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Logistics Management and the Performance of Manufacturing Firms in Selected States of Northern Nigeria

Umar, Adeiza Muazu
Lecturer, Department of Management and Information Technology, Abubakar Tafawa Balewa University, Bauchi, NIGERIA

Corresponding Author: amumar@atbu.edu.ng

ABSTRACT

The study examined the role of logistics in manufacturing firms' performance in some states in Northern Nigeria. A firm-level survey was conducted in a cross-sectional examination of members of the Manufacturers Association of Nigeria (MAN), with a sample of 144 firms. The study was underpinned by the resource-based theory, and data was analyzed using multiple regression analysis through the partial least squares structural equation modeling (PLS-SEM). It was discovered that both inbound and outbound logistics have positive relationships with performance. However, the relationship between outbound logistics and performance was not significant. The findings implies that managers of manufacturing firms cannot entirely rely on the contributions of logistics to enhance performance. It was therefore recommended that management in the manufacturing sector could find ways of improving those outbound activities they perform; contemplate involving drivers, such as information technology to boost performance; and consider outsourcing those outbound activities.

Keywords— Firm Performance, Inbound Logistics, Outbound Logistics, Logistics Management, Manufacturing

I. INTRODUCTION

The performance of an organization relates to the overall functioning of the organization, the outcomes of its operations, how well it achieves its market-oriented as well as its financial goals (Chan, Ngai, & Moon, 2016; Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006; Yamin, Gunasekruan, & Mavondo, 1999). The performance of a firm can be described as multidimensional (Santos & Brito, 2012; Selvam, Gayathri, Vasanth, Lingaraja, & Marxiaoli, 2016), and the enhancement of these performance requires some measurements, which can be classified into accounting and marketing indicators (Demirbag, Tatoglu, Tekinus, & Zaim, 2006), as well as objective or subjective indicators (Adetunji & Owolabi, 2016; Dawes, 1999; Harris, 2001; Monday, Akinola, Ologbenla, & Aladeraji, 2015).

To be successful, companies must manage their logistics, which enhances efficiency, reduce costs and improve performance (Ristovska, Kozuharov, & Petkovski, 2017).Logistics management has to do with acquiring the sufficient resources at the right quantity, place, price, time and it covers of both inbound and outbound activities. Inbound logistics relates to incoming materials while, outbound logistics are activities performed after production up to and including after-sales services(Albernaz, Maruyama, Maciel, & Correa, 2014).

Ideally, manufacturers should take advantage of latest business innovations to drive overall performance (Bello & Adeoye, 2018), and one area where such intervention enhances performance is in logistic activities, such as transportation, inventory management, warehousing, material handling and other logistic activities(Agu, Obi-Anike, & Eke, 2016; Ogbo, Onekanma, & Wilfred, 2014; Oyebamiji, 2018; Saini, Agrawal, & Jain, 2018).Despite the availability of these advances, the performance of manufacturing firms in Nigeria has declined significantly in recent times(Simbo, Iwuji, & Bagshaw, 2012) and a widerange of reasons have been adduced, including cost of logistics(Malik, Teal, & Baptist, 2004; Obabori, 2016; Simbo, *et al.*, 2012; Söderbom & Teal, 2002). Consequently, manufacturers are unable to improve performance notwithstanding the resources at their disposal. Furthermore, the study area in Northern Nigeria still suffers unique challenge of insurgency and insecurity, which has disrupted business activities, particularly logistics (Achumba, Ighomereho, & Akpor-Robaro, 2013; Eme & Jide, 2012; Shehu, 2015). The solution probably lies with the effective and efficient management of both inbound and outbound logistics, which is why this study examined the effect of logistics management on a manufacturer's performance, and specifically to: (1) examine the effect of inbound logistics on manufacturing firm's performance, and (2) evaluate the effect of outbound logistics on manufacturing firm's performance.

A model was proposed for the study, where logistics management, comprised of inbound logistics, and outbound logistics, served as the independent variable, while the firm's performance was the dependent variable. The data were collected in 2017 from 144 manufacturing firms in some states in Northern Nigeria that are members of the MAN, an association of manufacturing firms that are organized into seven branches (MAN, 2017). However, only the following five branches were considered in the study: Jos; Kaduna Northwest; Kaduna Southeast; Kano

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Bompai; and Kano Sharada. This was due to insurgency and insecurity in the region where the Adamawa/Borno/Yobe branch was situated.

II. LITERATURE REVIEW

A. Firms performance

The concept of firm performance has received various interpretations over the years. Some look at the firm performance to mean the development of share prices, while others viewed it in terms of profitability(Kolawole & Tanko, 2008). A firm's marketing performance indicates how productive its marketing activities are with regards to its marketing goals (Homburg, Grozdanovic & Klarmann, 2007), whichis influenced by the firm's characteristics, approach, internal and external environment, resources and other qualities/characteristics of the shareholders and management of the firms(Adetunji & Owolabi, 2016; Ahmad, 2017; Nimlaor, Trimetsoontorn, & Fongsuwan, 2014).

The most notable performance measures of a firm are financial and non-financial measures (Adetunji & Owolabi, 2016; Monday, *et al.*, 2015; Stock, Greis, & Kasarda, 2000), and in strategic management research, firm performance is frequently used as a dependent variable (Richard, Devinney, Yip, & Johnson, 2009; Santos & Brito, 2012; Selvam, *et al.*, 2016).

B. Logistics management

Logistics management is the forward and reverse movement of outputs within an organization and with its external environment(Council of Supply Chain Management Professionals [CSCMP], 2013).This movement coordinates, enhances and integrate all logistics activities with other functional areas of a business entity, which therefore relates with performance (Bhatnagar & Teo, 2009; CSCMP, 2013; Lis, Pabian, & Starostka-Patyk, 2014).

C. Logistics management and firms performance

Most organizations hinge their productivity on establishing of logistic activities(Tilokavichai, Sophatsathit, & Chandrachai, 2012), and studies haveshown that this affects firm's performance significantly(Agu, *et al.*, 2016; Imran & Amjad,2017; Kamakura, Mittal, de Rosa, & Mazzon, 2002; Mittal, Anderson, Sayarak, & Tadikamalla, 2005;Mwangangi, 2016; Shah, 2014).

This study was underpinned by Barney's (1991) resource-based theory (RBT), which facilitates analysis of innovation and its association with performance since only firms with certain resources will achieve superior performance. RBT uses the internal characteristics of firms to explain their heterogeneity in strategy and performance. According to the main assumption of RBT, only firms with certain resources and abilities with distinct characteristics will gain competitive advantages and, therefore, achieve superior performance. The RBT is increasingly being employed in logistics management studies to examine the logistics resources on performance (Lai, Li, Wang, & Zhao, 2008; Yang, Marlow, & Lu, 2009).

D. Research framework

The model predicted that both inbound and outbound logistic activities can influence the ability of manufacturing firms to improve performance, as depicted in Figure 1.

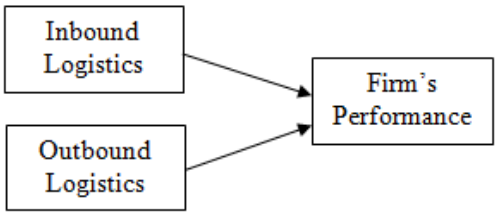

Fig. 1: Theoretical Framework

E. Inbound logistics and firm's performance

Inbound logistics are the procedures related to managing incoming supplies and inputs(Porter, 1985; Sandhu, 2015), and studieshave shown that inbound logistics significantly affect performance (Musau, Namusonge, Makokha, & Ngeno, 2017; Piriyakul & Kerdpitak, 2011).Thus, if the components of inbound logistics are available and deployed properly, inbound logistics can lead to a substantial improvement in performance. Therefore it is hypothesized that:

H_1: Inbound logistics significantly relates to the firm's performance.

F. Outbound logistics and firm performance

Outbound logistics deals with storing and delivery of finished goods to the final consumer(Porter 1985).There are as many research findings that showed significant relationship between outbound logistics and firm's performance (Mbondo, Okibo, & Mogwambo, 2015;Kathurima, Ombul, & Iravo, 2016; Roko & Opusunji, 2016). However, there are others that indicated insignificant relationships (Bawa, Asamoah, & Kissi, 2018; Oyebamiji, 2018). There is, therefore, an indication ofa mixed result, which implied that the deployment of outbound logistic activities would translate into better performance on one hand, while on the other hand, it would not translate to significant firm's performance. Despite the diverse results, the following proposition is advanced:

H_2: Outbound logistics significantly relates to the firm's performance.

III. METHODOLOGY

The model developed for this study assumes that the inbound logistics and outbound logistics would enhance the capabilities of manufacturers to perform better.

A. Design

This study adopted the survey research design, which was a cross-sectional examination of members of the MAN in 2017. The primary data were obtained through the administration of a structured questionnaire, while the multiple regression analysis was conducted through the PLS-SEM using the *Smartpls* 3.0 software (Ringle, Wende, & Becker, 2015). The analytical procedure, for the stages of the PLS-SEM algorithm, was adopted from (Hair, Hult, Ringle, & Sarstedt, 2014; Henseler, Ringle, & Sarstedt, 2012).

B. Population and Sample

The study targeted manufacturing firms operating in selected states in Northern Nigeria, registered with MAN as at March 2017. MAN is structured into 11 sectors with five branches and had 225 members in the study area (MAN, 2017). Using Krejcie and Morgan (1970) table for determining sample size, a sample of 144 firms was obtained from the population. Area sampling technique was used to draw samples from the population, since the research involves a population within an identifiable geographical area, which is Northern Nigeria.

C. Measurements and instrumentations

A 7-point Likert scale questionnaire coded Strongly Disagree (1 point); Disagree (2 points); SomeWhat Disagree (3 points); Undecided (4 points); SomeWhat Agree (5 points); Agree (6 points), and Strongly Agree (7 points) was used to collect the data. The 4-item survey instrument for measuring inbound logistics was adopted from Mahmood & Soon, 1991; while the 4-item outbound logistics measure was obtained from the Sethi and King (1994). To measure the firm's performance, a 5-item instrumentation was adopted from Sarkar, Echambadi, and Harrison (2001). The instruments were adopted because they are standardized instruments that fit in diverse contexts, including the study area.

IV. ANALYSIS AND RESULTS

Two primary software for analysis were used in the study, the IBM Statistical Packages for the Social Sciences (SPSS) version 21, and the PLS-SEM *SmartPLS 3.0*.

A. Multicollinearity diagnosis

Multicollinearity is a problem associated with a correlation matrix when variables are highly interconnected, i.e., 0.90 and above (Tabachnick & Fidell, 2007). As a rule of thumb, predictor variables can be correlated with each other as much as 0.8 before there is cause for concern about multicollinearity. The tolerance value should be high, which means a small degree of multicollinearity, while the variance inflation factor (VIF), should be small. A VIF value of 5 and higher indicates a potential collinearity problem **(**Hair, Ringle & Sarstedt, 2011). The highest value obtained in the model was 4.095(OL3), whichshows that the collinearity was not an issue because the values are all less than 5.

B. Research model

The measurement model displays the relationships between the constructs and the indicator variables, while the structural model displays the relationships between the constructs. Inbound logistics consisted of 4 items; outbound logisticshas 4 items, while firm's performance has 5 items. However, as a result of factor analysis, itemsIL3 and IL4 were removed from the model.

C. Measurement model

Logistics management constructs and firm's performance are modeled as reflective measures, based on the recommendations of Chin (1998) and Diamantopoulos and Winklhofer (2001). An examination of the PLS-SEM estimates focused on understanding how to assess the quality of the results through the evaluation of the reliability and validity of the construct measures. Composite reliability was used to evaluate internal consistency, while the average variance extracted (AVE) evaluated convergent validity. The Fornell-Larcker criterion and cross-loadings were used to assess discriminant validity.

D. Reliability

The composite reliability served as the upper bound for the true reliability with the following values: FP (0.849), IL (0.718), and OL (0.862) as shown in Table 1. The results revealed that all the constructs have high levels of internal consistency reliability above the threshold of 0.70 (Nunally & Bernstein, 1994) and therefore confirmed the reliability of the constructs.

Table 1: Measurement Model Evaluation

Constructs	Cronbach's Alpha	Composite Reliability	AVE
FP	0.849	0.890	0.620
IL	0.718	0.874	0.776
OL	0.862	0.907	0.712

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E. Content validity

The factor loading assessed the content validity of the constructs in the study as suggested by (Chin, 1998; Hair, Black, Babin, & Anderson, 2010). As presented in Table 2, all items meant to measure a particular construct loaded highly on the construct they were designed to measure, thus confirming content validity.

Table 2: Cross-Loading of Items

Items	Firm Performance	Inbound Logistics	Outbound Logistics
FP1	**0.842**	0.357	0.271
FP2	**0.752**	0.209	0.098
FP3	**0.787**	0.248	0.162
FP4	**0.658**	0.183	0.107
FP5	**0.880**	0.460	0.209
IL1	0.296	**0.841**	0.374
IL2	0.406	**0.919**	0.531
OL1	0.118	0.418	**0.665**
OL2	0.194	0.359	**0.905**
OL3	0.254	0.544	**0.943**
OL4	0.186	0.447	**0.834**

Compiled by the Author

F. Convergent validity

Convergent validity was confirmed by examining the composite reliability and the AVE as shown in Table 1. The composite reliability measures are all above the threshold of 0.70 for construct reliability as recommended (Hair *et al*., 2010). A satisfactory level of convergent validity was also maintained since the AVE values [FP(0.620), IL (0.776), and OL (0.712)] are all above the recommended threshold of 0.50 (Wong, 2013). Based on the assessments of the composite reliability as well as AVE values, the measures of the constructs have high levels of convergent validity.

G. Discriminant validity

Discriminant validity was examined by following the Fornell-Larcker criterion, which compares the square root of the AVE values with the latent variable correlations, where the square root of each construct's AVE should be greater than its highest correlation with any other construct (Fornell & Larcker, 1981). The discriminant validity is assumed if the diagonal elements are higher than other off-diagonal elements in their rows and columns. As presented in Table 3, the Fornell-Larcker criterion provides evidence for discriminant validity.

Table 3: Discriminant Validity

Constructs	FP	IL	OL	AVE
FP	**0.788**			0.620
IL	0.405	**0.881**		0.776
OL	0.232	0.524	**0.844**	0.712

Compiled by the Author

H. Structural model and hypotheses testing

Once reliability and validity were confirmed, the constructs are therefore suitable for inclusion in the path model. Thus, the next step involves examining the relationships between the constructs and the model's predictive capabilities.

i. Path coefficients and coefficient of determination (R^2)

The path coefficient range from – 1 to + 1, with coefficients closer to + 1 representing strong positive relationships and coefficients closer to – 1 indicating strong negative relationships (Hair *et al*., 2014). The R^2 measures the model's predictive accuracy and represents the exogenous variable's combined effect, which ranges from 0 to 1, on the endogenous variables. The values of 0.75, 0.50,

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and 0.25 represent substantial, moderate and weak effects respectively (Hair *et al.*, 2011; Henseler, Ringle, & Sinkovics, 2009). As shown in Figure 2, the R^2values obtained for the firm's performance (0.165) indicate weak effects. As shown by the results, the exogenous latent variables have different effects on the endogenous constructs. With the path coefficient value of 0.391, inbound logistic has a larger effect on the firm's performance, compared with outbound logistics (0.027).

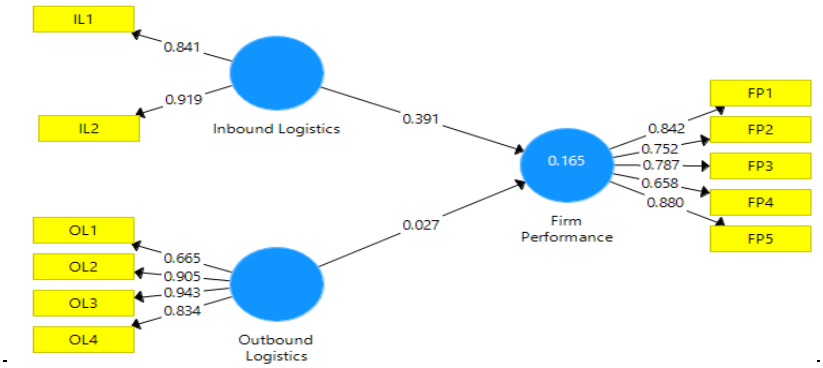

Fig. 2: Path Coefficient

ii. Critical values

The bootstrapping procedure was used to assess the path coefficients' significance at 5000 minimum bootstraps, and the critical *t*-values for a two-tailed test was 1.96 at 5% significant level. Thus, when the empirical *t*-value is larger than the critical value, the coefficient is significant at the stated significant level. As shown in Figure 3, the paths IL—> FP (4.221) has a coefficient value larger than the critical value, while path and OL —> FP(0.252) has a coefficient value less than the critical value.

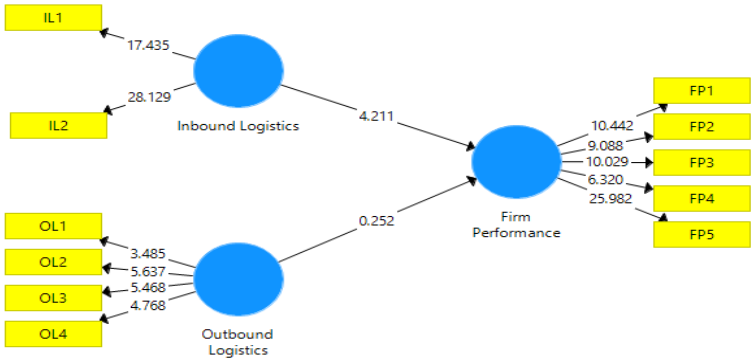

Fig. 3: Path coefficient *t*-values

iii. The predictive relevance of the model (Q^2)

To assess the predictive power of the model, the cross-validated redundancy was utilized. The value of the cross-validated redundancy was obtained by running the blindfold procedure to generate the communality and redundancy at 300 maximum iterations, a stop criterion of $1{\cdot}10^{-5}$ and an omission distance of 7. The predictive power of the model was based on Cohen's (1988) guidelines 0.26: substantial; 0.13: moderate; 0.02: weak. A model is considered to have predictive quality if the cross-validated redundancy values were found to be more than zero, otherwise, the predictive relevance of the model cannot be confirmed (Fornell & Cha, 1994). The cross-validated redundancy of the endogenous variable was found to be 0.078, which is greater than zero, therefore, the hypothesized model indicated good overall predictive power, since the Q^2 value of 0.078 is positive, in line with (Hair *et al.*, 2014; Henseler*et al.*, 2009).

iv. Hypotheses testing

Based on the results of the study achieved through PLS-SEM statistical procedure as shown in Table 4, the following discoveries were made:

a) Results of hypothesis 1, which predicted a significant relationship between inbound logistics and performance of manufacturing firms (β = 0.462, t = 4.221, p = 0.000) was supported. The alternate hypothesis was accepted.

b) Results of hypothesis 2, which predicted a significant relationship between outbound logistics and performance of manufacturing firms (β = 0.038, t = 0.252, p = 0.670) was not supported. Thus, the null hypothesis was accepted.

Table 4: Hypotheses Testing

	R/ships	Beta	*t*-value	*p*-values	Decision
H_1	IL─>FP	0.462	4.221	0.000	Supported
H_2	OL─>FP	0.038	0.252	0.670	Not supported

Compiled by the Author

I. Findings

Based on the results of the analysis, the following are the findings:

i. Inbound logistics has significant effects on the performance of manufacturing firms in Northern Nigeria.
ii. Outbound logistics has insignificant effects on the performance of manufacturing firms in Northern Nigeria.

V. DISCUSSION

The broad objective of the study was to study the effect of logistics management on the performance of manufacturing firms and the results of the study underscored the importance of the relationships and the implications therein.

A. Inbound logistics and firm performance

It was posited that therewould be a significant relationship between inbound logistics and performance of manufacturing firms and the relationship (β = 0.462, t = 4.221, p = 0.000) was found to be significant. This means that for every unit increase in inbound logistics, there was a 46.2% increase in firm's performance. Thus, it implied that activities associated with receiving, storing, and disseminating inputs to the product, such as material handling, warehousing, inventory control, vehicle scheduling, and returns to suppliers, if properly managed could be used to improve performance for manufacturers. The result of this study supported the hypothesis and generally conforms with the literature and in agreement with other empirical results (Musau*et al.*, 2017; Piriyakul & Kerdpitak, 2011),which also showed positive and significant relationships.

B. Outbound logistics and firm performance

It was postulated that therewould be a significant relationship between outbound logistics and performance of manufacturing firms and the relationship (β = 0.038, t = 0.252, p = 0.670) was found to be positive but insignificant. So for every unit increase in outbound logistics, there was a 3.8% increase in firm's performance. This finding was in disagreement with (Mbondo*et al*., 2015**;**Kathurima, *et al.,* 2016; Roko & Opusunji, 2016), but in agreement with the results of Bawa, *et al.,*(2018) and Oyebamiji (2018), which also showed insignificant relationships. The result, therefore,did not support the hypothesis. Thus, it implied that activities associated with collecting, storing, and physically distributing the products to buyers, such as finished goods warehousing, material handling, delivery vehicle operation, order processing, and scheduling do not contribute significantly to performance. Perhaps the manufacturers in the survey rely on third-party outbound logistics providers, as is often the practice, and therefore considered this activity as external and therefore not strategic.

VI. CONCLUSION AND RECOMMENDATIONS

Results obtained indicated that the relationship between logistics management and performance of manufacturers in the model has mixed outcomes; given that the relationship between inbound logistics and performance was significant while that between outbound logistics and performance was not significant. By implication, it is not definitive therefore that logistics management can be used to improve the firm's performance. Based on the findings, it was recommended that management of manufacturing firms could find ways of improving those outbound activities they perform; consider involving drivers, such as information technology to boost performance, as well as consider outsourcing those outbound activities.

VII. IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

Whereas managers can rely on the contributions of inbound logistic activities along their value chain, in its present form, outbound logistic activities may not contribute significantly towards improving firm's performance. A notable limitation of the study is the typical limitations of the cross-sectional design, such as finding and recruiting participants from the target population, representativeness of the sample, lower

validity and reliability scores. The second limitation was the PLS bias, which relates to the assessment of model fit and consistency of the parameter estimates. Future studies should consider a longitudinal design to determine the relationships over time and should use covariance-based SEM (CB-SEM) to avoid the PLS bias. Furthermore, the insignificant relationship between outbound logistics and firm's performance, merits further investigations.

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