EMPIRICAL ANALYSIS OF THE EFFECT OF MATERIALS MANAGEMENT ON OPERATIONAL EFFICIENCY OF LISTED FOOD AND BEVERAGE FIRMS IN NIGERIA

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ABSTRACT

This paper is aimed at assessing the effect of materials management practices on operational efficiency of listed food and beverage firms in Nigeria. A descriptive and survey research designs were adopted to structure the research to show how all key variables of the research synchronize as well as to address the main research questions that were used. The population of the study was 33 Food and Beverage Firms listed on the Nigeria Stock Exchange (NSE Factbook, 2019). Five (5) of such firms whose headquarters are in Port Harcourt, were purposively selected and used for the study. 150 managers, assistant managers and supervisors were purposively selected as sample size for the study. Data collected using questionnaire were analyzed using linear regression statistical tools. Findings indicate the non-acceptance of the six (6) hypotheses stated in null form leading to the conclusion that effective materials management practices have significant effect on listed food and beverage firms' operational efficiency in Nigeria. On this basis, it was recommended that a more scientific materials management approaches and methods using software and advanced materials and other resources management technology such as visual and automatic production scheduling should be adopted by firms and staff should be well trained on the use of these advanced technologies in materials and inventory management in a bid to improve operational efficiency.

Keywords: Operational Efficiency, Materials, Management, Practices, Food and Beverages

***JEL Classification Code*:** G31, M41

1. INTRODUCTION

Materials management is a critical function of accounting that involves just in time procurement, inventory control and management, storage of raw materials and finished goods as well as accounting for them in form of valuation, among others. Materials are important aspect of the firm's prosperity and goal attainment and this is more pronounced with firms operating in the food and beverage industry. Thus, for enterprises to realize their corporate goals and objectives, efficient management of materials and/or inventories are imperative. The noticeable challenge is that most organizations especially the food and beverage companies lack efficient mechanism for the management of materials procurement and other resources especially in the aspect of just in time procurement of materials. Workable mechanism for efficient storage and usage of materials is another issue. Effective material management according to Christine (2002) is imperative in order to provide the best service to customers, produce at maximum efficiency and manage inventories at predetermined levels to stabilize investments in inventories.

Optimum materials management requires the development of a highly integrated and coordinated system involving sales forecasting, purchasing, receiving, storage, production, shipping and actual sales. The imperative of materials management is clearly evident in the sum of money spent monthly, quarterly and annually in the purchase and storage of materials and the significant contribution of materials to food and beverage operational efficiency. Efficient material management will reduce material cost, improves financial performance and improve the rate of return on investment. For Ogbadu (2014), the consequences of effective materials management are lower costs and improved customers value and satisfaction to achieve competitive advantage in the global world of business.

Materials are the life wire of any manufacturing system and the food and beverage industry cannot just trivialize the essentiality of materials management as they cannot operate without material resource. In many cases, the cost of materials exceeds forty five percent of the total cost of goods produced. Such large expenditure on materials requires considerable planning and control to maximize operational efficiency and to minimize wastage. Thus, materials must be made available at the right price, at the right quantity, in the right quality, in the right place and at the right time in order to coordinate and schedule the production activity in an integrative way for industrial

undertakings. A manufacturing firm will remain shaky if materials are under-stocked, overstocked or in any way poorly managed (Lee *et al*; 2010). Materials management involves all operations management functions from purchasing of raw materials through the production processes to the final delivery of the end products. It brings together under one management responsibility for determining the manufacturing requirement, scheduling the manufacturing processes and procuring, storing and dispensing materials (Wild, 1995).

Evan *et al;* (2023) highlighted in their study that materials account for more than fifty percent of the annual turnover in the manufacturing firms and this to a great extent agrees with precious assertions made by other scholars. Thus, there is need to give priority to material management in order to achieve significant cost savings, improvement in production efficiency, and increase competiveness and operational efficiency. Similarly, Subramanian (2010) analysis of the financial statements of large number of private and public sector organizations indicate that materials account for nearly sixty percent (60%) of the total expenditure of those entities. Consequently, the importance of materials management lies in the fact that any significant contribution made by the materials manager in reducing materials cost will go a long way in improving the operational efficiency and rate of return on investment. Regrettably, few studies exist on the area of the effect of effective material management on operational efficiency of the food and beverage subsector in Nigeria and the issues surrounding the quality assurance have not been addressed. Few studies performed considered mainly the effect of materials management on profitability hence this study was undertaking to fill this noticeable gap.

1.2 Objectives of the Study

Generally, the paper attempts to analyze the effect of efficient materials management on operational efficiency of listed food and beverage firms in Nigeria. Specific objectives of the study include to:

I. Investigate the effect of inventory management on return on investment of listed food and beverage firms in Nigeria.
II. Investigate the effect of inventory management on the input-output ratio of listed food and beverage firms in Nigeria.
III. Investigate the effect of material resource planning on return on investment of listed food and beverage firms in Nigeria.

IV. Investigate the effect of materials resource planning on the input-output ratio of listed food and beverage firms in Nigeria.
V. investigate the effect of production planning and control on return on investment of listed food and beverage firms in Nigeria.
VI. investigate the effect of production planning and control on the input-output ratio of listed food and beverage firms in Nigeria.

1.3. Research Questions

In this paper, attempt will be made to provide answers to the following questions in line with the objectives of the study:

i. To what extent does inventory management affect return on investment of listed food and beverage firms in Nigeria?
ii. To what extent does inventory management affect the input-output ratio of listed food and beverage firms in Nigeria?
iii. To what extent does material resource planning affect return on investment of listed food and beverage firms in Nigeria?
iv. To what extent does material resource planning affect input-output ratio of listed food and beverage firms in Nigeria?
v. To what extent does production planning and control affect return on investment of listed food and beverage firms in Nigeria?
vi. To what extent does production planning and control affect input-output ratio of listed food and beverage firms in Nigeria?

1.4. Research Hypotheses

To meet the objectives of the study, the following hypotheses stated in null form would be examined in the course of this study:

Ho_1 Inventory management has no significant effect on return on investment of listed food and beverage firms in Nigeria

Ho_2: Inventory management has no significant effect on input-output ratio of listed food and beverage firms in Nigeria.

Ho_3 Material resource planning has no significant effect on return on investment of listed food and beverage firms in Nigeria.

Ho_4: Material resource planning has no significant effect on input-output ratio of listed food and beverage firms in Nigeria

Ho_5:Production planning and control has no significant effect on return on investment of listed food and beverage firms in Nigeria.

Ho_6: Production planning and control has no significant effect on input-output ratio of listed food and beverage firms in Nigeria

2. LITERATURE REVIEW

2.1 Material Management

According to Wild (1995), material management is a concept which brings together the responsibility for determining the manufacturing requirement that involves scheduling the manufacturing processes and procuring, storing and dispensing materials. An integrated approach to material management defines the concept as the function responsible for the coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner in order to provide a predetermined service to the customer at a minimum cost (Ramakrishma, 2005).

Chase and Kale (2009) explained that the concept of materials management encompasses the total system technique to the management of the entire flow of materials, and services from raw materials suppliers through factories and warehouses to the end users. These explanations provide a clear scope of material management to include material requirements planning, materials resource planning, production control, materials procurement, inventory management, storage and warehouse management, distribution of finished goods at minimum cost at due time among others. (Osotimehin, 2006).

As explained by Banjoko (2000), the key objectives of materials management are to ensure that the right item of material is purchased and made available to the manufacturing operations at the right time, at the right place and at the lowest possible cost. Therefore, the role of the material management department is to ensure effective flow and management of materials from the time the materials are ordered, received, stored and used in production or in providing services. The bottom line is that materials management is a veritable means for the optimization of operational performance of firms and in meeting with customers' service requirements at the same time increasing profitability by minimizing costs and making the best utilization of the available resources.

2.1.2. Material Resource Planning

Material resource planning is a production planning, material requirement planning, and scheduling and inventory control and management system used to manage manufacturing processes and the material resource of an organization. In a similar vein, Wikipedia defined material requirements planning which is a variant of material resource planning as "a production planning, scheduling, and inventory control system used to manage manufacturing processes." The resource element in food and beverage industry may include equipment, employees, facilities and materials. Materials Resource Planning system provides the user with information about timing (when to order) and quantity (how much to order), generates orders, and reschedules existing orders as necessary to meet the changing requirements of customers and manufacturing. Material resource planning identifies necessary materials, estimates quantities, and determines when materials will be needed to meet the scheduled production. It also manages delivery time all in a bid to meet customers' demands and improve productivity and operational efficiency.

With the advancement in technology, material resource planning has become a much simpler and more strategic (Wild, 1995). These advancements in technology have enabled project managers to manage resources through visual and automatic production scheduling. Resource planning is important to manufacturing operations that want to take their production to the next level and create a much more efficient production and resource flow. Without manufacturing resource planning, facilities are unable to effectively assign resource tasks, jobs or projects to labour (Ondiek, 2009). Material planning is the initial process that needs to be undertaking accurately in order to provide guide to all the subsequent activities. Adopting a good material management planning can increase productivity and profit. Hence, it can help to increase the success of project delivery (Kasim, *et al;* 2005). Generally, material resource planning involves the determination of the number of materials resources that are needed to deliver a project or to provide services and allocating and scheduling work based on team capacity to meet specifications. Thus, steps in Material Resource Planning would include identifying material resource requirements, checking inventory of materials, scheduling production and identifying other issues.

2.1.3. Production Planning and Control

Production control involves monitoring and controlling operation or the production process. It also involves forward ordering, arrangement of materials for production, preparation of production schedules and sequences, issue of order to production emergency action to meet material shortages, make or buy decisions, quality and reliability, feedback and adjustment of supplies flow to production lines or sales trends (Jacobs, et *al;* 2009). According to Wild 1995), production planning and control are sets of actions and decisions taken during production to regulate output and obtain reasonable assurance that the specification will be achieved. Therefore, it involves forecasting, planning and scheduling work, taking into account manpower, materials availability and other capacity restrictions and cost to meet proper quality and quantity at the time it is required and then following up the schedule to see that the plan is performed using whatever systems have proven satisfactory for the purpose (Banjoko, 2000). With inventory management and control and quality control, production control is one of the crucial functions of operations management.

2.1.4. Operational Efficiency

As explained by Mankins in the Harvard Business Review, efficiency is a matter of producing the same output with less input. Operational efficiency is measured by comparing the input-to-output ratio of company processes. Common mistakes firms make when measuring efficiency is taking into account only the input-for example, costs and human hours required to produce a single unit. It does not show the whole picture. It is a measure of how well an organization converts inputs such as labour, materials and capital into outputs such as products and services. Operating efficiency is calculated by adding operational expenses in the company and dividing it by the total revenue or sales. Three factors of operational efficiency are process optimization, technology utilization and workforce management. Research reveals that operational efficiency is significantly determined by human, organizational and technological factors.

Illustratively, if a firm's expense is x and your sales/revenue is y, operational efficiency is x/y. An efficiency ratio of fifty percent (50%) or less is considered optimal. It the efficiency ratio increases; it means a firm's expenses are increasing or its revenues are reducing. In computing operational efficiency, we add operational expenses (OPEX) to the cost of delivery services or products (cost of sales) and

dividing that number by net sales/venues. Outputs represent sales or revenues made selling products/services while inputs represent costs or resources put in. To improve operational efficiency, resources are to be optimized, review processes, automate processes, improve team collaboration, make data more accessible, invest in time management, and introduce project control, among other factors.

Return on Investment

Returns on investment is a ratio between retained earnings over time and the cost of investment. As a performance and operational efficiency dimensions, return on investment is used to assess the efficiency of an investment; that is, to compare the efficiencies of several different investments (Osotimehin, 2006) within a portfolio. The investment with the largest returns is usually prioritized

2.2. Theoretical Review

This study is anchored on the contingency theory as effectiveness and efficiency depend on the interplay between management applications and behavior and particular conditions (Fielder, 1967). As posited by Sridhar (2017), modern day entities are laced with complexity and therefore a particular managerial strategy is not applicable to all types of conditions or situations. Thus, the focus of contingency technique is on the adoption and implementations of management strategies as situation arises and it is geared to meet a specific situation. The theory also emphasized the importance of development of management skills to handle situational factors and contingency factors like culture technology, external environment etc that might affect the functionality of the entity. It stresses the need to separately evaluate each situation, plan and to take into account a range of internal and external factors to administer the complexities of the dynamic business environment. As noted by Sridhar (2017), flexibility is required in the organizational design and structure and therefore, bureaucratic structure would be ineffective in such situation. The contingency theory has however been criticized for its straightforwardness and failure to consider that situations could be tricky as numerous factors could arise in the middle of process. Besides, in search for perfect solution that fits organizational goal, there could be wastage of invaluable resources such as time and money. Thus, this approach is not the best fit all as it is not feasible in all situations as it takes a situational context and what may appear viable in a

particular situation might not be the best for the company in the long term because of change in the situations.

2.3. Empirical Review

Ogbadu (2009) adopted descriptive research design for the study to determine factors affecting materials management in manufacturing firms in Nairobi, Kenya. A sample of 6 respondents was chosen from a list of 455 manufacturing firms and data were obtained using structured questionnaire and analysis was carried out using tables, charts and linear regression. The outcomes of the study indicate that good inventory control is imperative in materials management as it reduces stock levels and hence improves operational efficiency and profitability.

Stukhart (2007) investigated the effect of materials management on the profitability of Nigerian Brewing Firms. The population of this study was 4648 being the total staff strength of Nigerian Breweries and Guinness Nigeria Plc, and a sample of 368 was chosen. Data were obtained through structured questionnaire and oral interviews while data analysis was undertaking with the aid of simple percentages and Z-statistics. Findings show that materials procurement, materials storage, materials inventory and interdepartmental collaboration have a significant effect on the profitability of brewing firms.

Wild (1995) carried out an assessment of materials management in medium and large manufacturing firms based in Nairobi, Kenya. A stratified random sampling technique was used to select 55 firms while the data was collected using structured questionnaire consisting mainly of both close ended and open-ended questions. Data were analyzed using means, median and percentages. the study concluded that materials management gets together tasks for shaping manufacturing necessities which include scheduling of manufacturing procedure, procurement, storage and administration of materials.

Ibegbulem and Okories (2015) undertook an assessment of materials management and profitability of an enterprise. The study reported that materials management contributes to firms' profitability and thus recommended its adoption by firms. Nwosu (2014) examined the effect of material management on profitability of Nigerian Breweries and Guinness Nigeria Plc. Data were sourced through oral

interview and questionnaire responded to by a sample of 368 employees from the two firms. The study concluded that materials management makes a significant contribution to firms' profitability.

Agorzie *et al.* (2020) investigated the effect of materials management practices on operational performance of selected quoted food, beverages and breweries firms in South Western Nigeria. The study concludes that materials management practices have significant effect on firm operational performance. The study also identifies the number of challenges faced by firms in the efforts to adopt material management practices and the five most serious among them are: inadequate power supply (mean of 4,4, 99%), poor transportation system (mean of 4.0, 97.1%), lack of trained personnel (mean of 4.2, 93.1%), poor relationship with vendors in the sector (mean of 3.9, 91.1%) and poor ICT facilities (mean of 3.8, 91.7%). Thus, it was recommended that Government at the Federal and State level should step up efforts at providing adequate power supply and solve the issue of poor transportation network through mass investment on rail transportation

3. METHODOLOGY

A descriptive and survey research designs were adopted to structure the research to show how all key variables of the research synchronize as well as to address the main research questions that were used. The population of the study was 33 Food and Beverage Firms listed on the Nigeria Stock Exchange (NSE Factbook, 2019). Five (5) of such firms whose headquarters are in Port Harcourt, were purposively selected and used for the study. 150 managers, assistant managers and supervisors were purposively selected as sample size for the study due to their direct involvement in material handling in their various departments. Data collected using questionnaire drawn using 5-point likert interval option of Strongly Disagree (SD) = 1, Disagree (D) = 2, Undecided (U) = 3, Agree (A) = 4, and Strongly Agree (SA) = 5 was analyzed using multiple regression statistical tools. The multiple linear regression function and model of the effect of materials management approaches (MMA) on operational efficiency (OEF) of the study are as stated:

$OEF = f(MMA)$ (i)

$MMA = (INVM1, MRP2, PPC3)$ (ii

$OEF = \beta_0 + \beta_1 IVM + \beta_2 MRP + \beta_3 PPC + \varepsilon$ iii)

Where: OEF = Operational efficiency
β_0 = Constant
β_1-----β_3 = Coefficient of the predictor variables (INVM, MRP, PPC
INVM = Inventory management
MRP = Material resource planning
PPC = Production planning and control

4.1 DATA ANALYSIS AND RESULTS

Table 4.1 Coefficients of the Explained and Explanatory Variables

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model	B	Std Error	Beta	T	Sign	Tolerance	VIF
K	212.311	6.314		51.602	0.000		
IM	0.592	0.098	0.216	3.458	0.000	0.314	4.910
MRP	0.780	0.084	0.137	4.162	0.000	0.363	3.885
PPC	0.661	0.081	0.178	3.820	0.003	0.421	3.527
ROI	0.586	0.074	0.128	2.243	0.001	0.298	2.744
x/y	0.590	0.069	0.101	2.194	0.000	0.234	2.551
R		710;					
R^2		0.504					
Adjusted R^2		0.486					
S.E. of estimates		1.61207					
S.E. of estimates		1.61207					
F-stat		38.520					
Sig. (F-stat)		0.000					
DW stat		2.16					

Criterion variable (1): ROI = Return on investment (proxy for operational efficiency)
Criterion variable (2): x/y = ratio of input (x) to output (x) (proxy for operational efficiency) Predictors: (Constant (K), IM, MRP, PPC)
IM = Inventory Management, MRP = Materials Resource Planning,
PPC = Production Planning and Control

5. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

Given that the study is centred on the effect of materials management on operational efficiency, multiple regression test was appropriately adopted and the results showed that three effective materials management approaches which are inventory management, material resource planning and production planning and control have significant effect on operational efficiency of the firms which was measured using the input-output ratio (x/y) and return on investment as their p-values are 0.000 < 0.05 level of significance. The R^2 value 0.504 indicates that the materials management approach model for the study explained 50.4% of the changes in operational efficiency of the listed food and beverage firms investigated. Thus, all the hypotheses stated in null form are rejected leading to the conclusion that effective materials management approaches have significant effect on listed food and beverage firms' operational efficiency in Nigeria. The conclusion agrees with our earlier reviewed literature especially the findings of Ogbadu (2009), Ibegbulem and Okories (2015), Nwosu (2014) and Agorzie *et al*. (2020). It is thus recommended that a more scientific materials management approaches and methods using software and advanced materials management technology should be adopted by firms and staff should be trained on how to use these advanced technologies in materials and inventory management in a bid to improve operational efficiency.

Competing Interest: The authors hereby declare that there is no conflict or competing interest in this manuscript.

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