

Materials Management: An Effective Tool for Optimizing Profitability in the Nigerian Food and Beverage Manufacturing Industry

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Abstract

Materials play a key role in manufacturing firms as it represents the major component of manufacturing cost and profitability. The accumulation of, and need for materials in the form of inventories, is a significant variable for managers to concentrate on, monitor and control. This study therefore examined the effect of Materials Management on the profitability of Nigerian Food and Beverage (F&B) Manufacturing firms using a case study of Nigerian Bottling Company (NBC) Plc. Data was collected through a structured questionnaire, relevant publications and interview with key individuals in the company. The results showed that there was significant increase in the company's profitability as a result of efficient management of materials, which was aided by inter-departmental coordination among materials related departments, inventory management, good relationship with vendors, and state-of-the-art facilities/ICT. However, the major constraints to Materials Management in the company included epileptic public power supply and poor transportation network. This study advocated that priority should be given to Materials Management in F&B Manufacturing Industry in order to achieve significant cost saving, improvement in production efficiency, and increase in profitability and competitiveness. Recommendation was made for government to provide adequate infrastructural supports to boost Materials Management in Nigerian F&B Manufacturing Industry.

Keywords: materials management, inventory management, materials cost, production costs, profitability

INTRODUCTION

Every organization invests a considerable amount of capital on materials. In many cases, the cost on materials exceeds fifty percent of the total cost of goods produced. Such a large investment requires considerable planning and control so as to minimize wastage which invariably affects the performance and profitability of organizations. Materials are the lifeblood and heart of any manufacturing system. No industry can operate without them. They 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 co-ordinate and schedule the production activity in an integrative way for an industrial undertaking. A manufacturing firm will remain shaky if materials are understocked, overstocked or in any way poorly managed (Lee *et al.*, 1977 and Banjoko, 2000).

Materials Management encompasses 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, Ondiek, 2009). Thus, Materials Requirements Planning (MRP), purchasing, procurement of materials, inventory management, storage, materials supply, transportation and materials handling are the activities of Materials Management (Monday, 2008). Materials Management came to limelight at the advent of liberalization and globalization which posed intense competition on the business environment. Before that time, the concept was treated as a Cost Centre since Purchasing Department was spending money on materials while Store was holding huge inventory of materials, blocking money and space (Ramakrishna, 2005). With the process of liberalization, there has been a drastic change in the market which has forced manufacturing companies to devise strategies to minimize production costs in order to remain competitive. Since then, Materials Management has been recognized as a source of opportunities to reduce production costs and can be treated as a Profit Centre. Today, there are dramatic evolutions in the market environment and every organisation must strive to keep itself in business. Major competition has shifted from the market to the production floor where manufacturing costs can be reduced and profitability boosted for firms to

complete favourably. Backed by advanced technology, firms are closely monitoring their manufacturing costs and embarking on efficient management of materials (Ondiek, 2009). Fearon *et al.* (1988) see the introduction of computers as a great boost to the adoption of Materials Management, as materials functions have many common databases. Therefore, efficient Materials Management is fundamental to the survival of business, industry and economy.

Previous Researches (Evan *et al.*, 1987; Ramakrishna, 2005; Ogbadu, 2009; Ondiek, 2009) have shown that materials account for more than fifty percent of the annual turnover in the manufacturing firms. This shows clearly that priority should be given to Materials Management in manufacturing firms in order to achieve significant cost saving, improvement in production efficiency, and increase in profitability and competitiveness. Thus, Materials Management should no longer be viewed as a drain-pipe, but as a serious stabilizing and economic growth potential factor. Unfortunately, few studies exist yet on the effect of Materials Management on the performance of manufacturing firms for a developing economy as Nigeria. This study intends to fill this gap.

This paper reviews the concepts and examines the effect of Materials Management on the profitability of Food and Beverage (F&B) Manufacturing firms in Nigeria. The empirical analysis focused on the Nigerian Bottling Company Plc (NBC). Specifically, the pertinent questions for this study are:

1. What organizational factors promote Materials Management in the company
2. What are the constraints to Materials Management in the company

This study postulated the null hypothesis: There is no significant relationship between efficient Materials Management and the profitability of the company.

LITERATURE REVIEW

Overview of the Nigerian Food and Beverage Market

The F&B Manufacturing Industry which constitutes the more significant part of the Food/Beverage & Tobacco Sector, is one of the most thriving industries in the Nigerian economy. It contributes about 0.05% in turnover to Gross Domestic Product (GDP) and its market capitalization of N900.9bn relative to GDP is estimated to be about 3.94% up from 2.01% in 2003. It takes up to 31.4% share (on average) of the Manufacturing Sector. The values index of the industry stock tremendously increased from 32,763.3pts in 2003 to 133,422.3pts in 2007 ((CBN, 2008; Meristem Research, 2008). Despite this impressive profile, some firms in this industry have shut down operations as a result of high manufacturing costs created by exorbitant prices of

materials coupled with lack of adequate management commitment to timely funding of materials procurement (Ilori *et al.*, 2000; Oba, 2008; Adeloye, 2010). The few surviving firms are faced with stiff competition in the current markets. This has led to the need for developing better methods of managing and measuring how material resources should be utilized by various jobs or products, and therefore, be able to reduce material cost as well as eliminate any wastage in the value chain.

CONCEPT OF MATERIALS MANAGEMENT

Materials are simply industrial goods that become part of another physical product. They represent the major component of business cost and profitability. According to Ramakrishna (2005), on an average, half the sales income in an organization is spent on materials. This implies that to boost a firm's profit, there is the need to reduce materials cost which leads to a reduction in manufacturing cost. In the cost structure of most of the products manufactured, materials constitute 50% of the total cost, pointing to the need for the proper budgeting and control on cost of materials which is a core objective of Materials Management.

The various types of materials to be managed in any organization include purchased materials, work-in-process (WIP) materials and finished goods (Banjoko, 2000). Ogbadu (2009) identified basic price, purchasing costs, inventory carrying cost, transportation cost, materials handling cost, office cost, packing cost, marketing cost, obsolescence and wastages as the various costs involved in these materials. Thus, the management of these materials so as to reduce the costs associated is what we refer to as Materials Management. An integrated approach to Materials Management defines it as "the function responsible for the coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner so as to provide a predetermined service to the customer at a minimum cost" (Ramakrishna, 2005; Gopalakrishnan & Sundaresan, 2006). International Federation of Purchasing and Materials Management (IFPMM) defined it as a total concept having its definite organization to plan and control all types of materials, its supply, and its flow from raw stage to finished stage so as to deliver the product to customer as per his requirements in time. These definitions provide the scope of Materials Management which includes decision on purchasing raw materials, staffing, inventories, stores and warehouse management, production levels, and distribution of finished goods at minimum cost at due time (Banjoko, 2000; Osotimehin, 2006; Ogbadu, 2009).

OBJECTIVES AND BENEFITS OF MATERIALS MANAGEMENT

Materials Management is a tool to optimize performance in meeting customer service requirements at the same time adding to profitability by minimizing costs and making the best use of available resources. The basic objective of Materials Management as explained by Banjoko (2000) and Jacobs *et al.* (2009) is to ensure that the right item is bought and made available to the manufacturing operations at the right time, at the right place and at the lowest possible cost. They stressed that without adequate planning for materials resources, the overall performance of an organization may be crippled. Barker (1989) articulated that improvement in continuity of supplies with reduced lead times, reduction in inventories with reduced obsolescence and surplus, improvement in cooperation and communications with reduced duplication of effort, reduction in material costs, improvement in quality control, improvement in status control, and quicker identification of problems are the main benefits of Materials Management in organizations.

Key Functional Areas of Materials Management

Barker (1989) identified five key functional areas that Materials Management cuts across which include purchasing, production and inventory control, quality control, storage and warehousing, and physical distribution. Other literatures (Donald, 1975; Whybark and William, 1986; Linton *et al.*, 2007) expanded the areas/activities to include forecasting demand and quantity of materials requirements, good supplier and customer relationship, indigenous source of supply for foreign materials, developing skills of workers in Materials Management, improved interdepartmental efficiency, and Research and Development (R&D) in Materials Management. These activities managed by the Materials Management Department.

Selection of personnel for marketing, purchasing, inventory control, stores management and materials handling and their training and placement is also to be seen by the Materials Management Department. The materials manager has to manage all these functions with proper authority and responsibility in the Materials Management Department. This indicates that it is very essential to have a Materials Management Department in any organization to support the management in the production activities. It also helps in the marketing, sales promotion and control of all the types of materials for its quantity, quality and cost.

Profitability of Manufacturing Firms

Profit represents the balance from sales revenue after all costs have been deducted. It is a controllable factor to the extent that management can control his revenue through price on one hand and through costs

on the other hand (Ogbadu, 2009). Ramakrishna (2005) articulated that profit can be obtained by deducting the manufacturing cost from the selling price (SP). He emphasized that in the current competitive market situation, the selling price is determined by the market forces and as such, profit can be ensured only by reducing the manufacturing cost which can be minimized through reduction in the materials cost. Materials cost constitutes about 60 percent of manufacturing cost. His analysis showed that materials cost as well as manufacturing cost of an organization is inversely proportional to its profitability. Materials cost is divided into unit price of materials and consumption for production.

Ramakrishna (2005) suggested ways in which Materials Management via Purchasing can help to minimize materials cost and increase profitability. They include obtaining materials at lower prices through development of new sources, effective price negotiations with vendors and using cost-price analysis to determine the right price for materials; managing taxes payable; reducing the cost of packaging; optimizing transportation costs; ensuring right materials' quality; and adopting import substitution. Also, Lyson (1996) and Adeyemi and Salami (2010) posited that effective inventory management is a *sine qua non* for increased profitability in any manufacturing firm since about 70% of the total funds employed are tied up in current assets, of which inventory is the most significant component. They argued that inventory control enhances profitability by reducing costs associated with storage and handling of materials. Proper management of inventory is reflected in a company's Return on Investment (ROI) which is calculated by:

$$ROI = \frac{\text{Profits}}{\text{Capital Employed}} \times 100 \quad (1)$$

ROI can be maximized by either reducing the material cost or reducing the current assets by way of inventory of materials or can be optimized by increasing profits and reducing capital employed (Omolehinwa, 2000; Ramakrishna, 2005; Asaolu and Nassar, 2007).

METHODOLOGY

The study relied on primary and secondary data. Primary data was collected through structured questionnaire and interview from the sample of a case study of Nigerian Bottling Company (NBC) Plc, Lagos. Secondary data was obtained from the company's Annual Report and internet sources. NBC is an integral part of the Nigerian Manufacturing Sector with an outstanding profile as the largest bottler of non-alcoholic beverages in Nigeria and the second largest in Africa (Meristem Research, 2008). We adopted case study approach since it successfully enhances the understanding of complex issues and can further anchor what has been previously known,

while emphasising detailed contextual analyses of limited conditions and their relationships (Dooley, 2002).

This study employed judgemental sampling, and the purchasing, production, quality control and warehouse/store departments were selected as they deal directly with materials: procurement, processing, checking and storage. The population of these four departments was 135. The sample size was determined using the Slovin's formula (Serakan, 1992 cited in Dionco-Adetayo, 2011):

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

where n is the sample size, N is the population size, and e is the margin of error. Applying 5% error margin, the sample size for the study was 100 members of staff, of which 25 were randomly selected from each department. The research questions were analyzed using simple percentages and weighted mean, while the hypothesis of the study was tested using Chi-square test statistic:

$$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e} \quad (3)$$

where f_o is the observed frequencies and f_e is the expected frequencies at α level of significance, with $(r - 1)(c - 1)$ degree of freedom. (r = No. of rows; c = No. of columns). Equation (3) was supported by the effect side analysis:

$$phi(\phi) = \sqrt{\frac{\chi^2}{N}} \quad (4)$$

RESULTS AND DISCUSSIONS

In the recent time, Materials Management has received considerable attention in NBC after a very significant decline in operational performance in 2006 (Table 1). Out of a total of one hundred (100) copies of the questionnaire that were administered to the staff as stipulated in the methodology, 92 copies were correctly filled and returned resulting in a high response rate of 92%. The analysis of this study is

based on the retrieved copies of the questionnaire. Below are the responses to the research questions and the test of the hypothesis. All the respondents indicated that inventory management, inter-departmental coordination, training, good relationship with vendors, R&D in Materials Management, state-of-the-art facilities/ICT and Professionalism are the key factors that promote Materials Management in NBC (Table 2). Inventory management is the most important function of Materials Management and it forms the nerve centre in any organization (Ramakrishna, 2005; Adeyemi and Salami, 2010). In a 4-year retrospect, we observed abysmal inventory management results as reflected by a decline in the return on investment (ROI) from 13.04% in 2003 to 2.24% in 2006 (Table 1). This was however reversed in 2007 with 6.59% ROI indicating a drastic improvement in the inventory management. This gives an obvious reason for majority of the respondents (66%) admitting that inventory management has highly contributed to the efficiency of Materials Management in the company. A high mean value of 2.02 confirmed the result. The company operates just-in-time, buffer stock and lot-for-lot types of inventory system.

In most manufacturing companies, a fundamental problem is that purchasing, production planning and control, inventory control, warehouse and distribution, tend to be developed mainly in independent compartments which consequently results in an insular, restricting and uneconomic approach (Barker, 1989). To boost the performance and profitability of manufacturing firms there is the need for interdepartmental coordination among these materials related departments. In this study, over 60 percent of the respondents admitted that interdepartmental coordination among materials related departments is a highly significant factor to efficient Materials Management in NBC. A mean value of 2.58 confirmed the existence of a high interdepartmental coordination which was aided by professionalism (interview response).

Table 1 Key Performance Indicators of NBC Plc

Year	Turnover (N'000)	Fixed Asset (N'000)	Current Assets (N'000)	Capital Employed (N'000)	Profit (N'000)	Growth in Profit (%)	ROI (%)
2003	43,900,832	22,431,356	11,265,723	33,697,079	4,394,960	-	13.04
2004	47,553,874	24,383,833	11,564,219	35,948,052	3,025,954	-31.15	8.42
2005	55,444,504	30,039,586	13,950,231	43,989,817	2,314,358	-23.52	5.26
2006	59,674,516	33,381,081	13,139,672	46,520,753	1,042,578	-54.95	2.24
2007	68,529,128	34,044,778	14,043,356	48,088,134	3,166,418	203.71	6.59

Source: Equity Research, 2008

Professionalism is considered very important for efficient Materials Management, a view shared by reports from similar studies (Barker, 1989; Ogbadu, 2009; Ondiek, 2009). A high percentage of the

respondents (82%) acknowledged professionalism as critical success factor to efficient Materials Management in NBC. Most of the heads of departments or units were found to be professionals in their functional areas with certification in professional bodies such as Certified Institute of

Warehousing and Materials Management (CIWM), Chartered Institute of Purchasing and Supply Management of Nigeria (CIPSMN), amongst others. This was in addition to their academic qualifications, of which none of them had below first degree or Higher National Diploma.

The analysis further showed that majority of the respondents indicated that good relationship with vendors (63%) and the deployment of state-of-the-art facilities (88%) highly contributed to efficient Materials Management in NBC (Table 2). Ogbadu

(2009) identified poor relationship with vendors as a major Materials Management problem which could result in the breakdown of manufacturing plant. From the interview, the company recently acquired a new state-of-the-art can filling and packaging line in order to boost Materials Management and consequently, enhance its performance. Moreover, the company enormously employ information and communication technologies (ICT) especially in Material Requirements Planning (MRP).

Table 2 Key Factors Promoting Materials Management in NBC Plc

Response	Degree (N = 92)								$\bar{x}_w$
	High		Moderate		Low		Not at all		
	n	%	n	%	n	%	n	%	
Inventory management	42	45	19	21	22	24	9	10	2.02
Inter-departmental coordination	61	66	23	25	8	9	0	0	2.58
Training	23	25	20	22	37	40	12	13	1.59
Good relationship with vendors	58	63	25	27	9	10	0	0	2.53
R&D in materials management	16	17	22	24	49	53	5	6	1.53
State-of-the-art facilities/ICT	81	88	11	12	0	0	0	0	2.88
Professionalism	75	82	17	18	0	0	0	0	2.82

High Significance, $\bar{x}_w > 2.00$

Source: Research Survey, 2008

Training of materials management personnel and R&D in Materials Management recorded low contributions to efficient Materials Management in the company. About half of the respondents admitted that the company's commitment to staff training and R&D in Materials Management was rather very low. This is not surprising as studies by Ilori *et al.* (2000) and Egbetokun *et al.* (2007) revealed that commitment to R&D in Nigerian manufacturing companies is very low as compared with companies in nations like Japan and Australia. Training will effectively develop skills of personnel in Materials Management. The R&D in Materials Management brings about innovation in product design (technological innovation), new product development, and development of new sources of supply at competitive way. From the interview, it was found that the company did not have Materials Management Department which could effectively handle issues of staff training and R&D in Materials management. Weak infrastructural facilities with particular reference to power and transport ranked highest among the constraints to Materials Management in the company (Figure 1). Consistent with the findings of previous studies (Egbetokun *et al.*, 2007; Meristem Research, 2008; Siyanbola *et al.*, 2009), infrastructural constraint is one the major problems facing the Manufacturing Sector in the emerging economies. This calls for attention from the government and other stakeholders of NBC.



Figure 1 Constraints to Materials Management in NBC Plc

The low percentages of poor storage facilities, use of obsolete machinery and inefficient hands on the production line, out-of-stock and substandard raw materials could be traced to the presence of state-of-the-art facilities, professionalism in Materials Management, and effective inventory management in the company. Considering whether or not there is a significant relationship between efficient Materials Management and the profitability of the company as specified by the hypothesis, the Chi-square statistic showed that efficient Materials Management has contributed positively to the growth in profit of the company (Table 3). Efficient Materials Management is measured by rate of materials wastage in the

questionnaire. The strength of the relationship is on the high side ($\phi = 0.5$).

The result of the statistical analysis is in line with the report of the Equity Research (2008) where the profit of NBC increased by over one hundred percent in 2007 (Table 1). Information gathered through the interview revealed that the restructuring embarked upon in terms of acquiring state-of-the-art facilities, and proper management of inventory aided by professionalism, has actually reduced the rate of materials wastage and increased the company's profitability.

Table 3 Relationship between Material Wastage Rate and Profit of NBC

		Profit			Total
		Increased	Decreased	Unchanged	
Material wastage	Low	47 (38.4)	8 (14.8)	13 (14.8)	68
	High	5 (13.6)	12 (5.2)	7 (5.2)	24
	Total	52	20	20	92

Values outside and in parentheses represent Observed and Expected Frequencies respectively

Source: Research Survey, 2008

Using equations (3) and (4), we obtain the calculated Chi-square and phi values respectively,

$$\chi^2_{cal} = \sum \frac{(f_o - f_e)^2}{f_e} = 20.22$$

Determining the critical χ^2 from the tables at 5% level of significance: $\chi^2_{tab} = 5.99$, and

$$phi(\phi) = \sqrt{\frac{\chi^2_{cal}}{N}} = 0.5$$

CONCLUSION AND RECOMMENDATION

Although our intention is not to generalize from this study, but nonetheless, we provide useful insight to the future prospects of the Nigerian Food and Beverage Manufacturing Firms if Materials Management is handled as a total concept. The study shows that there is a positive and significant relationship between efficient Materials Management and firm's profitability. Through efficient management of materials, an organization can achieve significant cost saving, improvement in production efficiency, and increase in profitability. Among the factors that positively influence Materials Management, effective inventory management, inter-departmental coordination, staff training, good relationship with vendors, R&D in Materials Management, state-of-the-art facilities/ICT and Professionalism were found to be the key factors. Inadequate power supply and poor transport system were the most significant constraints to Materials Management.

Based on the findings, it is inevitable to provide recommendations to the Government, and the F&B industry management. In order to boost Materials Management in F&B Manufacturing Industry in

Nigeria, the Federal Government should provide adequate infrastructural supports particularly in the areas of power and transport. The company is encouraged to increase its resource commitment to staff training and R&D in Materials Management so as to develop skills, update knowledge and create indigenous source of supply for foreign materials. Materials Management Department should be established to effectively shoulder the responsibilities of sending or organizing training programmes for materials management personnel as well as performing R&D in Materials Management.

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