

**MATERIAL PLANNING AND OPERATIONAL EFFICIENCY
GAP OF MANUFACTURING FIRMS IN NIGERIA**¹OFOEGBU, Wilson Chukwuemeka; ²UMOH, G. I.^{1,2}Department of management, University of Port Harcourt¹+2348068753432,wilsonofogbu@gmail.com²+2348066890210,godaks5@yahoo.co.uk**Abstract**

This study examined the relationship between material planning and operational efficiency of manufacturing firms in Rivers State. The cross-sectional survey design was adopted and data were drawn from 172 key functional managers of the 39 manufacturing firms in Rivers State (Manufacturing Association of Nigeria, Rivers State Council). These 172 key functional managers consisted of the respondents who returned the copies of questionnaire that were administered out of a total of 195 copies of questionnaire that were administered. The data collection instrument was the questionnaire and the Spearman's Rank Order Correlation statistical tool was used in testing the formulated hypotheses. The findings revealed that material planning positively and significantly correlate with operational efficiency thereby resulting in cost minimization, and increased profitability of firms. Based on these findings, we recommended that manufacturing firms should employ suitable inventory policy and ensure an effective material planning system.

Keywords:Material planning, operational efficiency, cost minimization, profitability

1.0 INTRODUCTION

Historically, the economy of Nigeria was classified an agrarian economy due to high food production for local consumption and export. The basic economic activity then was the production of primary raw materials for foreign industries, and importation of manufactured goods (Mike, 2010). At the attainment of independence, the post-independence governments embraced the policy of transformation of the country into a modern industrial economy with series of national policies

which in some cases helped the transformation and, in some cases, hindered the transformation (Mike, 2010). One of them was the indigenization policy of 1972 and 1977 which had adverse effect on the economy (Mohammed, 2017). In 1986, the Structural Adjustment Programme (SAP) was adopted to rescue the economy. Consequently, the SAP policy did not work as intended (Ogbonna, 2012).

However, in today's era of great change witnessed by the transition from an industrial nation –based resource-

oriented economy to a global, networked knowledge-based economy, the case is different (Ann, Christopher and Adibe, 2012). This transition strives towards achieving economic developmental strides as every economy attempts to improve on her manufacturing sector in order to achieve efficiency in its operations through waste reduction, adequate material planning and promoting global best practices towards ensuring that inventory policies are strictly adhered to for continuous improvement in operations (Uguru, 2011).

Although, to achieve the aforementioned strides, it is also pertinent to identify the following problems that have eaten deep into the fabric of the manufacturing sector. These identifiable problems are the non-optimization of inventory levels as a plausible cause of inefficiency in production processes. The numerous bottlenecks in production processes, ineffective allocation of labour with the corrupt practices of payment for overtime not worked, acceptance of “tippings”, performing contracts beyond arms-length transactions, non-accountability for production costs and its impact on product pricing.

Therefore, based on these attendant problems that seeks to undermine the efforts of the manufacturing firms in Rivers State, this study attempts to identify how manufacturing firms could operate efficiently through proper material planning in order to minimize cost and enhance profitability.

Aim and objectives of the Study

The main objective of this study

is to examine the relationship between material planning and operational efficiency. Other specific objectives are to identify;

1. The relationship between material planning and cost minimization of manufacturing firms in Rivers State.
2. The relationship between material planning and profitability of manufacturing firms in Rivers State.

Research Questions

In the course of this study, we attempted to ask the following questions thus;

1. What is the relationship between material planning and cost minimization of manufacturing firms in Rivers State?
2. What is the relationship between material planning and profitability of manufacturing firms in Rivers State?

2.0 Literature Review

Material planning has been defined as the process involved in the setting up of consumption standards of working out the requirements for all materials for any given manufacturing programme, by considering all relevant factors such as make or buy, laying down standards and specification, sources of supply available and availability of stock (Banga & Sharma, 2013). Material planning and its timely provisioning is the essence of the success of materials management. As observed, the cost of inventory constitutes a large portion of company's assets in terms of non-current assets (Mac'Odo, 2008). Hence, the significance of inventory to the organization cannot be overemphasized.

Furthermore, the accumulation of inventory in the company's statement of

financial position as working capital (among others), varies negatively with other forms of working capital Holt, Modigliani, Muth, & Simon (2003). This being noticed, signifies that so much fund has been tied down in inventory and as a result, there are little or no cash and other components of working capital for utilization in other viable projects or to take advantage of investments. Consequently, the need to adequately plan and control (inventory management) for inventory (Umoh, Wokocha & Amah, 2013). This they said, would be further strengthened where an ideal stock level is determined for the purposes of avoiding under stocking and over stocking of inventory (material).

Inventory control has been argued by Holt, Modigliani, Muth, & Simon (2003) as being synonymous with stock control as he succinctly identified it as a means by which material of the right quality and quantity are made available as at when required with regards to proper storage, economic ordering policy and at a minimal cost or purchase price. These control measures he pointed out include; the determination of items of stock for replenishment, the quality of each item to be held in stock, the regulation of inventory during receipt, inspection, identification and recording processes, and the proper records of inventory issued from the store/warehouse. Therefore, the essence of inventory planning and control is to ensure smooth operations in production runs, product availability to customers, ability to take advantage of economies of scale and to guard against uncertain lead time.

In view of these planning and control processes, the various cost associated with inventory; setup/ordering cost, carrying or holding cost, stock out costs, etc, must be considered as regards to the principle of cost-benefit analysis for an effective and efficient inventory management of stock levels and costs (Adeniji, 2012). Basically, two inventory control methods have been identified by Joseph & Morrison (1986) which are the control by value and by quantity. This he emphasized are performed when fixing inventory items levels through the use of the stock/bin card records and their subsequent issuance with a proper observation of the stock records. In yet another study by Umoh & Wokocha (2014), two fundamental inventory control levels/policies were identified of which are; the re-order level policy and the periodic review policy levels. Nevertheless, there is a general model known as the Economic Order Quantity (EOQ) used to ascertain the level of inventory at which the total material cost is minimized and at the same time, reduces the total incremental cost (Bestwick & Lockyer, 2008).

Finally, in all these, it is evident that the material (inventory) planning and control is of essence to the organizations.

Operational Efficiency

The concept of productivity and efficiency are somewhat used interchangeably in the literature; but, there is a demarcation between them. Productivity simply means relates to a factor(s) of production being expressed as the ratio between its outputs and its inputs, with the result expressed in

physical units (Anderson, Fish, Xia & Michello, 2012). The objective of this quotient he said is to evaluate the level of efficient use of the physical resources. Lovell (1993) argued that the problem with this definition is well-known, and arises in situations in which the firms use multiple inputs types to manufacture multiple output types or products. Faced with this situation, the inputs and outputs must be totalled in two single measurements through the transformation of their monetary equivalent, by means of multiplying the physical quantities by their prices. According him, this comparison between the values observed and the optimum values corresponding to inputs and outputs which he considered the efficiency of a firm may be made using the maximum obtainable output, for certain level of inputs of the one really attained, or by comparing the minimum necessary level of inputs to certain level of outputs and of that really used. Lovell (1993), asserted that, efficiency refers to the levels of inputs and outputs in physical units. For this reason, it is called technical efficiency. However, the values observed can be compared with optimum values of variables such as costs, income and profit, in which case we would speak of economic efficiency. Lovell went further to give the three basic problems involved in calculating efficiency which are;

1. How many and which inputs and outputs should be included in the analysis?
2. How should they be considered when many inputs and/or outputs must be added?
3. How the optimum level or performance for comparison purposes is to be determined?

In a similar study by Stiegler (1976), it

was noted that the inefficiency of a production unit may be as a result of failure to include all the inputs and outputs and that, if the underlying technology is unknown, an essential input or output may easily not be included. In the field of management and engineering, operational efficiency has been associated with how well a relevant action is performed (Chia-Yen, Andrew & Johnson, 2012). The US Economic Intelligent Unit, on January 2017 asserted that companies have reported that improving operational efficiency is critical to their ability to thrive because of the competitiveness of the marketplace which is characterized by globalization, market consolidation, increasing regulation, competition for resources, and the rapid pace of innovation. On this regards, Stevenson (2013) stated that despite the fact that every organization seeks to be efficient in business by having a well-designed and executed operations strategy that would ensure profitability, survival and ability to withstand the competitiveness of their changing environment, manufacturing firms in order to attain operational efficiency, strive to provide quality products and services at the right value with the attendant effect of waste minimization and maximization of resource capabilities which would impact on their profit margin and reduce operational cost (Sheila & Shahbaz, 2011).

Scholars such as Weber, (1947); March & Simon, (1958); Babcock & Scott, (2002); Umoh & Wokocho, (2014); Jorgenson & Griliches (2007) observed that management all over the world have realized that operational efficiency is most critical for the future effectiveness of organizations. As such, Liao & Jimenez (2010) noted that for any organization to operate efficiently, it must ensure waste

minimization, cost effectiveness and improve quality in all of its operations. Convincingly maintained by Chase, Jacob & Aquilano (2004) that when competition is fierce, firms thrive to survive by way of being operationally efficient to sustain their growth and also generate the desired profit.

Theoretical Review

This study is anchored on the Resource Based View theory which focusses on the managerial attention on firm's internal resources as a means of organizing processes (Barney, 2001) and to identify the competencies and capabilities of resources with the potential to achieve competitive advantage and sustainability to the firms (Prahalad & Hamel, 1991). Several theorists such as Day (1994); Hunt & Morgan (1995); Hooley, Greenly, Fahy & Cadogan (2001); Barney (2001) have made immense contributions to the Resource Based View where they identified that the firm's resources are financial, legal, human, organizational, informational and relational; with the notion that these resources are heterogeneous and imperfectly mobile and that management's key task is to understand and organize resources for efficiency in operations and towards achieving sustainable competitive advantage.

Empirical Insights

In a study performed by Adenikinju & Alaba (2000) to evaluate the Nigerian manufacturing sector's performance in relation to productivity using the aggregate model, they measured the changes in the total factor productivity of the sector relative to the change in material utilization. They found out that efficiency and productivity of the Nigerian manufacturing organizations are

indeed related to the energy supply and price.

Subsequently, in the study on *the effect of strategic decisions on firm's productivity* by Olusegun & Adegbuyi, (2010), it was found that a positive and significant relationship exist between productivity and top management decisions. As observed by Higgins, (2001) that firms with automated inventory planning and control system perform better than those using the adhoc approach towards production operations. He pointed out that for a better performance in operations in manufacturing firms, the inventory planning and control systems should be fully automated. In a similar work by Umoh & Wokocha (2014), they found out that proper material planning yields to the smooth flow in the production cycle, which prevents delays in operations and ultimately, is the essence of being efficient in the organization. In yet another study performed by Umoh, Wokocha & Amah, (2013) on *production control and corporate operational efficiency*, they discovered that about 82% variation in operational efficiency was determined by adequate material planning and control in the production operations in most organizations and that efforts should be made to ensure conformity of actual output to expected output.

Research Hypotheses

The following hypotheses were formulated for the purpose of this study:

Ho₁: There is no significant relationship between material planning and cost minimization of manufacturing firms in Rivers State.

HO₁: There is no significant relationship between material planning and profitability of manufacturing firms in

Rivers State.

3.0 Methodology

Research Design

This study adopted the cross-sectional survey, a type of quasi-experimental research design because it enables the researcher to draw inferences concerning the casual relationship among the variables under investigation which are out of the control of the researcher (Cooper & Schindler, 2001; Nachmias & Nachmias, 2009).

Population of the Study

The population for this study comprises 195 managers in the thirty-nine (39) registered and functional manufacturing firms in Rivers State (Manufacturers Association of Nigeria (MAN), Rivers State Chapter.

Sample Size and Sampling Technique

The researcher wholly adopted the population size as his sample size because, the researcher could effectively manage the population size. Therefore, the population size of 195 managers comprising the production manager, line manager and the finance manager, is the sample size of this study.

Data Collection Methods

The structured questionnaire consisted of two (2) sections. "A" which presents background information on the respondents' profile and section "B" which contains questions to elicit respondents' opinions regarding the study variables. It contains 15 questions structured using the 5 point Likert rating scale where respondents were graded on

their responses based on their extent of agreement. A total of 195 copies of questionnaire was administered out of which, one hundred and seventy-two (172) copies were returned and twenty-three copies were not returned.

Operational Measures of Variables

Material planning was operationalized on a 5-item scale developed by Holt, Modigliani, Muth & Simon, 2003; while, the criterion variable which is operational efficiency was dimensionalized using cost minimization and profitability as operationalized by a 10-items (5-items from each of cost minimization and profitability) as contained in (Bryman & Bell, 2003; Stevenson, 2004). All items were rated using a 5-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

Test of Validity and Reliability

The content and face validities of the instrument were ascertained through the proper scrutiny of scholars and experts in the field (Nunnally & Bernstein, 1994; Cooper & Schindler, 2001; Nachmias, 2009). The data were pre-tested on a group of managerial employees with a view to ascertaining their suitability for the study. The test-retest method was used because it was based on correlation procedures; although, reliability method has the disadvantage of being influenced by practice and memory. The reliability of the instrument was also determined using the Cronbach's Alpha values. From the test, it showed that material planning, cost minimization and profitability were

reliable as they returned alpha scores of 0.76, 0.70 and 0.72 respectively which indicates that only items that return alpha values of 0.7 and above will be used; since, this is the threshold value that is generally accepted by the rule of thumb (Nunnally, 1978) and therefore, is considered adequate for this study.

4.0 Data Analysis

After performing the tests of normality, linearity and homoscedasticity which failed, the Spearman's Rank Order Correlation Coefficient was considered

appropriate for the analysis (Tabachnick & Fidell, 1996; Pallant, 2005) with the aid of the Statistical Package for Social Sciences (SPSS) version 22 which is a compendium of statistical and analytical tools.

Table 1 below, displays the tests of normality for material planning and operational efficiency with significant values of ($p < 0.05$) which indicates the non-normality of the constructs and therefore, the need to adopt the Spearman's Rank Order Correlation Coefficient statistical tool for this study.

Table 1: Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Material Planning	.080	172	.004	.987	172	.000
Operational Efficiency	.113	172	.000	.973	172	.002

Source: Research Data, (2018).

4.1 Results and Discussion

Results

Material Planning and Operational Efficiency

Table 2: The relationship between Material Planning and Operational Efficiency

			Material Planning	Cost Minimisation	Profitability
Spearman's	Material Planning	Correlation Coefficient	1.000	.690	.569*
rho		Sig. (2-tailed)	.	.000	.002
		N	172	172	172

Source: Research Data, (2018).

Table 2 illustrates the relationship between Material Planning and the measures of operational efficiency. The table reveals that at a rho-value of 0.690

and a significant p-value ($p < 0.05$) there is a positive and significant relationship between Material Planning and Cost Minimisation. Also, at a rho-value of

0.569 and a significant p-value ($p < 0.05$) there is a positive and significant relationship between Material Planning and Profitability.

Therefore, we reject the previously stated hypotheses 1-3 and state that:

There is a significant relationship between Material Planning and Cost minimisation.

There is a significant relationship between Material Planning and Profitability.

Discussion of Findings

This section is focused on giving detailed discussion on the research findings as it relates to previous studies carried out.

Material Planning and Operational efficiency

The findings of the study showed a p-value of less than 0.05 ($p < 0.05$) indicating a positive and significant relationship existing between Material planning and Operational efficiency. These findings corroborate with that performed by Olusegun & Adegbuyi (2010); Umoh & Wokocha (2014) where effective planning in materials resulted to about 70.6% to 80% variation on operational efficiencies as incident on cost minimization and profitability.

5.1 Conclusion

The concern of some organization has been that of adequate utilization of scarce resources. This they will achieve by ensuring the efficiency of its operations and strict adherence to laid down policies of the firms.

This problem of seeking for an efficient and optimal utilization of such scarce resources and at the same time, maintaining minimum cost and high-

quality goods and services has necessitated the need for material planning. Just as any organization with the right plans, processes and mechanism has a very high chance of survival (Bartol & Martin, 1994). This study using the manufacturing firms in Rivers State has revealed that material planning has a positive and significant influence on operational efficiency (cost minimization, profitability).

5.1 Recommendations

Based on the conclusions arrived, the following recommendations were made;

- 1) Manufacturing firms should focus more on the inputs of production by ensuring an effective production planning system where material would be adequately controlled.

A good inventory policy applicable to a manufacturing firm should be adopted based on the nature and demand of the goods and services.

R e f e r e n c e s

- Adeniji, A. A. (2012). *An insight into management accounting*. Lagos, Nigeria: EL – TODA.
- Adenikinju, A. & Alaba, O. (2000). Energy use and productivity performance in the Nigerian manufacturing sector (1970-90). *Centre for econometric and allied*. Nigeria: University of Ibadan press.
- Agbadudu, A. B. (1996). *Elementary operations research*. Benin, Nigeria: Mudiaga press.

- Anderson, R. I., Fish, M., Xia, Y. & Michello, F. (2007). Measuring efficiency in the hotel industry: A stochastic frontier approach. *International journal of hospitality management* ,18(2), p p . 4 5 - 5 7 . doi:10.5465/AMR.2001.401193
- Ann, I. O., Christopher, C. O. & Adibe, T. N. (2012). *Improving production planning and control through the application of breakeven analysis in manufacturing firms in Nigeria*. Port Harcourt, Nigeria: Africana first publishers l i m i t e d .
- Bartol, K. M. & Martin, D. C. (1994). *Management*. New York , London: Mc Graw - Hill
- Babcock & Scott (2002). *Organisations: Rational, natural, and open systems* (5th ed.). Upper saddle river, London: Prentice hall.
- Bryman, A. & Bell, E. (2003). *Business research methods*. London: University Oxford press.
- Banga, T.R. & Sharma, S. C. (2013). *Industrial engineering and management including production management* (11th). New Delhi, India: Khanna p u b l i s h e r s .
- Bestwick, P. P. & Lockyer, K. (2008). *Quantitative production manangement*. London: Pitman.
- Bestwick, P. P. & Lockyer, K. (2009). *Quantitative production manangement*. London: Pitman.
- Barney, J. B. (1991). Firm resources and sustained competitive a d v a n t a g e , *Journal of Management*, 17(1), 9 9 - 1 2 0 .
- Chase, R. B., Jacobs, I. R., Aquilano, J. J. (2004). *Operations management for competitive advantage*. Boston: Mc Graw- hill.
- Barney, J.B. (2001). "Is the Resource-Based "View" a Useful Perspective for Strategic Management Research?". *Academy of Management Review*. 2 6 (1) : 1 0 2 .
- Chia-Yen, L., Andrew, L. & Johnson. (2012). *Effectiveness: A measure of demand effect in productivity analysis*. New Delhi: India.
- Cooper, D. R. & Schindler P. S. (2001). *Business research method* (7th). Boston : Mc Graw hill irwin.
- Day, G. S. (1994). "The Capabilities of Market-Driven Organizations". *Journal of Marketing*. 58: 37-52. doi : 1 0 . 2 3 0 7 / 1 2 5 1 9 1 5
- "Democracy Index 2014: Democracy a n d its discontents". *The Economist Intelligence Unit*. Retrieved 26 J a n u a r y 2 0 1 7 .

- Higgins, J. M. (2001). *Strategic management and operations*. Chicago: The diyden press.
- Holt, C. C., Modigliani, F., Muth, I. F. & Simon, H. A. (2003). *Planning production, inventories and workforce*. New Jersey, Englewood Cliffs: Prentice-hall.
- Hooley, G. J.; Greenley, G. E.; Fahy, J.; Cadogan, J. W. (2001). "Market-focused Resources, Competitive Positioning and Firm Performance". *Journal of Marketing Management*. 17 (5 – 6) : 5 0 3 – 5 2 0 . doi:10.1362/026725701323366 908
- Hunt, S.D. and Morgan, R.M., "The Comparative Advantage of the Firm," *Journal of Marketing*, V o l 59, April, 1995, pp 1-15.
- Jorgenson, D. & Griliches, Z. (2007). Sources of measured productivity change: Capital input and output. *American economic review*, 56(2), pp. 50-6 1 .
- Joseph, K. & Morrison, A. (1986). *Storage and control of stock for industry and public undertaking*. London: Pitman publishers.
- Liao, C. H. & Jimenez, D. B. (2010). Comparing operational efficiency among mobile operators in Brazil, Russia, India and China. *Weekly Review*, pp. 05-11. Retrieved from <http://www.cprsouth.org/wp-content/upl>.
- LOVELL, C.A.K (1993). *Production frontiers and production efficiency*. New York: Oxford University Press .
- Mac'Odo, D.S. (2008). *Production and operations management*. Port Harcourt Pearl Publishers.
- Mac'Odo, D. S. (2009). *Production and operations management*. Port Harcourt: Pearl publishers.
- March & Simon, A. (1958). *Organizations theory*. Cambridge: Blackwell p u b l i s h e r s .
- Mike, J. A. (2010). Banking sector reforms and the manufacturing sector: The manufacturers' association of Nigeria perspective. *Economic and financial review*, 46(2), pp. 57-6 5 .
- Mohammed, I. (2017). The Nigerian Enterprises Promotion Decrees (1972 and 1977) and indigenisation in Nigeria [microform] *Thesis (Ph. D.) University of Warwick*, 1985.
- Nachimias, D. & Nachimias, C. (1981). *Research methods in the social sciences* (2nd ed.). London: Edward Anold publishers

- l i m i t e d .
- Nachimias, D. & Nachimias, C. (2009). *Research methods in the social sciences* (2nd ed.). London: Edward Anold publishers
l i m i t e d .
- Nunnally, J. C. (1978). *The psychometric theory*. New York: McGraw hill.
- Nunnally, J. C. & Bernstein, I. H. (1994). *The psychometric theory*. (3rd ed.). New York: McGraw-Hill.
- Ogbonna, B. C. (2012). Structural Adjustment Program (SAP) in Nigeria: An empirical assessment. *Journal of Banking*, 6 (1) , 1 9 – 4 0 .
- Olusegun, D. & Adegbuyi, F. M. (2010). *Production management- A strategic approach*. Ibadan: Heinemann publishers.
- Pallant, J. (2005). *SPSS Survival Manual: A step by step guide to data analysis using SPSS version 12*. (2nd ed.). Open University
P r e s s .
- Prahalad, C. K. & Hamel, G. (1991). The core competence of the corporation, *Harvard Business Review*, 68(3), 79–91.
- Sekaran, U. (2003). *Research methods for business*. New York: John Wiley and Sons .
- Sheila, S. & Shahbaz, S. (2011). *Operational efficiency- process improvement opportunities for credit unions*. Florida, USA.
- Stevenson, W. J. (2004). *Operations management*. Boston: McGraw-
l h i l l .
- Stevenson, W. J. (2013). *Operations management*. Boston: McGraw-
l h i l l . 9 3
- Stiegler, G. J. (1976). The existence of x-efficiency- American economic review. March 66(1).
- Tabachnick, B. G., & Fidell, L. S. (1996). *Using Multivariate Statistics*. (3rd ed.). New York: Harper Collins .
- Uguru, L. C. (2011). Impact of capital flight on corporate performance in Nigeria. *Nigerian Journal of Business*, 5(1), 83 – 92.
- Umoh, G. I. (2005). *Quantitative analysis for modeling and decision making* (1st ed.). Nigeria: Lynno company.
- Umoh, G. I. (2010). *Quantitative analysis for modeling and decision making* (3rd ed.). Port Harcourt: Mentor printing and publishing .
- Umoh, G. I. & Wokocha, I. H. (2014). *Production planning and corporate productivity performance in the Nigerian*

- manufacturing industry. IOSR journal of business and management, 16(1), 7-13.
- Umoh, G. I., Wokocha, I. H. & Amah, E. (2013). Production improvement functions and corporate operational efficiency in the Nigerian manufacturing industry. IOSR journal of business and management, 3 (1 0) , 3 9 - 4 5 .
- Vollman, T. G., Berry, W. L. & Whybark, D. C. (2007). Manufacturing planning and control systems. Burr ridge: Irwin inc.
- Weber, M. (1947). The theory of social and economic organisation. The yale law journal company inc. 5 7 (4) , 6 7 6 - 6 7 8 .