) and order costs (any fees associated with placing orders, such as delivery charges).
In inventory management using EOQ, it is necessary to know the format of the distribution of lead-time demand to determine the safety stock embedded within the reorder point (Keaton 1995). According to Porras and Decker (2008), this calculation requires specifying the distribution of lead-time demand so that the safety factor can be determined. Traditionally, lead-time demand is modeled using a Normal distribution (Silver and Peterson 1985). Due to the properties of this distribution, the safety factor K for a specific service level is the same as of the standard normal distribution curve, Z, which can be found in several statistics and logistics literatures (Levine et al. 2005 and Ballou, 2006). Various studies, however, criticize this (Wanke, 2014) methods of calculation of EOQ. Furthermore, according to Eppen and Martin (1988), items that present a normal distribution of lead-time demand are found in only a few cases. As an attempt to balance the advantages and disadvantages of choosing a specific premise, Silver et al. (1998) has propose a general rule for approximating lead-time demand using the probability distribution of the coefficient of variation (CV).

Firm Performance

Omar Taouab and Zineb Issor (2019) said that successful firms represent a key ingredient for developing nations. Many economists consider them similar to an engine in determining their economic, social, and political development. To survive in a competitive business environment, every firm should operate in conditions of performance. At all times, firm performance has become a relevant concept in strategic management research and is frequently used as a dependent variable. Although it is a very common notion in the academic literature, there is hardly a consensus about its definition and measurement. However, due to the absence of any operational definition of firm performance upon which the majority of scholars consent, there would naturally be diverse interpretations suggested by various people according to their personal perceptions. Siminica (2008) has the opinions that a firm is performing when it is at the same time efficient and effective. Therefore, the performance is a function of two variables, efficiency and efficacy. Colase (2009) considers the word performance as a bag-word because it covers various and different notions such as growth, profitability, return, productivity, efficiency, and competitiveness. Bartoli and Blatrix (2015) believed that the definition of performance should be achieved through items such as piloting, evaluation, efficiency, effectiveness, and quality Ittner and Larcker (2003) point out the mistakes that firms make when trying to measure the non-financial performance as: 1) Lack of Alignment between Measurements with Strategy: A key challenge for firms is to find out which non-financial measures they need to implement. 2) Validate the Measurements: Companies do not validate the model, which leads to the measuring of many things, and most of them are irrelevant. 3) Inability to set up the right goals and measures. 4) Wrong Measurements: Many companies use metrics that have no statistical validity. Tangen (2004) says that many companies still rely on the traditional quantitative financial performance measurement systems. Man (2006) determined that the measures of performance are divided into four categories: Financial, non-financial, tangible, and intangible. According to Gimbert, Bisbe & Mendoza (2010) said that performance measurement system is a concise and defined set of measures (financial or non-financial) that supports the decision-making process of an organization by collecting, processing, and analyzing quantified data of performance information

Performance is viewed as financial and organizational and can be measured based on variables that involve productivity, returns, growth or even customer satisfaction (Nnubia, et al. 2017).

In firm performance profit is not the same thing as profitability. Profit is the excess of revenue over revenue expenditure in a given trading period say in calendar year, profitability means the measure of the ability of the firm to earn profit (Huynh, 2011). Bodies, Kane and Marcus (2004), there are 5 measures of profit the use of which depends on the purpose for which such measure is computed viz. gross profit, operating profit, profit before interest and tax (PBIT), profit before tax (PBT) and profit after tax (PAT). ldiko and Tamas (2009), said that profitability is expressed as a ratio measuring the rate of some profit which is bench marked against some base measurement or variable of reference such as total assets, equity, non-financial assets, gross profit, investment, net capital employed and other appropriate variables. Therefore Profitability is given as (profit/Base measurement) 100%. Selvam, Gayathri, Vinayagamoorthi and Kasilingam (2016) developed a performance model with nine determinants/dimensions: profitability, growth, market value, customer satisfaction, employee satisfaction, environmental audit, corporate governance and social performance and found that these nine performance dimensions or determinants cannot be used interchangeably since they represent different aspects of firm performance and different stakeholders of firms have different demands that need to be managed independently.

Our study applied return on asset ROA to evaluate firm's performance ability in profit making according to total investments in assets (Babalola, 2013). ROA is a financial ratio that shows the percentage of profit that a firm earns in relation to its overall resources. It is generally defined as net income (or Pretax profit)/total asset. According to Babalola (2013), ROA is calculated as the net profit after tax divided by total assets and indicates the returns generated from the assets financed by the firm. Our study applies performance as the dependent variable with (ROA) as proxy to measure the impact of inventory management models on firm profitability (performance) but not operating profit only.

Theoretical Framework

This study is anchored on Economic Order Quantity EOQ Model of Inventory Management which opines that inventory control model uses minimization of costs, between stock holding and stock ordering. This model requires the determination of (EOQ) as the ordering quantity at which stock holding costs are equal to stock ordering costs (Saleemi, 1993). The view of the model is that the optimal inventory size is the point at which stock ordering costs are equal to the stock holding costs. However, the optimal inventory size is also known as (EOQ). This model helps an organization to put in place an effective stock management system to ensure reliable stock needs for production or sales forecasts to be used in ordering purposes (Atrill, 2006). EOQ model puts several assumptions into consideration: the usage of stored product is assumed to be steady; ordering costs are assumed to be constant, i.e. the same amount has to be paid for any order size; and the carrying costs of inventory which are composed of cost of storage, handling and insurance are assumed to be constant per unit of inventory, per unit of time. The EOQ model therefore merely takes variable costs into consideration, although it can easily be extended so as to include fixed costs (Ross et al., 2008). Prior researchers like (Nyabwanga et al., 2012) have applied this model. Other EOQ model assumptions are that only one product is produced, annual demand requirements are known, demand is spread evenly throughout the year so that demand rate is reasonably constant, lead time does not vary, each order is received in a single delivery and there is no quantity discounts.

Empirical Studies

Priniotakis and Argyropoulos (2019) discusses some basic concepts and techniques for classifying inventory, controlling inventory levels, avoiding stock outs and increasing customer satisfaction. It also discusses the importance of forecasting demand and uses the Root Mean Square Error (RMSE) as an effective measure of the forecast error, which later becomes a basic driver for inventory management. They state that Service Level (SL) as a performance metric and emphasizes on the importance of Safety Stock (SS) and also the use of the Reorder Point (ROP) as an efficient indicator for triggering production replenishment and proposes a simple technique for prioritizing production orders.

Senthilnathan (2019) described that in stock management (EOQ) is an important inventory management system that demonstrates the quantity of an item to reduce the total cost of both handling of inventory (Handling Cost) and order processing (Ordering Cost). The author argues that the purpose of determining the EOQ is to minimise the Total Incremental Cost (TIC), beyond the cost of purchasing of a product/material, in consideration of two main total costs: Total Ordering Cost (TOC) and Total Handling Cost (THC) and finally highlights two basic methods of determining the EOQ: Trial and error method and Mathematical approach and emphasises the mathematical model as highly useful to enhance the inventory management of a product.

Chan, Tasmin, Aziati, Rasi, Ismail and Yaw, (2017 tried to identify the problem of inventory management faced by the manufacturing small medium enterprise MSME and also to determine the factors that influence the effectiveness of inventory management. They applied 80 employees in Batu Pahat, Johor using questionnaires. They found that the problems of inventory management faced by manufacturing organization were underproduction, overproduction, stock out situation, delays in the delivery of raw materials and discrepancy of records. The factors, documentation/store records, planning, knowledge of employees/staff skill have shown to significantly influence the effectiveness of inventory management while the funds have shown slightly significant influence on the inventory management in MSME.

Capkun, Hameri, and Weiss (2009) studied the relationship between inventory and financial performance in manufacturing companies. The researchers studied 52,254 businesses for 25 (1980-2005) using multiple regressions. They measured financial

performance using gross profits and operating profit results and Inventory levels in regard to raw materials, partially manufactured products, and finished products. The results found a positive correlation between a company's inventory management and its financial performance. They also noted that Degrees of correlation vary depending on the type of inventory and the financial performance reference.

Sahari, Tinggi and Kadri (2012) analyzed the relationship between inventory management and firm performance along with capital intensity. They applied a sample of 82 construction firms in Malaysia from (2006-2010). Using the regression and correlation analysis, they found that inventory management is positively correlated with firm performance. Again, the results indicate that there is a positive link between inventory management and capital intensity.

Nnubla, Omaliko, Ogechi and Etuka (2017) investigated the effect of inventory control on profitability of manufacturing companies listed on (NSE) from 2011-2015. The study used descriptive and Ordinary Least Square (OLS) multiple regressions to analyze the data collected. They discovered that Raw material has positive significant effect on profitability using Return on Asset (ROA) as profitability indices; inventory conversion period has significant effect on profitability; inventory turnover has significant effect on profitability; storage cost has a negative insignificant effect on profitability.

Lwiki, Ojera, Mugenda, Wachira (2013) applied a survey design on all the eight (8) sugar manufacturing firms in Kenya found that there is generally positive correlation between each of inventory management practices. Specific performance indicators were proved to depend on the level of inventory management practices. They established that Return on Equity had a strong correlation with lean inventory system and strategic supplier partnerships.

Eneje, Nweze, and Udeh (2012) studied the effects of raw materials inventory management on the profitability of brewery firms in Nigeria from (1989-2008). (OLS) multiple regression model was applied in the analysis. Result is that the local variable raw materials inventory management designed to capture the effect of efficient management of raw material inventory by a company on its profitability is significantly strong and positive and influences the profitability of the brewery firms in Nigeria.

Anichebe & Agu (2013) examined the effect of inventory management on organizational effectiveness in selected organizations in Enugu Nigeria, using (248) respondents, they discovered that there is a significant relationship between good inventory management and organizational effectiveness. Thus inventory management was found to have a significant effect on organizational productivity. There was a high positive correlation between good inventory management and organizational profitability.

Mohamad, Suraidi, Rahman and Suhaimi (2016) study inventory management and company performance in a textile chain store in Malaysia, and found that inventory days was significantly related to return on assets (used proxy for company performance). The study identified that the textile chain store company had unorganized inventory arrangement, large amount of inventory days and lacked accurate stores balances due to unskilled workers.

Victoire (2015) investigated the impact of inventory management on profitability in Rwanda using a manufacturing company as case study. The findings indicate that inventory management had significant impact on the company's financial performance.

Prempeh (2015) studied the impact of efficient inventory management on the profitability of manufacturing firms in Ghana using four listed manufacturing firm annual report and the data was analyzed with OLS multiple regression and the result found a strong significant and positive relationship between raw materials inventory management and profitability.

Abdulraheem, Yahaya, Isiaka and Aliu (2011) studied the impact of inventory management on the performance of small businesses in Nigeria, using multiple regression technique. They found that inventory management had a strong positive, impact on profitability among small businesses in Nigeria.

Falope and Ajilore (2009) sampled 50 Nigerian quoted non-financial firms from (1996-2005). Their study utilized panel data econometrics in a pooled regression where time series and cross sectional observation were combined and estimated and found a significant negative relationship between operating profit and the inventory turnover.

Hassan, Imran, Amjad and Hussain (2014) examined the effect of working capital management on the performance of listed non-financial firms in Pakistan. Ordinary Least Square technique was employed to analyse data collected from non-financial firms listed on the Karachi Stock Exchange from (2007-2010). The result shows that among the independent variables used for working capital management, average age of inventory had a positive insignificant relationship with gross profit margin and return on assets, but had a negative insignificant effect on return on equity.

Raheman and Nasr (2007) studied the effects of inventory turnover in days and current ratio of the net operating profit of Pakistani firms. They applied a sample of 94 Pakistani firms listed on the Karachi Stock Exchange from 1999-2004 and found a strong negative relationship between inventory conversion period and profitability of the firms.

Further, Sekeroglu and Altan (2014) examined the effect of inventory management on the profitability of firms in the weaving, food, wholesale and retail industries in Turkey from (2003- 2012. The analyses used regression and correlation techniques on the data collected and the results indicates positive relationship between inventory management and profitability in the food industry, but no relationship in the weaving, wholesale and retail industries.

Finalyy, Panigrahi (2013) explored inventory conversion period and the profitability of cement companies in India from (2001–2010). Gross operating profit was the dependent variable and for profitability and inventory conversion period applied as the independent variable; while current ratio, size and financial debt ratio were employed as control variables. They found a significant negative linear relationship between inventory management and firm performance of profitability.

Methodology

The methodology applied primary survey design and with a focus on a population of 53 manufacturing firms in Nigeria. The respondents (staff) are: production, Accountants, Human Resource, Administration and Operations. Populations of 710 staff strength data of these firms were collected from each of the firms Human Resource records. The staff cadre ranges from senior, principal, chief officers, deputy directors and the directors at the top levels. A purposive sample of 10 firms applied; while Taro Yamane formulae was used to calculate the sample which arrived at 400 staff approximately who formed our respondents
The study constructed the questionnaires on equal numbers of five questions for both dependent and each of the independent variables to remove bias and difficulties in preparation of the raw data to fit properly in the statistical tools analyses to be applied.

The study adopted Likert Scale five point style of structured questionnaire as; strongly disagree (SD) = 1, Disagree (D) = 2, Undecided (UND) = 3, Agree (A) = 4 and strongly agree (SA) = 5.

The study applied Ordinary Least Square Regression Method and the model indicating the link between the dependent and the independent variables is given thus:
Firm Performance is the Dependent Variable = Return on Asset ROA
Inventory Management is the Independent Variable proxy by:
ABC Model techniques
Low Medium High, LMH model techniques
Economic Order Quantity, EOQ Model technique

The model function is shown as thus:
$Y=f(X_1, X_2, X_3,u)$ ……. i
$Y=a+\beta_1X_1\ \beta_2X_2+\beta_3X_3+u$ …… … ii

From this we have:
$FP = ao+\beta_1ABC+\beta_2LMH+\beta_3EOQ+u$ …… iii
$ROA_{it} = \beta o + \beta_1ABC_{it} + \beta_2LMH_{it} + \beta_3EOQit + \mu_{it}$ …… ….iii
Where:
Y= Performance (ROA); βo = Constant Term (intercept) of the model; $_{it}$ = Beta Coefficient;
β_1 - β_3 = Coefficients of inventory Management Techniques; μit= Component of unobserved error term of firms
X(= ABC model techniques); X_2= Low, Medium, High LMM Techniques; X_3=Economic Order Quantity EOQ model techniques.

There is no significant relationship between inventory control techniques and firm performance in Nigeria @ 0.05 levels of significance: Decision reject or accept the hypothesis.

Data Analyses, Presentation and Interpretation

Table One: Descriptive Statistics of the Variables

VARIABLES	ROA	ABC	LMH	EOQ
Mean	36.6000	36.6000	36.6000	36.6000
Median	25.5000	23.5000	26.0000	25.0000
Maximum	140.000	140.000	140.000	140.0000
Minimum	4.00000	4.00000	4.00000	6.00000
Std. Dev.	35.0611	36.3476	34.2505	35.3300
Skewness	1.15147	1.17788	1.13234	1.22246
Kurtosis	3.00086	3.00190	3.100256	3.21720
Jarque-Bera	33.6324	35.0073	32.7182	39.0625
Probability	0.00000	0.00000	0.00000	0.00000
Sum	5985.00	5985.00	5985.00	5985.00
Sum Sq. Dev.	183163	196851	174791	185983
Observations	145	145	145	145

Source: Authors Computation, 2020

The result of the descriptive statistic shows positive Skewness distribution values (ROA 1.15147; ABC, 1.17788; LMH, 1.13234; EOQ, 1.22246) with a long right tailed skewed to the right. The Kurtosis, shows (K=3) approximately (3) and this indicates a normal "bell shaped" (Mesokurtic) distribution for all the independent and dependent variables of the study. The mean values of

both the criterion and the explanatory variables are equal; while the median values are ROA=25.5; ABC=23.5; LMH=26; and EOQ=25. The maximum values show an equal distribution of 140 for each; while the minimum values are 4.0 for each except EOQ which has different value of 6 stocks. The assumption is that the large differences between the maximum and minimum value show that the variables portrayed significant variations in terms of magnitude, thus suggesting varying estimation stock levels.

Diagnostic Test to Check for Multi-co-linearity Problem, Using Correlation Matrix

In order to diagnose for the presence of multi-co-linearity in our data used, as well as evaluating the association among the variables adopted, the Pearson correlation coefficient (correlation matrix) analysis was employed.

Table Two: Pearson Correlation Matrix

VARIABLES	ROA	ABC	LMH	EOQ
ROA	1.00000	0.92075	0.92310	0.91225
ABC	0.92075	1.00000	0.94449	0.93898
LMH	0.92310	0.94449	1.00000	0.94665
EOQ	0.91225	0.93898	0.94665	1.00000

Source: Authors Computation, 2020

The correlation matrix above shows that ROA has a positive relationship with ABC, LMH, EOQ and with each of the independent variables, but none has a perfect correlation. In other words there is no multi-co linearity observed from the result hence the use of the proposed model for the study.

Table Three: Regression Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.29129	1.40091	0.92178	0.35821
ABC	0.17377	0.08432	2.08452	0.03821
LMH	0.43514	0.09551	4.67078	0.00000
EOQ	0.35614	0.08844	3.90881	0.00010

R-squared	0.901210	Mean dependent var	39.90000
Adjusted R-squared	0.87918	S.D. dependent var	35.0611
S.E. of regression	11.1326	Akaike info criterion	7.68395
Sum squared resid	18094.7	Schwarz criterion	7.76423
Log likelihood	-571.296	Hannan-Quinn criter	7.71656
F-statistic	420.250	Durbin-Watson stat	2.07721
Prob(F-statistic)	0.00000		

Source: Authors Computation, 2020

In the table above, we observed from the OLS pooled regression that the Adjusted R-squared has a value of 0.879 which shows that about 88% approximately of the systematic variations in the dependent variable in the pooled firms was jointly explained by the independent variables (ABC, LMH, EOQ), on stock control/management. The unexplained part of the dependent variable (waste or lack or excess) can be attributable to exclusive of very important independent variable that can explain the dependent variable but are outside the scope of this study. The F-statistic value of 429.250 and its associate P-value of 0.0000 shows that the OLS pooled regression model on the overall is statistically significant @ 5% level, this means that the regression model is valid and can be used for statistical inference. We therefore accept and state that there is a significant relationship between the variables. This means that the parameter estimates are statistically significant in explaining the relationship in the dependent variable.

Our model is free from the problem of autocorrelation which is seen from the Durbin-Watson value of 2.07721. Then our presumed (a'priori) criteria are based on the prior accounting theories and the variables result from ABC, LMH and EOQ respectively showing that proper management of these three independent variables impacts firm performance in conformity to our posited theoretical expectation.

In testing the hypotheses we provide the specific analysis for each of the independent variables.

X1-ABC (OLS =0.17377 with probability of 0.03821) as an independent variable to inventory management has a positive and significant influence on inventory management at 5% level. We therefore reject the hypothesis **1 (H0i: ABC model has no significant impact on firm performance)**. This result agrees with the prior empirical results which show that ABC is a major driver of proper inventory management.

X2-LMH (OLS = 0.43514 with Prob. 0.00000) as an independent variable to inventory management has a positive and significant

influence on inventory management at 5% level. We therefore reject the hypothesis **2 (H0ii: LMH model has no significant impact on firm performance)**. This result agrees with the prior empirical results which show that ABC is a major driver of proper inventory management.

X3-EOQ (OLS = 0.35614 with Probability 0.00010) as an independent variable to inventory management has a positive and significant influence on inventory management at 5% level. We therefore reject the hypothesis **3 (H0iii: EOQ model has no significant impact on firm performance)**. This result agrees with the prior empirical results which show that ABC is a major driver of proper inventory management.

The overall findings of inventory management model techniques which shows that (ABC, LMH and EOQ) have positive and significant impact on firm performance agrees with these empirical results (Senthilnathan, 2019; Chan et al., 2017; Capkun et al., 2009; Sahari et al., 2012; Nnubla, et al., 2017; Eneje et al., 2012; Anichebe and Agu, 2012; Mohamad, et al., 2016; Victoire, 2015; Premeli, 2015; Abduraheen et al., 2011; Falope and Ajilore, 2009; Hassan et al., 2014; Raheman and Nasr, 2007; Sekeroglu and Altan, 2014 and Finalyy Panigrahi, 2013), who also found positive significant in their various works.

Summary of Findings

Our study found that inventory management model techniques impact firm performance being significant at 5% significance level of the study. Other findings are that: ABC model technique in stock management has a positive significant impact on firm performance in Nigeria; LMH model technique in stock management has a positive significant impact on firm performance in Nigeria; and EOQ model techniques in stock management has a positive significant impact on firm performance in Nigeria.

Conclusion

Based on the result, the study concludes that inventory management model techniques have positive significant impact on firm performance at 5% level of significance. Also, each of the study model techniques of ABC; Low, medium, high, (LMH) and Economic order quantity EOQ have significant impact on firm performance of selected firms in Nigeria.

Recommendations

This study is important to the manufacturing firms in Nigeria because it provides the guidelines to the management of firms on stock management models that impact corporate performance..

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Appendix:

Questionnaire Format Inventory Management Models and techniques

This questionnaire is designed to find out the inventory models that impact firm performance in Nigeria. The information given in this questionnaire will be held in strict confidence and will be used only for the purpose of this study.

Please, indicate the extent to which you agree or disagree using the key. Key: SA = Strongly Agree; A = Agree; SD = Strongly Disagree; D = Disagree; U = Undecided. 1

1) To what extent do you agree that the inclusion of the following in ABC inventory management model enables it to impact on firm performance?

Inclusions of:	**SA**	**A**	**UD**	**D**	**SD**
ABC as a model in inventory techniques.					
Competent personnel for ABC inventory management.					
Proper Implementation of ABC model					
ABC model helps to regulate working capital costs.					
ABC model singles out stocks or products that are needed at the right time and curtail excesses.					

2) To what extent do you agree that the inclusion of the following in Low, Medium, High inventory management model impact on firm performance?

Inclusion of:	**SA**	**A**	**UD**	**D**	**SD**
Low stock model as part of LMH in inventory management					
Medium stock as part of LMH in inventory management					
High stock as part of LMH model reduces inventory waste, outdated, and spoiled inventory.					
LMH helps to reduce waste and increase efficiency, minimizing and eliminating warehousing and stockpiling.					
LMH helps in maximizing inventory turnover, maintain healthy cash flow by ordering stock only when necessary					

3) To what extent do you agree that the inclusion of the following in Economic Order Quantity EOQ in inventory management model impact on firm performance?

Inclusions of	SA	A	UD	D	SD
Calculation of EOQ					
Trial and error method and Mathematical approach of EOQ					
Emphasizing the mathematical model as highly useful to enhance the inventory management of a product.					
Calculation of EOQ model involves a tradeoff between inventory holding costs (the cost of shortage, as well the cost of tying up capital in inventory rather than investing or using it other purposes).					
Calculation of order costs (any fees associated with placing orders, such as delivery charges).					

4) To what extent do you agree that the inclusion of the following in Low, Medium, High inventory management model impact on firm performance?

Statement	**SA**	**A**	**UD**	**D**	**SD**
ABC model is significant in firm performance					
Low, Medium, High model inventory techniques is significant infirm performance					
Economic Order Quantity EOQ model inventory is significant in firm					

performance.					
Identification of specific inventory model techniques impact on firm performance.					
ABC, LMH and EOQ model impact on firm performance.					