

**MATERIALS MANAGEMENT FOR BUSINESS SUCCESS:  
The Case of the Nigerian Bottling Company Plc**

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**ABSTRACT**

*The objective of this study was to examine the relationship between Materials Management and success of manufacturing firms. The empirical analysis focused on the Nigerian Bottling Company Plc (NBC), being one of the largest manufacturing firms in Nigeria. Data was collected through a structured questionnaire, supported by interview. Using Chi-square ( $\chi^2$ ) test of independence, the results provided evidence of a positive significant relationship between efficient Materials Management and firm success. The implication of this is that through efficient management of materials, a manufacturing firm can achieve significant cost saving, improvement in production efficiency, and increase in profitability. The study also found that inter-departmental coordination, effective inventory management, good relationship with vendors, and state-of-the-art facilities/ICT were significant success factors of Materials Management. This study showed that for manufacturing industries to experience remarkable success in their performance, priority must be given to Materials Management as a total concept.*

**Keywords:** *material requirements planning, material wastage, manufacturing cost, profitability*

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**1. INTRODUCTION**

Materials are the lifeblood and heart of any manufacturing system (Lee *et al.*, 1977). They represent the major component of manufacturing cost and profitability. 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. The accumulation of, and need for materials in the form of inventories, is a significant variable for managers to concentrate on, monitor and control.

Materials are simply industrial goods that become part of another physical product. In manufacturing companies, a high proportion of operational expenditure is expended on materials (Oniwon, 2011). In the cost structure of most of the products manufactured, the cost on materials exceeds 50% of the total cost (Ramakrishna, 2005). Such a large investment requires considerable planning and control of materials so as to minimize wastage which invariably affects the performance of organisations. A manufacturing firm will remain shaky if materials are understocked, overstocked or in any way poorly managed (Banjoko, 2000). This points to the need for proper budgeting and control on cost of materials.

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 the study refers to as Materials Management.

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). 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 materials requirements planning (MRP), decision on purchasing, procurement of materials, inventory management, staffing, stores and warehouse management, production, and distribution of finished goods at minimum cost at due time (Osotimehin, 2006; Monday, 2008; Ogbadu, 2009).

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.

In the earlier years, Materials Management 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). However, with the process of liberalization and opening up of global economy, there has been a drastic change in the business environment, resulting in manufacturing organizations exposed to intense competition in the market place. The manufacturing companies' worldwide has been forced to work out various strategies to face the challenges and to cut down manufacturing costs to remain competitive. As noted by Ramakrishna (2005), progressive management has since recognized that Materials Management can provide opportunities to reduce manufacturing costs and can be treated as a Profit Centre.

Today, there are dramatic evolutions in the market environment and every organisation strives to keep itself in business. Major competition has shifted from the market to the production floor where manufacturing costs can be cut down and profitability boosted for firms to compete 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.

Businesses in the Nigerian manufacturing sector have tottered over the years due to lack of adequate management commitment to timely funding of materials procurement coupled with unethical practices of some executives (Oba, 2008). According to a survey carried out in 2010 by the Manufacturers Association of Nigeria (MAN), 834 manufacturing companies have shut down their operations in 2009 across the country due to high manufacturing costs created by exorbitant price of raw materials among other reasons (Adeloye, 2010). The few surviving manufacturing firms are faced with stiff competition in the current markets. This has led to the need for coming up with better method of managing and measuring how material resources are utilized by various jobs or products, and therefore be able to eliminate any wastage in the value chain. Thus, this study became inevitable in view of the developing and changing nature of the Nigerian economy given the extra environment: economic, political, changes in technological development, government regulations, multiple taxation, environmental degradation, and reduction in quality of raw materials as a result of re-cycling and stiffer competition.

Previous Researches (Whybark and William, 1986; 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 management of materials in manufacturing firms to avoid unnecessary costs. 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 examines the relationship between Materials

Management and success of manufacturing firms in Nigeria using the Chi-square ( $\chi^2$ ) test of independence. The empirical analysis focused on the Nigerian Bottling Company Plc (NBC).

## 2. METHODOLOGY

Data in this study was obtained through structured questionnaire supported with interview from the sample of a case study of Nigerian Bottling Company (NBC) Plc, Lagos. A case study approach was adopted 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).

NBC is an integral part of the Nigerian Manufacturing Sector with an outstanding reputation as the largest bottler of non-alcoholic beverages in Nigeria and the second largest in Africa (Meristem Research, 2008). Over the years its production capacity has grown and it presently has 13 bottling facilities, over 80 distribution warehouses and over 200,000 sales outlets nationwide (Equity Research, 2008). Besides, driven by a culture of passion for quality, the organization's history is steeped in a tradition of bringing quality products to the Nigerian market. For NBC, the mission statement is "Quality is more than just something we taste or see or measure or manage. Anything less than 100% quality is unacceptable."

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 respectively. 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):

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

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.

Materials Management brings about reduction in material wastage (Donald, 1975). In this study, efficient Materials Management was measured by the rate of material wastage, while business success was measured by the firm profitability – profit after tax, PAT (Collier, 1995). The study employed descriptive and inferential statistics to show the relationship between efficient Materials Management and profitability as well as the organizational factors that promote Materials Management in the company. The descriptive statistics include percentage and weighted mean, while the inferential was the Chi-square test statistic given by:

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

where  $f_o$  is the observed frequencies, and  $f_e$  is the expected frequencies which is obtained as:

$$f_e = \frac{r_t \times c_t}{g_t} \quad (3)$$

at  $\alpha$  level of significance, with  $(r - 1)(c - 1)$  degree of freedom ( $df$ ). ( $r_t$  = row total;  $c_t$  = column total and  $g_t$  = grand total)

To assess the strength of the relationship between efficient Materials Management and firm profitability, Cramer's V was employed.

$$Cramer's V = \sqrt{\frac{\chi^2}{(N)(df \text{ smaller})}} \quad (4)$$

## 3. RESULTS AND DISCUSSIONS

Out of a total of one hundred (100) copies of the questionnaire that were administered to the staff of the materials-related departments 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 was based on the retrieved copies of the questionnaire.

Examining the relationship between Materials Management and the profitability of the company, the Chi-square statistic showed that there is a positive and significant relationship between efficient Materials Management and firm profitability (Tables 1 and 2). This implies that efficient Materials Management has contributed positively to the growth in profit of the company. The result is in line with the report of the Equity Research (2008) where the profit of NBC increased by over one hundred percent in 2007. In a similar study conducted by Ogbadu (2009), he found that inefficient Materials Management significantly contributed to materials wastage and breakdown of the Benue Brewery plant. The effect size of the relationship between efficient Materials Management and profitability in this study is on the high side (*Cramer's V* = 0.5). This confirmed a very strong relationship. 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 profitability.

**Table 1:** Contingency table for the observed frequencies of Material Wastage Rate and Profitability

Material wastage	Profitability			Total
	Increased	Decreased	Unchanged	
Low	47	8	13	68
High	5	12	7	24
Total	52	20	20	92

Source: Research Survey, 2008

**Table 2:** Contingency table for the observed and expected frequencies

$f_o$	$f_e$	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
47	38.4	8.6	73.96	1.93
8	14.8	-6.8	46.24	3.12
13	14.8	-1.8	3.24	0.22
5	13.6	-8.6	73.96	5.44
12	5.2	6.8	46.24	8.89
7	5.2	1.8	3.24	0.62

Source: Author's computation, 2008

Using equations (2), (3) and (4), we obtain the calculated Chi-square and phi values respectively,

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

Determining the critical  $\chi^2$  from the tables at 5% level of significance:

$$\chi_{tab}^2 = \chi_{\alpha}^2(r - 1)(c - 1) = \chi_{0.05}^2(2) = 5.99 \text{ and}$$

$$Cramer's V = \sqrt{\frac{\chi_{cal}^2}{(N)(df \text{ smaller})}} = 0.5$$

Apart from reduction in materials wastage rate and increase in profitability of the firm, almost all the respondents admitted that Materials Management results in minimization of customers' complaints and reduction in rejection and return rates. It helps the organisation to sustain its quality standard.

Considering the factors that promote efficient Materials Management in NBC, 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 were the major factors (Table 3). 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). Majority of the respondents (66%) admitted 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. Based on the interview, the company operates just-in-time, buffer stock and lot-for-lot types of inventory system.

Just-In-Time (JIT) System emphasizes the production or delivery of precisely the required amount of materials at the right time and precisely where needed. Thus, the usual wasteful practice of ordering and receiving or storing materials many weeks or months before they are actually needed is avoided. The beauty of this system is that materials are ordered and the receipt of such materials is scheduled to arrive on hand just immediately before the commencement of production. Buffer Stock, on its part, is the minimum stock or safety stock kept to meet emergencies, unexpected increase in demand or errors in forecasting the lead time (Asaolu and Nassar, 2007). As the name implies, the lot-for-lot order quantity generates orders equivalent to the size of the demand forecast for each period. The size of the demand forecast per period determines the size of the order. Thus, for a firm to minimize its total inventory cost, it should order for the same lot forecast whenever the need to order arises. These inventory systems minimize inventory holding costs and wastage.

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 success of manufacturing firms there is the need for interdepartmental coordination among these materials related departments. What then is needed is a philosophy of integrated professionalism. Staff cannot operate well unless they appreciate the needs and problems of colleagues in interrelated functions. Such awareness cannot by itself produce desired results. These are achieved by each function translating awareness into action and all staff working as a team to achieve corporate objectives (Barker, 1989). Managing materials must be viewed as a total concept, which is in balance with other major functions such as marketing, sales, production, engineering, finance and personnel (Ogbadu, 2009). Materials Management requires the right blend of technical and commercial expertise operating within the framework of an appropriate and good organizational structure if it is to provide the efficient and effective service demanded of it. 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).

Professionalism is considered very important for efficient Materials Management, a view shared by reports from similar studies (Barker, 1989; Ogbadu, 2009; Ondiek, 2009; Oniwon, 2011). A high proportion 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 3). 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) - a computer-based information system for ordering, scheduling and controlling of inventory level so that an organization does not under-stock nor overstock itself, and to better order priority planning for the various items needed in the assembly of the final products.

**Table 3:** 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	%	
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
Inter-departmental coordination	61	66	23	25	8	9	0	0	2.58
Good relationship with vendors	58	63	25	27	9	10	0	0	2.53
Inventory management	42	45	19	21	22	24	9	10	2.02
Training in Materials management	23	25	20	22	37	40	12	13	1.59
R&D in materials management	16	17	22	24	49	53	5	6	1.53

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

Source: Research Survey, 2008

Staff training 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 developed nations. 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. As one of the interviewee stated:

“...Had the company had a separate Materials Management Department, the issue of training of materials management personnel and conducting R&D in Materials Management would not have been a challenge. In developed countries, almost all large-scale manufacturing firms have separate Materials Management Departments, so an organization like ours should not be an exception.”

A number of national research institutes such as the National Centre for Technology Management (NACETEM) and the Raw Materials Research and Development Council (RMRDC), as well as private institutions like Prudent Materials Management Consultancy and Services Nig. Ltd., and the Chartered Institute of Purchasing and Supply Management of Nigeria (CIPSMN) have the capacity for such training and R&D in Materials Management. The Management of NBC would do well to network with such organisations as the significance of training and R&D in Materials Management cannot be overemphasized in the light of business success.

#### 4. 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 manufacturing industries if Materials Management is given priority as a total concept. This study established that there is a positive and significant relationship between efficient Materials Management and success of manufacturing firms. This implies that through efficient management of materials, an organization can achieve significant cost saving, improvement in production efficiency, and increase in profitability and competitiveness. 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. However, like most Nigerian manufacturing firms, the company was weak in training and R&D in Materials Management which calls for special attention.

Based on the findings, it is inevitable to provide recommendations to the Management of NBC and other manufacturing firms on how to boost Materials Management in Nigerian manufacturing industries.

- i. Manufacturing firms in Nigeria are encouraged to increase their resource commitment to staff training and R&D in Materials Management so as to develop skills, update knowledge, enhance new product development and create indigenous source of supply for foreign materials.
- ii. 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. The Materials Management Department help to support the management of an organisation 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.
- iii. Quality consciousness through capability surveillance (i.e. constant touch with suppliers' plant/factory to ensure manufacturing conforms to product specification and quality) should be strongly advocated. This practice is necessitated by the problems associated with specifications – failure of the manufacturer or supplier to seek clarifications or specifications using the Order Confirmation method in the manufacturing process.
- iv. Materials Management policy should be initiated in order to promote quality consciousness.
- v. Professionalism should be encouraged at all levels of a manufacturing organization. It should not be restricted to top management or management staff.

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