

Materials management and productivity of fast moving consumer goods companies in Nigeria: A canonical correlation approach

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Abstract

In this paper, the effect of material management on productivity level of fast moving consumer products enterprises in Nigeria was assessed. The survey design was employed and questionnaire was the major instrument of data collection designed via two material management dimensions (raw materials and work-in-progress) and productivity dimensions (material efficiency and yield). Questionnaire were administered to three hundred and seven (307) respondents and data obtained were analyzed using Canonical correlation. Results of canonical correlation analysis revealed that the combination of material efficiency and yield (productivity proxies) had a statistically significant relationship on sets of material management being measured by raw material and work-in-progress. The study concludes that improvement in material management will increase the productivity of FMCG companies in Nigeria. Given the results of the study, improvements in material management is needed such that material requisition and conversion units should ensure that required materials for production of goods are those put into the production process in order to realize efficiency of production and superior yield of finished goods by fast moving consumer products organizations. In addition, fast moving products companies should ensure maintenance of optimum level of material resources in its store room and reduce unhealthy practice in material usage that are pivotal to reducing productivity.

Keywords: Material management; Organizational productivity; Material efficiency;
Material yield; Raw material; Fast moving consumer goods companies

JEL Classification: J24; M11; M9

Introduction

In the past, materials management was traced as a cost-centre because purchasing department spent money on material whereas store held enormous material inventories, blocking space and money (Ramakrishna, 2005; JerutoKeitany, Wanyoike&Richu, 2014). Nevertheless, with the advent of globalization and expansion in information technology (IT), a drastic change occurred in the business environment such that organizations are opened to stern competition in marketplace (Oba, Ayoola,Ademola&Obadeji, 2017; Dagim, 2018; Garba, 2020); thus the need

to utilize material resources for effective productivity. Sturkhart (2007) asserts that total cost of materials may be 60 percent or more; however, in most cases, cost of materials may exceed 50 percent of total cost of goods. Consequently, large investments in material resources demand effective control and planning in order to minimize material waste, which unvaryingly affect companies' productivity (Ondiek&Odera, 2012).

Song, Haas and Caldas (2006); Cross (2019);Kisioya and Moronge (2019); Oteki and Sakwa (2020) opined that

companies engaging in efficient material management are most probable to perform better than those that do not and realize significant savings in total costs of production; hence, effective materials management can result to cost reduction, savings and overall, productivity. According to Banjoko (2009), the diverse forms of materials needed to be managed encompassed raw materials, work-in-progress (WIP) and finished goods. Impliedly, materials management refers to the management of raw materials, WIP and finished goods in order to reduce costs linked with production.

Prior researches (Ondiek, 2009; Asaolu, Agorzie&Unam, 2012; Dagim, 2018; Cross, 2019; Kisioya&Moronge, 2019; Muchaendepi, Mbohwa, Hamandishe&Kanyepe, 2019; Nyongesa& Shale, 2019; Oteki&Sakwa, 2020; Garba, 2020) have shown that materials management accounts more than annual turnover of companies. This suggests that precedence should be given to materials management in fast moving consumer goods companies in order to avert excessive production costs. Given that fast moving consumer goods companies experience material waste in the course of production, there is therefore the need for fast moving consumer goods companies to have improved ways and strategies of managing material resources in order to reduce wastage in value chain and thus augmenting productivity.

Unfortunately, there are scanty empirical evidences on materials management and productivity, particularly of Fast Moving Consumer Goods (FMCG) companies in Nigeria. This study therefore was carried out with the view to assessing the effect of materials management (using material management components – raw and work-in-progress materials) on organizational productivity dimensions (material efficiency and yield) of FMCG companies in Nigeria. The raw material and work-in-progress are material inputs

while material efficiency and yield are materials output measures.

Theoretical literature and conceptual model

In literature, materials management has been widely recognized as a vital tool for boosting the productivity of organizations since it curtails costs and makes the best use of existing resources.

Cross (2019) opines that materials management offers an integral methods of proper planning of materials activities and total material price. Ogbadu (2009) asserts that organizations can retain adequate materials inventories in diverse forms to ensure profit. In this regard, material inventories may serve as a link between production and consumption of goods in organizational settings (Oba, *et al* 2017; Dagim, 2018).

In recent times, organizations invest huge resources in materials management in order to curtail material wastage (Ondiek&Odera, 2012), cost saving (Song, Haas & Caldas, 2006; Cross, 2019) and enhanced productivity (Banjoko, 2009; Asaolu, *et al*, 2012). Management literature suggests that materials management accounts more than yearly turnover organizations record (Cross, 2019; Ondiek, 2009), and as such materials management is considered a dynamic strategy for enhancing turnover, performance and productivity.

Barker (1989); Linton, Klassen and Jayaraman (2007) acknowledged five main functional areas of materials management to include purchasing, inventory and quality controls, warehousing/ storage, distribution and production (raw materials conversion to work-in-progress and finished goods). Materials management refer to purchasing, warehousing and controlling of organization materials in an optimum manner such that a predetermined service to customers at a lowest cost can be realized (Ramakrishna, 2005; Gopalakrishnan & Sundaresan, 2006).

Banjoko (2009) asserts that for organizations to enhance productivity, it must consider materials management as the lifeblood of the production process. This means that organizations materials for production must be available at a suitable price, quantity, quality and be able to coordinate and schedule production activity. In materials management literature, there are two key issues organizations avoid – under-stock and overstock in order to enhance productivity (Navon&Berkovich, 2006). According to Jacobs, Chase and Aquilano (2009); JerutoKeitany, *et al* (2014), the fundamental objective of materials management is aimed at purchasing the right items and making them available to production unit at the right time, and possible lowest cost.

Materials management according to Levi, *et al* (2009) have a vital influence on organization’s performance and productivity. Prior researches (Ondiek&Odera, 2012; Asaolu, *et al* 2012; JerutoKeitany, *et al* 2014; Oba, *et al*, 2017; Dagim, 2018; Cross, 2019) found that

materials management have significant effect on organizational productivity and that the effect emanates in form of efficiency and better yields in production processes. More worrisome is the fact that there have been no empirical studies in developing countries like Nigeria with abundant Fast Moving Consumer Goods companies desirous of improved materials management strategies in order to breakeven or enhance productivity.

Notwithstanding the objectives of materials management, Banjoko (2009) posits that the types of materials to be managed by organizations embraced purchased raw materials, work-in-progress and finished goods. This study was carried out with the view to assessing the effect of materials management (using material management components – raw and work-in-progress materials) on organizational productivity dimensions (material efficiency and yield) in Nigeria. In view of the theoretical literature, the following conceptual model was developed to guide the canonical model:

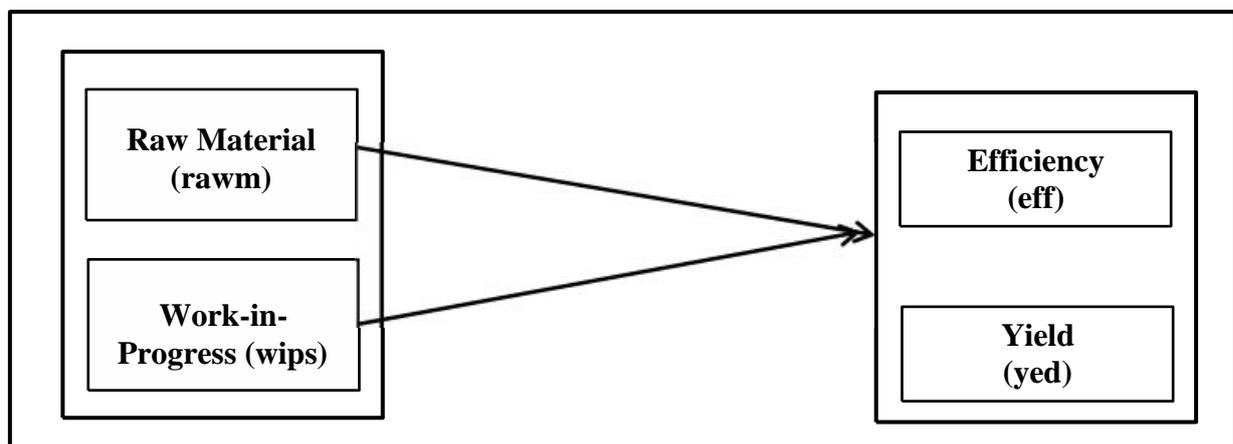


Fig. 1: Conceptual model of the study
Source: Conceptualized by the researcher, 2020

Research methods

This paper adopts descriptive survey research design in order to assess the relationship between materials management and productivity dimensions of Fast Moving Consumer Goods (FMCG)

companies in Nigeria. The survey design was employed since the study seeks to obtain the viewpoints of people on the research subject.

A sample of three hundred and seven (307) respondents were randomly selected from two viable FMCG companies – Nestle

Nigeria and Nigerian Brewery and a 20-itemed questionnaires were administered to employees of the studied FMCG companies who are the participants of the study; the study sample was obtained via convenience sampling technique. The 5-point Likert type scale instrument was used as basis for questionnaire design and a pilot test was carried out; questionnaire was adjusted to the present form in which it was used to obtain data for the study.

The questionnaire was designed in two parts (Parts I – bio-data of respondents & II – thematic issues); questionnaire items in Part II captured materials management dimensions (raw material and work-in-progress) and productivity dimensions (materials efficiency and yield). Part II of the questionnaire recorded a Cronbach Alpha reliability coefficient of 0.75, which according to Manson, Lind and Marchal (1999) is considered a reliable instrument since it is not less than 0.5. The data obtained from the survey was illustrated using descriptive statistics like pictorial charts, mean, median, standard deviation, kurtosis, and skewness while inferential (Canonical correlation) statistical technique

was employed in analyzing data obtained in the field survey.

Canonical correlation approach has the ability to handle multiple sets of dependent variables and independent variables (Hotelling, 1936; Thompson, 1999; Fan, 1997; Sherry & Hensen, 2005), hence was adopted as analytical framework. The model specification examines the relationship between sets of material management and productivity dimensions as stated thus:

$$eff = f(rawm, wips) \quad - \quad eq. 1$$

$$yed = f(rawm, wips) \quad - \quad eq. 2$$

Where: Productivity was measured by materials efficiency (*eff*) and yield (*yed*) while materials management was proxied by raw material (*rawm*) and work-in-progress (*wips*).

$$eff = \beta_0 + \beta_1rawm + \beta_2wips + \mu_t \quad - \quad eq. 3$$

$$yed = \beta_0 + \beta_1rawm + \beta_2wips + \mu_t \quad - \quad eq. 4$$

Questionnaire items were raised on the dependent variables dimensions (productivity- materials efficiency and yield) and the independent variables dimensions (materials management - raw material and work-in-progress). The statistical analysis was carried via STATA 13.0 software.

Results and discussions

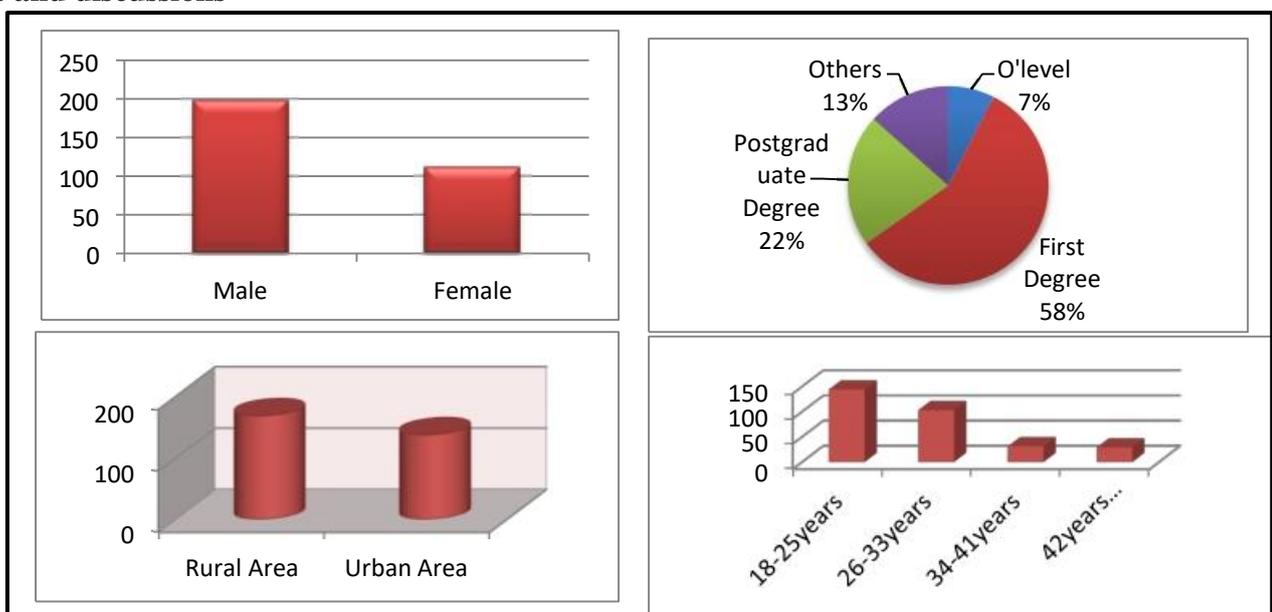


Fig. 2: Demographic variables of the sampled respondents

Figure 2 shows the demographic variables of 307 sampled respondents; the results reveal that the respondents cut across diverse

genders, educational qualification, area of resident and age group, which gives the study

a broader assessment of the viewpoints of diverse respondents on the research theme.

Table 1: Descriptive statistics

<i>Statistics</i>	<i>Eff</i>	<i>yed</i>	<i>Rawm</i>	<i>Wips</i>
Mean	4.4848	4.6118	4.3649	3.6395
Median	4.6126	4.6126	4.3243	3.6057
Std. dev.	0.5803	0.6107	0.5109	0.4260
Minimum	1	1	1	1.0000
Maximum	5	5	5	4.0000
Skewness	-0.8459	4.7972	4.7972	-0.6351
Kurtosis	3.9798	-0.9417	-0.7617	3.6260
Sum	1466.5	1507.9	1427.3	1501.7
Observation	307	307	307	307

Source: Computed by Researcher, 2020

Presented in Table 1 is the descriptive result of dependent (*eff* and *yed*) and independent (*rawm* and *wips*) variables of study. The results showed that all variables beat the mean threshold of 2.00, suggesting that respondents perceived questionnaire items as fundamental dimensions of material management and organizational productivity. In addition, dependent and independent variables moved in similar direction as shown in skewness(negative signs). Also, the dependent and independent variables are

normally distributed since kurtoses are closer to 3.

The correlation matrix obtained using canonical model have provision in assessing the separate correlation matrix on sets of dependent, independent and combination of both variables as shown in Tables 2a, 2b and 2c. The preliminary test of correlation matrix is vital since there is need to establish whether the data is free from multi-collinearity problem; results are presented in Tables 3-5:

Table 2: Correlation matrix for productivity

	<i>eff</i>	<i>Yed</i>
<i>Eff</i>	1.0000	
<i>Yed</i>	-0.1187	1.0000

Source: Computed by Researcher, 2020

Table 3: Correlation matrix for materials management

	<i>Rawm</i>	<i>wips</i>
<i>Rawm</i>	1.0000	
<i>Wips</i>	0.1410	1.0000

Source: Computed by Researcher, 2020

Table 4: Correlation matrix between materials Management and Productivity Dimensions

	<i>Eff</i>	<i>Yed</i>
<i>Rawm</i>	0.0735	-0.0275
<i>Wips</i>	-0.0946	0.0404

Source: Computed by Researcher, 2020

Using rule of thumb, the results shown in Tables 2, 3 and 4 suggest the absence of

multi-collinearity as none of the correlation coefficients is above -0.70 and

0.70 benchmark (Manson, Lin & Marshall, 1999).

Table 5: Raw coefficients (first and second variable sets)

Raw coefficients for the first variable set

	1	2
Eff	0.0349	-0.0956
Yed	0.0002	0.0013

Source: Computed by Researcher, 2020

Raw coefficients for the second variable set

	1	2
Rawm	0.0908	-0.3572
Wips	-0.0300	0.0425

Source: Computed by Researcher, 2020

Table 5 reveals that one-unit increase in raw material (rawm) of raw coefficient for the second variable set leads to 0.0908 increases in the first canonical variate 'V'

when all other variables are held constant. Besides, the association between material management and productivity sets of variables are weak.

Table 3b: Summary of CCA result for test of overall hypothesis

Canonical correlations:

0.2426 0.1007 0.0380

Tests of significance of all canonical correlations

	Statistic	df1	df2	F	Prob>F
Wilks' lambda	0.9507	12	1303.74	2.0700	0.0213a
Pillai's trace	0.0490	12	1483.96	2.0500	0.0224a
Lawley-Hotelling trace	0.0508	12	1473.97	2.0800	0.0203a
Roy's largest root	0.0426	4	303	5.2800	0.0005u

e = exact, a = approximate, u = upper bound on F

Source: Computed by Researcher, 2020

The first test to confirm the null hypothesis that there is no significant relationship between set of material management and productivity is the Wilks' Lambda test statistic with a value of 0.9507, F-value of 2.0700 and the P-value of 0.0213 which is less than 0.05. Therefore, the null hypothesis is rejected, and alternate hypothesis which states that there is significant relationship between the sets of material management variables and all sets of productivity variables is accepted. Besides, the second test, Pillai's trace result showed a value of 0.0490, with F-value of 2.0500 and P-value of 0.0224,

while Lawley-Hotelling trace statistic reported 0.0508 and F-value of 2.0800 with P-value of 0.0203. Both test results are less than 5% level of significant. Finally, the fourth test, Roy's largest root results also reported a statistics value of 0.0426, F-value of 5.2800 and P-value of 0.0005, indicating 1% level significance between sets of material management and sets of productivity.

Summarily, test of significance of all canonical correlations indicates that the null hypotheses is rejected and the study can clearly conclude that a significant association exists between the sets of

productivity measurements and that of material management using Wilks' Lambda, Pillai's trace and Lawley-Hotelling trace at 5% level of significance and 1% level of significance for Roy's largest root. This finding collaborates the results of Ondiek and Odera (2012); Asaolu, Agorzie and Unam (2012); JerutoKeitany, Wanyoike and Richu (2014); Oba, Ayoola, Ademola & Obadeji (2017); Dagim and (2018); Cross (2019); Oteki and Sakwa (2020); Garba (2020) that material management have significant effect on organizational productivity and that the effect results efficiency and better yields in the production processes of organizations.

Conclusions and recommendations

This paper assessed the effects of material management on productivity level of FMCG companies in Nigeria. Questionnaire was the major instrument of data collection designed via two material management dimensions (raw materials and work-in-progress) and productivity dimensions (material efficiency and yield). Data obtained in the field survey were portrayed using descriptive statistics while inferential (Canonical correlation) statistical tool was used in validating whether material management significantly affect productivity level of FMCG in Nigeria.

Overall, the results of canonical correlation analysis revealed that the combination of material efficiency and yield (proxy for productivity) had a statistically significant relationship on the sets of material management being measured by raw material and work-in-progress; more so, the relationship between material management and productivity level of FMCG is weak. More importantly, the study concludes that improvement in material management will increase the productivity of FMCG companies in Nigeria. The weak correlation suggests that FMCGs have not been able to manage materials in their

productive processes effectively and efficiently.

On the basis of the foregoing analysis, the study suggests improvement in material management such that material requisition and conversion units should ensure that the required materials for production of goods are those put into the production process in order to realize efficiency of production and superior yield of products by fast moving consumer goods (FMCG) companies. More so, FMCG companies should ensure maintenance of optimum level of material resources in its store room and reduce unhealthy practice in material usage that are pivotal to reducing productivity. In fact, FMCG companies should adopt information technology as a major part of its inventory control systems; this would guarantee improved productivity.

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