International Journal of Supply and Operations Management

IJSOM

February 2015, Volume 1, Issue 4, pp. 392-406
ISSN-Print: 2383-1359
ISSN-Online: 2383-2525
www.ijsom.com

Inventory management practices and operational performance of flour milling firms in Lagos, Nigeria

Nsikan Efiok John[a*], John Joseph Etim[b], and Tommy Uduak Ime[c]

[a] *Department of Business Management, University of Uyo, Uyo-Nigeria.*
[b] *Faculty of Management Sciences, Cross River University of Technology, Nigeria.*
[c] *Faculty of Management Sciences, University of Calabar, Nigeria*

Abstract
This study examines inventory management practices in flour milling manufacturing firms and their effects on operational performance. Five flour manufacturing firms with aggregate staff population of 2569 constituted the unit of study. From the population space, 150 respondents were randomly selected. Structured questionnaire was the major instrument for the collection of relevant primary data while mean and standard deviation was used to analyze descriptive data. Results showed that exception of the large manufacturing companies, most of the medium-sized flour milling firms adopts different inventory management strategies from the scientific models. Their inventory management strategies and policies were rather based on factors such as changing level of customer demand, prevailing industry practices, forecast estimates and guesses, and available production capacity. Findings also revealed significant differences between effective management of inventory and optimal operating performance. For instance, while firms that scientific inventory management approaches reported efficiency in capacity utilization, increased service level, and reduced lead time, others with unscientific strategies had minimal utilization of material resources. There is need for flour manufacturing firms to implement scientific inventory management models to adequately handle material shortages, product stock outs, and component pile up with consequent penalties.

Keywords: Inventory Management Practices; Operational Performance; Stock Out; Service Availability Level.

[*] Corresponding author email address: nsikiboy5000@yahoo.com

1. Introduction

In a world of intense competition fueled by globalization, increasing consumer awareness, and technological improvement, organizations that are keen towards large scale success must at all times hype its service availability as consumers can very easily divert their patronages elsewhere (Sharma, 2009). Consequently, managing inventory efficiently has become an important operational weapon for products and service firms wishing to survive the competitive pressures. To demonstrate how vital the efficient management of inventory is, we have been counseled to make a careful study and learning from the "proverbial Ant." Seemingly inconsequential, the biblical ant appears to have mastered the art and science of adequately keeping inventories of food and other materials for its future use.

Inventories represent those items which are either accumulated for sale or they are in the process of manufacturing or in the form of materials, which are yet to be utilized. An inventory system is the set of policies and controls that monitor levels of stocks and determine what levels should be maintained, when stock should be replenished, and how large orders should be. Thus, inventory management may be defined as the system used by a firm to control its investment in inventory (Stevenson, 2010). It involves the recording and monitoring of stock level, forecasting future demand and deciding on when and how to order (Adeyemi and Salami, 2010).

The primary goal of inventory management, therefore, is to have adequate quantities of high quality items available to serve customer needs, while also minimized the costs of carrying inventory (Brigham and Ehrhard, 2005). According to Adeyemi and Salami (2010), inventory constitutes the most significant part of current assets of majority of Nigerian manufacturing firms, in which flour milling companies are not an exception. Because of the relative largeness of inventories maintained by flour milling firms, a considerable amount of organization's fund is being committed to holding inventory. It thus becomes essential to deploy cutting-edge techniques to manage inventories efficiently so as to avoid lost sales, costs of changing production rates, overtime cost, sub-contracting, unnecessary cost of sales and back order penalties during periods of peak demand (Chen, 2005). Effort must also be made by the management to strike an optimum investment in inventory since it costs much money to tie down capital in excess inventory. Consequently, we examine in this study the effect of inventory management practices on operational performance.

2. Statement of the Problem

Over the years, effort has been on the development of suitable mathematical models designed to aid the decision-makers in setting and managing optimum inventory levels. Theoretical literature has also not been left behind in reporting breakthrough interventions in inventory management techniques. Besides the well-known deterministic models developed by Harris in 1913 (e.g. Economic Order Quantity (EOQ), Economic Production/batch Quantity (EPQ), Discount and Back Order Model), the design of more sophisticated models to take care of the weaknesses associated with deterministic approaches, and to model a more realistic stochastic business situation has also been intensified (Ayeni and Adewunmi, 2004).

Deterministic models assume that product and service demand pattern are known and constant. In

this situation, other parameters such as lead time and relevant inventory costs are constant and do not change overtime. On the other hand, stochastic inventory models assume condition of uncertainty. Both the demand and relevant costs are no longer constant or known with certainty, and the replenishment policy is not immediate.

To a certain magnitude, studies have reported their usefulness in optimizing scarce business resources and minimizing associated cost (Rajeev, 2010; Ayeni and Adewunmi, 2004). However, the extent to which the inventory management tools (both deterministic and stochastic) have been applied in practice as well as how effective they have been in enhancing operational efficiency of manufacturing firms in Nigeria has not been extensively investigated. Therefore, in this study, we examine the inventory management practices of Nigerian flour milling companies with a view to establishing their effects on firms' operational success.

3. Literature Review

In the theoretical literature, a vast array of inventory management best practices (for example, just in time, vendor managed inventory, collaborative planning, forecasting and replenishment, automatic replenishment, agile system, and material requirement planning) abound. But experience and empirical evidence has revealed that there is limited knowledge and understanding of these practices, their mode of operation, and practical relevance in the Nigerian manufacturing industry; including the Flour milling sub-sector (Eloranta and Raisanen, 1988; Adeyemi and Salami, 2010; Alao, 2010). This lack of awareness and limited embrace of these cutting-edge practices in inventory management could account for the rising increase in raw material wastages, longer lead-time, lost sales, product shortages, backorder penalties, increasing production cost, and poor quality issues currently ravaging the industry. Thus, there appears to be a huge wall of disparity between theoretical inventory management and the practical approach in the context of Nigerian flour milling industry, and the need to bridge the theory-practice gap is imperative.

Several practices have been put forward for effective management of inventory including the use of Economic order quantity (EOQ), Economic Batch Quantity (EBQ), and more recent collaborative models: Vendor managed inventory system, automatic replenishment etc. The Automatic replenishment and Just-In-Time inventory management models-an automated system seeks to ensure swift service availability when needed while minimizing stock handling cost. While the collaborative models are demand pull strategies, the deterministic approaches (EOQ, EBQ) act based on forecast information. The EOQ/EBQ attempt to determine the quantity to order or produce at any point in time taking consideration of all relevant costs- ordering costs, handling costs, stock-out and backorder costs. The EOQ includes parameters such as annual usage in unit, order cost and carrying cost. When implementing the EOQ method, it is advised to manually check the result obtained, run a simulation by using a sampling of items, and maintain the EOQ formula by reviewing the interest rates, storage costs and operational cost periodically.

In this direction, Dave (2001) presents an inventory model for calculating optimal order quantity that used the Economic Order Quantity (EOQ) method. He points out that many companies are not using the EOQ method due to poor results arising from inaccurate data input. He clarifies that many errors in the calculation of EOQ in the computer software package are due to the failure of the users in understanding the data inputs and system setup that control the output. Dave (2001)

posited that EOQ is an accounting formula that determines the point at which the combination of order costs and inventory cost are the least.

Farzaneh (2012) presents a mathematical model to assist companies in their decision to switch from the economic order quantity (EOQ) to the Just in Time (JIT) purchasing policy. The author highlights that the economic order quantity model focuses on minimizing the inventory costs rather than on minimizing the inventory. From the mathematic model presented, Farzaneh (2012) concludes that JIT can eliminate the storage, capital, insurance, ordering, and transportation costs. However, it depends on certain conditions.

Under the ideal condition, whereby all the conditions meet, it is economically better off to choose JIT over EOQ because it results in a simultaneous reduction in purchase price, holding cost and ordering cost. Nevertheless, it should be noted that in reality, the manufacturers produce a large quantity of items even though they may deliver them in very small quantities to fulfill customers' needs.

Kisaka (2006) analyzed the role of Economic Order Quantity model in reducing the cost of raw material inventory at a dairy farm Project. He compared total costs of raw material inventory incurred through the project-employed method with the total costs of raw material inventory which could have been incurred under the EOQ application. Kisaka found that there was a cost saving which could have been observed through employing the EOQ model.

Wild and Axsater (2005), used inventory technique methods in solving real inventory issues for business in a variety of industries from aerospace to retail consumables and from automotive to process chemicals. They noted that appropriate database was a prerequisite for the application of the techniques. This implies that manufacturing entities need to have a well identifiable database for the application of more sophisticated inventory models.

4. Objective of the Study

The overall objective of this study was to investigate how flour manufacturing companies make use of various inventory management practices to develop certain sets of operational capabilities. The following specific objectives were considered:

i. Examine the nature of current inventory management practices amongst flour manufacturing firms in Nigeria.
ii. Evaluate whether significant relationship exists between adoption of scientific inventory management approaches and operational performance.

The following hypotheses were therefore tested:

Hypothesis I: Effective deployment of scientific inventory management is positively related with operational performance of flour milling firms

Hypotheses II**:** Effective implementation of sophisticated inventory management practices has significant effect on operational performance of flour milling firms.

5. Materials and Methods

The study employed a cross-sectional survey design. This type of design allows generalization to be made from large population when representative samples are drawn. Survey design was used in

this study for its economy, rapid data collection and ability to understand the characteristics of the population under study. The fact that this study is quantitative in nature and involves an attempt to establish relationships between variables, made the use of descriptive survey design appropriate for this study. Thus, attempt was made to evaluate the relationship between inventory management practices and operational performance. In that light, inventory management practices constituted the independent (explanatory) variable. On the other hand, firms' operational performance was conceptualized as the dependent variable. The study was therefore based on primary data derived through structured pre-test questionnaire. Data collection was mainly from primary source using the questionnaires and these were augmented with pieces of information from periodicals, journals and other related materials.

The targeted population of the study consisted of all operations and production managers, warehousing managers, quality control personnel, production millers, sales and distribution executive, stores and requisition personnel, and production engineers in charge of inventory management processes in flour milling manufacturing firms operating in Lagos. For the purpose of collecting relevant data at a representative sample size for the study, five flour manufacturing firms were selected as the study organizations for this research project.

Various criteria were used in selecting the final organizations for this study. The researcher determined that the participating company must maintain sizable quantity of production materials with an identifiable inventory management policy. The researcher assumed a large-sized organization would be selected, because within a greater population of employees there exists an increased probability that organizations of such size will have personnel which engage in the activity of daily management of inventory, and such organizations would not have less than 100 employees. For ease of access, the preference of the researcher was that the selected organizations should be located within geographic proximity to the researcher's domain. Beside proximity, Lagos was purposively chosen for the preponderance of flour milling firms as a result of modern sea ports that facilitate importation and efficient operational handling of wheat, being the major raw material in the industry. Considering the above criteria therefore, five flour milling firms were purposively selected as the case study as follows:

1. Flour Mills of Nigeria Plc;
2. Honeywell Flour Mills Limited;
3. Dangote Flour Mills Limited;
4. Crown Flour Mills;
5. Standard Flour Mills,

To select a representative sample from the above organizations, a simple random sampling technique was used to draw one hundred and fifty (150) respondents as sample size for this study. The aggregate number of respondents administered with questionnaire from the five organizations comprised forty (40) junior level managers, eighty (80) middle level managers and thirty (30) top level managers. Among the 150 respondents, 20 either could not complete their questionnaire on scheduled time or were not accurate in answering the questions as required. Thus, 130 copies of the questionnaire were found suitable for data analysis. Data was analyzed using descriptive statistics (Mean and Standard Deviation) to describe the nature of inventory management practices deployed by the firms. Regression and correlation analysis was conducted to evaluate

extent of relationship between explanatory and causal variables of the study. All data collected were processed through the use of statistical package for social science (SPSS) version 20.

6. Results and Discussion

Table 1 presents the results showing dominant inventory management practices among surveyed flour milling companies. Descriptive statistics (mean and standard deviation) of the inventory management practices are shown. It is clear from the results that most commonly practiced inventory management approaches were: ABC inventory model (Mean=4.23, SD=0.89), Use of scientific inventory management approach (Mean=4.13, SD=0.88), Thumb Rule or Guesstimate (Mean=4.02, SD=1.06), Automatic replenishment (Mean=3.97, SD=1.19), Economic Order Quantity (Mean=3.19, SD=0.94), and Economic Batch Quantity (Mean=3.81, SD=0.94) in that order, respectively. On the other hand, the less prevalent inventory management practices by respondents were: Vendor managed inventory (Mean=3.58, SD=1.12), Just- in –Time (Mean=3.52, SD=1.23), Demand Forecast approach (Mean=3.49, SD=1.20), and computerized inventory management (Mean=3.20, SD=1.34).

From the above analysis, it can be deduced that the commonest inventory management approach by flour mills organization in Nigeria is the ABC inventory classification system, while the least practiced inventory management approach is computerization. In addition, the mean responses of the distribution ranges between 4.23- 3.20, while the standard deviation lies between (0.89-1.34). This implies that the variables are normally distributed and data exhibit relatively high values in most of the dimensions measured.

Table 1. Descriptive statistics of inventory management practices among surveyed organizations

Questionnaire Variables	Mean	Std. Deviation
Scientific inventory model	4.13	0.88
ABC Inventory model	4.23	0.89
Thumb Rule model	4.02	1.06
Economic Order Quantity(EOQ)	3.91	1.03
Economic Batch Quantity (EBQ)	3.81	0.94
Vendor managed inventory	3.58	1.12
Demand forecast inventory	3.49	1.20
Automatic Replenishment	3.97	1.19
Just-in Time(JIT) inventory	3.52	1.23

Source: Field Survey, 2014

Table 2 shows the result describing items representing measures of operational performance. Based on the mean values and their standard deviation, respondents admitted that inventory management approaches has the following effects on operational performance: Reduced production costs (4.16; 0.92), Minimized machine down time (3.84; 0.95), Enhanced continuous production (3.82; 0.96), and boosted employee work morale (3.80; 0.97). Others are: Reduced delivery lead time (3.41; 1.16), minimized scrap and rejects (3.16; 1.42), reduced resource wastages (3.07; 1.23) and prevent shortages and reduced stock out costs (2.99; 1.38). The result so far analyzed implies that the practice of effective inventory management has significant effect on

the operational capabilities of flour milling manufacturing firms used in this study. For instance, the greatest effect of inventory management approach is noticed on the reduction in the overall cost of production while the least benefits of appropriate inventory management practice is preventing material shortages and reduction in costs associated with stock out situations.

Table 2. Descriptive statistics of effect of inventory management practice on operational performance

Questionnaire Variables	Mean	Std. Deviation
Reduce production costs	4.16	0.92
Enhance continuous production	3.82	0.96
Prevents shortages and stock out costs	2.99	1.38
Minimize scrap and rejects	3.16	1.42
Reduced delivery lead time	3.41	1.16
Minimized machine down time	3.84	0.95
Reduced resource wastages	3.07	1.23
Boost employee work morale	3.80	0.97

Source: Field Survey, 2014

Hypotheses I

Effective deployment of best practice inventory management is positively related with operational performance of flour milling firms. Table 3 demonstrates the association amongst inventory management practices and operational performance.

Table 3 presents the summary of Pearson correlation between inventory management practice and operational performance. It can be observed that inventory management practices- Scientific Model, ABC Model, Thumb Rule, EOQ, EBQ, Vendor Managed Model, Automatic Replenishment, and Just- In- Time (JIT) are independently and positively correlated with Operational performance and are highly significant at 1% level. Here, it is obvious that the maximum correlation ($r=0.664$, $p<0.01$) exists between ABC inventory management model and operational performance. This is followed by EOQ, ($r=0.642$, $p<0.01$), EBQ ($r=0.532$, $p<0.01$), Vendor Managed inventory practice ($r=0.521$, $p<0.01$), Automatic Replenishment ($r=0.432$, $p<0.01$), JIT ($r=0.423$, $p<0.01$), and other Scientific models ($r=0.231$, $p<0.01$) in that order, respectively. This implies that changes in deployment of the above strategies are likely to have a corresponding change effect operational performance.

Table 3. Pearson's correlation matrix of relationship amongst inventory management practices and operational performance

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Scientific Model	1.00								
ABC Inventory Model	.456**	1.00							
Thumb Rule Model	.484**	.531**	1.00						
EOQ Model	.396**	.546**	.474**	1.00					
EBQ Model	.384**	.437**	.248*	.419**	1.00				
Vendor Managed Inventory	.362**	.446**	.254**	.452**	.298*	1.00			
Automatic Replenishment	.318**	.429**	.283**	.438**	.307**	.365**	1.00		
Just-In-Time	.298**	.346**	.259**	.521**	.346**	.349**	.376**	1.00	
Operational Performance	.231**	.664**	.416**	.642**	.532**	.521**	.432**	.423**	1.00

**. Correlation is significant at the 0.01 level (2-tailed)

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

Source: Authors' Computation

Hypotheses II

Effective implementation of sophisticated inventory management practices has significant effect on operational performance of flour milling firms.

Table 4. Summary of Regression Results on Inventory Management and Operational Performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.748(a)	.559	.522	3.78695	1.052

Source: Field Survey, 2014

a Predictors (Constant): Just- In- Time Inventory Management, ABC Inventory model, Economic Batch Quantity model, Automatic Replenishment, Economic Order Quantity (EOQ), Thumb Rule or Guesstimates, Use of scientific inventory model, Demand forecast inventory, Computer based inventory management,

Vendor managed inventory.

b Dependent Variable: Operational Performance.

Results of Regression analysis shown on Table 4 have been used to test hypothesis II to ascertain the extent of relationship with the variables that measures inventory management practices and operational performance. The correlation coefficient R is positive (0.748). The R-square is 0.559. Thus, the model composing of (Just- In- Time Inventory Management, ABC Inventory model, Economic Batch Quantity model, Automatic Replenishment, Economic Order Quantity (EOQ), Thumb Rule or Guesstimates, Use of scientific inventory model, Demand forecast inventory, Computer based inventory management, and Vendor managed inventory) can explain about 55.9% of the total variation in operational performance and also the result is statistically significant at the level of .05.

Table 5. Analysis of Variance of the Regression Model

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2165.541	10	216.554	15.100	.000(a)
	Residual	1706.582	119	14.341		
	Total	3872.123	129			

Source: Field Survey, 2014

a Predictors (Constant): Just- In- Time Inventory Management, ABC Inventory model, Economic Batch Quantity model, Continuous Replenishment, Economic Order Quantity (EOQ), Thumb Rule or Guesstimates, Use of scientific inventory model, Demand forecast inventory, Computer based inventory management, Vendor managed inventory.

b Dependent Variable: Operational Performance

The analysis of variance performed on the regression model yielded an F-value of 15.100, meaning that the overall equation is significant ($p< 0.05$). The Durbin Wattson (DW) of 1.052 (which is a bit greater than 1) shows the presence of autocorrelation among variables. Since F_{cal} (15.100) > F_{tab} (2.26) at 0.05 level of significance, the hypothesis that effective implementation of sophisticated inventory management practices has significant effect on operational performance of flour milling firms is retained.

In order to determine the inventory management approach that significantly contributed most on operational performance, multiple regression analysis was performed. Table 6 shows which of the variables included in the model contributed to the prediction of the dependent variable. The study is interested in comparing the contribution of each independent variable; therefore, beta values are used for the comparison. As can be observed from the table of regression coefficient, the largest standardized beta coefficient is 0.313 or 31.3% which is the use of Just- In- Time inventory management approach. This is closely followed by beta coefficients of 0.219 or 21.9% and 0.141 or 14.1% for computerized inventory management system and Economic Order Quantity (EOQ), respectively. This means that the above three inventory management practices make positive and significant contributions to explaining the dependent variable- Operational performance. It is also

observed from the regression model that though other inventory management practices made positive contributions to predicting operational performance, their contributions were, however insignificant. (See Table 6 for detail).

Table 6. Determination of the Multiple Regression Equation for Hypothesis II/Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	T	P Value
1	(Constant)	8.83	2.173		4.065	.000
	Scientific Inventory Model	.005	.475	.001	.010	.992
	ABC Model	.330	.486	.053	.679	.498
	Thumb Rule Model	.646	.401	.125	1.611	.110
	Economic Order Quantity	.749	.420	.141	1.783	.077
	Economic Batch Quantity	.422	.450	.072	.940	.349
	Vendor Managed System	.176	.434	.036	.407	.685
	Demand Forecast Model	.198	.377	.043	.525	.601
	Automatic Replenishment	.451	.348	.098	1.298	.197
	Computer base inventory	.892	.357	.219	2.498	.014
	Just- In- Time Inventory Management	1.38	.389	.313	3.568	.001

Source: Field Survey, 2014

a Dependent Variable: Operational Performance

7. Discussion

The study investigated the inventory management approaches of flour milling manufacturing firms and their effects on organizational performance. The Pearson correlation analysis revealed that a positive relationship exists between inventory management practices and operational performance. Correlation coefficient of 0.721 at 0.05 level of significant implies that the type of inventory management approaches adopted by manufacturing companies plays significant positive role in enhancing the performance of their production operations. This finding is supported by Peacock's research (2013) which found that effective application of inventory optimization models and practice is relevant to achieving quality and efficient operations. In addition, our research findings parallel that of Adeyemi and Salami (2010), that the overall goal of inventory management is to have what is needed, and to minimize the number of times manufacturing and services operations are interrupted by problems of stock outages.

In order to further examine the contributing effects of inventory management practices towards enhancing efficiency in manufacturing operations, the second hypotheses proposes that the inventory management approaches adopted by manufacturing firms has no significant effect on their operational performance. This proposition was also nullified by the result of regression analysis which shows that inventory management practices can explain about 55.9% of the total

variation in operational performance. In actual fact, most of the variables that measures inventory management practices in this study made significant contribution towards operational efficiency and by extension competitive excellence. For instance, with a beta coefficient of 0.313, Just- In-Time Inventory contributes 31.3% towards predicting operational performance. This is closely followed by beta coefficients of 0.219 or 21.9% and 0.141 or 14.1% for computerized inventory management system and Economic Order Quantity (EOQ), respectively. From the above, it is necessary to infer that efficient choice or mix of the scientific inventory management tools guarantees the optimal production processes as well as enhance the competitiveness of the firm.

Interestingly, this position is supported by quite a large number of previous and extant inventory management research (see Bloomberg, Lemay and Hanna, 2002; Chandra and Kumar, 2001; Chen; 2005; Alo, 2010). Bloomberg, Lemay and Hanna (2002) reported that effective management of inventory has enormous potentials for improving the efficiency of organizations, and firms that use scientific inventory control practices have a significant competitive advantage in the market. Similarly, Alo (2010) found it more economical for firms to produce a relatively large number of items in each production run and store them for future use. Thus, allowing firms to amortize fixed setup costs over a larger number of units and achieving competitive edge through cost minimization. This, therefore, implies that sub-optimal inventory management practices can seriously undermine the business growth and success.

8. Conclusion and Recommendations

The focus of this research study was to examine the inventory management practices of flour milling manufacturing companies and to examine the effects of the identified inventory management practices on operational performance.

Based on the study, it is concluded that a significant relationship exists between inventory management practices and organizational performance among flour milling manufacturing companies. In addition, the study has shown that prevalent inventory management practices among the surveyed firms: ABC inventory model, Use of scientific inventory management approach, Continuous replenishment, Economic Order Quantity and Economic Batch Quantity. On the other hand, the least practiced inventory management techniques were: Vendor managed inventory, Just-in –Time Demand Forecast approach, and computerized inventory management.

Exception of the large manufacturing companies, most of the medium-sized flour milling manufacturing firms sampled in this study uses inventory strategies that are totally different from formal and well known models such as the Economic Order Quantity (EOQ), Economic production quantity (EPQ), ABC inventory classification model etc. Their inventory management strategies and policies were rather based on factors such as changing level of customer demand, prevailing industry practices, forecasted estimates and guesses, and the available production capacity of manufacturing facilities. The large firms with higher operational capacity tended to rely more on computerized inventory management systems as well as a semblance of the Just- in-Time approaches plus the normal EOQ systems.

Majority of the sample manufacturing companies were either not aware of the existing inventory models or were simply not ready to adopt them as a guide to their inventory management practices. While some firms who were aware of the models (especially the EOQ) complain about its practical complexities, others feel that the models were not relevant to their present inventory

needs. Thus, the generality of assumption among participating flour manufacturing companies is that the practicability of the inventory models seems not to portray the daily economic realities and inventory problems that confront them. Thus, it could be concluded that the existing inventory models have not gained wider acceptability and popularity among flour milling companies in Nigeria.

In terms of effectiveness of the inventory management approaches in enhancing operational performance, results revealed that only three of the inventory management techniques (Just- In-Time, computerized inventory system, and EOQ) were highly significant in predicting operational performance. In terms of predicting competitive positions of the firms, three inventory management techniques (Just- In- Time Inventory, Automatic replenishment inventory, Vendor or supplier managed systems) also demonstrated positive relationship and significant strength towards predicting completive advantage.

9. Recommendations

Based on the findings made in this study, the following recommendations are suggested:

- Rather than depending on heuristics and guesstimate in managing inventory, there is need for the organizations to adopt time-tested scientific models in determining inventory quantities and managing inventory cost.
- Flour milling manufacturing firms in Nigeria should adopt proactive inventory management strategies rather than completely relying on reactive measures that depend on changes in market and inventory supplies situation.
- A situation whereby most medium scale firms in the flour milling sector are unaware of the traditional inventory models such as EPQ, MRP, EPQ etc is not globally satisfactory. Effort should be made by these firms to be acquainted with these proven strategies with a view to incorporating them into their inventory management practices.
- Best practice inventory management softwares should be deployed by firms as a reliable strategy for managing the rising cost of the holding stock. This may involve training employees on the usage of the softwares, or by acquiring the services of external system engineers and consultants.

References

Adeyemi, S. L. and Salami, L.O. (2010). Inventory management: A tool of optimizing resources in a manufacturing industry. *Journal of Social Science*, 23(2); 135-142.

Alao, R. O. (2010). Productivity in the Nigerian manufacturing sub-sector: An error correction model (ECM).*European Journal of Economics, Finance and Administrative Sciences,* 20(5); 129-135.

Annual Report and Account (2009). Dangote Flour Mills Plc, Honeywell Plc, Flour Mills of

Nigeria Plc (Golden Penny). Assessed from the company's website on 2/9/2014

Ayeni, K. and Adewunmi, O. (2004). Production planning and control practices influencing consumer satisfaction in Nigerian manufacturing industry. *Journal of Social Science,* 9(1); 57-62.

Ballard, D. (2009). A computer system for inventory management of lighting products: A case study. *Computers in Industry*, 22, 71-79.

Bloomberg, J. Leymay, K and Hanna, E (2002). *Production and operations management.* London: Pitman Publishers.

Bowersox, E. and Cooper, E (2002). Production planning for a deteriorating item with stochastic demand and consumer choice. *International Journal of Production Economics*, 6(16): 219–232.

Chandra I .J, and Kumar A. (2001). Towards a theory and conceptual background of inventory management. *Journal of Operations Management.* 12(2): 119–130.

Chen I. J, (2005). Towards a theory of supply chain management: the constructs and measurements. *Journal of Operations Management,* 22(2); 119–50.

Dave, P. L (2001). Relationship between inventory, sales and services in a retail chain store operation. *International Journal of Physical Distribution and Logistics Management,* 31(2): 124-140.

Eloranta, E., & Raisanen, J. (1988). Delivery performance in small-to-medium-scale industry in Scandinavia. *Production and Inventory Management Journal,* 29(1); 50-55.

Farzaneh, D. P. (2012). The Effect of inventory management on firm performance. *International Journal of Productivity and Performance Management*, 57(5), 355-369._

Healy, R.G. (2006). A technical aid for EOQ determination. *American Journal of Small Business,* 9(4): 46-56.

Kipingu, J. (2003). Channels of distribution conceptualizations: a state-of-the-art review. *European Journal of Marketing*, 12(7), 471-512.

Kisaka, J.F. (2006). The theory of power and conflict in channels of distribution. *Journal of Marketing*, 48 (3) 9-29.

Patrick, D. J. (2005). *Logistical Management*, 2nd edition, New York: McMillan Company.

Piasecki, S. F. (2007). Managing deployment of ERP systems using multi-agents. *International Journal of Project Management*, 22, 511-517.

Rajeev N. P. (2010). Inventory management performance in machine tool SMEs: What factors do influence them? *Journal of Industrial Engineering and Managemen*t, 3(3); 542-560.

Sharma, J. K (2009). *Operations Research: Theory and Applications*, 4th ed., India Macmillan Publishers.

Stevenson, B. U (2010). *Operations management*, 10th edition, N.Y. McGraw-Hill Publishing Inc. 321-340.

Wild, H. and Axsater, S.P., Jr. (2006). Seasonal and cyclic forecasting for the small firm. *Journal of Operations Research*, 2(9): 371–382.

Appendix

Research Instrument

Instruction: kindly indicate the extent of your agreement with the statement below by ticking [√] one of the spaces provided. Where

SA = Strongly Agree, A = Agree; U = Undecided; D = Disagree; SD = Strongly Disagree

S/N	Inventory Management Practices	SA	A	U	D	SD
1	Management is aware of existing scientific models of managing a firm inventory.					
2	All inventory items in our stores are classified according to their economic value and importance.					
3	In arriving at the optimum quantity to order and kept at any point in time, management is guided by a specific scientific model.					
4	Inventory management decisions in my firm are based on guestimates.					
5	In determining optimum stock levels, management strives to maintain a balance between minimum cost of ordering and holding stock.					
6	There is a specific procedure of determining the cost components of total inventory in this organization.					
7	We operate a made-to-stock inventory system pending when demand arises.					
8	Our stock management decisions are solely made by our suppliers.					
9	Inventory decisions in this firm are solely based in predetermined market demand estimates.					
10	Stock replenishment is done continuously					
11	Most inventory decisions are made based on computerized data output.					
12	Our suppliers are contacted immediately there is need for production. Thus, we keep no stock in stores.					

Effect on operational performance

S/N		SA	A	U	D	SD
1	Inventory management system has helped to reduce cost of production.					
2	Inventory control system promotes uninterrupted production activities in the company.					
3	Inventory control prevents material shortage and stock-out costs.					
4	Inventory management minimizes rejection or scrap rate of our products.					
5	Effective inventory management practice of this organization leads to reduced delivery lead time.					
6	Effective inventory management reduces machine down time					
7	Inventory control minimizes wastages of production resources in the company					
8	Employee morale is boosted by efficient management of inventory in this organization.					