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Logistics and distribution strategies as drivers of competitive advantage in Nigeria's cement industry: A Pre-COVID-19 Analysis

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Abstract

Prior to COVID-19, the Nigerian cement industry was dominated by three major firms offering relatively homogeneous products at similar prices, resulting in intense competition for market share. Since competition extended mainly to regions without cement manufacturing plants, efficient and cost-effective logistics became a critical factor for competitive advantage. This study examines the logistics and distribution strategies adopted by the leading cement companies in Nigeria between 2014 and 2018. Specifically, it evaluates the effect of logistics costs on cement landing costs, identifies key operational challenges, and analyses the distribution channels and strategies employed by the firms. The findings reveal that logistics costs had no significant effect on cement landing costs among the companies studied. The study also shows that the firms faced similar challenges, most of which were externally driven. Furthermore, road transportation emerged as the most efficient and cost-effective distribution channel for cement distribution in Nigeria during the pre-COVID-19 era.

Keywords: Logistics; Distribution; Supply chain; Transportation strategy; Competitive advantage

1. Introduction

Nigeria, as one of the fastest-growing economies in the developing world, has experienced rapid growth in infrastructural development over the years (Dunmade, 2002; Masetti et al., 2014). This growth is particularly evident in the construction sector, including the development of roads, houses, schools, hospitals, airports, and other public infrastructure (Isa et al., 2013). Consequently, the demand for cement, a critical material in construction activities, has increased significantly. Cement consumption in Nigeria is driven by urbanisation, industrialisation, road construction, irrigation projects, water supply systems, railway development, and the establishment of educational institutions. Nigeria currently represents the largest cement market in sub-Saharan Africa, with approximately 95 percent of production inputs sourced locally (Byiers et al., 2017a).

The history of cement production in Nigeria dates back to 1957 with the establishment of NIGERCEM in Nkalagu, in the then Eastern Region. Since then, the industry has witnessed considerable expansion, particularly following the introduction of the backward integration policy by the Federal Government in 2003. The policy aimed to encourage local cement production, reduce dependence on imports, and increase the production capacity of existing firms. Through the issuance of licences to committed investors, the policy stimulated significant growth within the industry. By 2013, Nigeria had attained self-sufficiency in cement production, leading to a ban on cement importation. Local production capacity increased from 17 million metric tonnes per annum in 2003 to about 28 million metric tonnes by 2014 (Ibhagui, 2017).

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Nigeria presently has the highest number of cement manufacturing facilities in sub-Saharan Africa, with plants spread across the six geo-political zones. The industry is dominated by Dangote Cement, Lafarge subsidiaries, and BUA Cement (Ibhagui, 2017; Mojekwu et al., 2013a). As production capacity increased, competition among firms intensified. At some point, market supply exceeded demand, creating surplus capacity within the industry. However, despite this surplus, cement prices remained relatively similar across firms due to the high costs associated with production and distribution. Consequently, firms increasingly focused on developing strategies to sustain profitability and maintain market share.

Cement manufacturing is highly capital intensive, especially in the areas of energy consumption and product distribution. Since energy challenges, particularly unstable power supply, are largely outside the control of firms, companies have concentrated more on improving distribution efficiency as a means of gaining competitive advantage. Efficient management of distribution costs enables firms to reduce overall operating costs and improve market performance (Okigbo et al., 2017).

The major raw materials used in cement production; limestone, clay, and gypsum, are usually sourced close to manufacturing plants to minimize production costs. While this reduces upstream transportation costs, it creates a major downstream challenge: efficiently moving cement from production plants to markets across the country. This challenge is particularly significant in Nigeria due to the country's inadequate transportation infrastructure (Aniki et al., 2014b).

Cement is bulky and heavy, making transportation both difficult and expensive. In Nigeria, where railway infrastructure remains underdeveloped and inland waterways are largely ineffective, road transportation has become the dominant distribution channel. Unfortunately, the poor condition of many Nigerian roads increases haulage costs and delivery inefficiencies. To overcome these challenges, cement firms have developed extensive haulage systems, including the use of third-party logistics providers, to ensure timely product delivery and market availability. Firms that successfully minimize logistics costs while maintaining efficient delivery systems are better positioned to achieve competitive advantage (Aniki et al., 2014b; Oyebamiji, 2018).

An important innovation within the industry occurred in 2011 when Lafarge Cement Nigeria Plc partnered with the Nigerian Railway Corporation to transport cement by rail from its Ewekoro Plant to customers nationwide. This initiative improved delivery efficiency by reducing transportation time and costs compared to road haulage (Osagie, 2011a). Despite such efforts, transportation infrastructure deficits continue to pose significant challenges to competitiveness within the Nigerian cement industry (Mojekwu et al., 2013a).

Given the strategic importance of logistics and distribution in determining product availability, delivery timelines, and final consumer prices, firms that develop effective logistics strategies are more likely to achieve sustainable competitive advantage. This study therefore examines the challenges faced by cement manufacturing firms in distributing their products and explores how effective logistics and distribution strategies can enhance competitiveness within the Nigerian cement industry.

2. Empirical review

It is not an understatement to say that Nigerians have been groaning under the unabated pressure of skyrocketed cement price. According to cement manufacturers, this is caused by several factors, prominent among which are lack of power (energy) and infrastructural deficiencies. By far, the major cost component in cement production is power (energy). Due to the high technical nature of the processes involved, constant supply of power and other products is needed to keep the factories running. Due to the epileptic supply of electricity in the country, most cement factories run continuously on heavy duty generators with all the attendant cost (Niazi et al., 2005). As reported by Global Cement News (Jan. 2013), CMAN boss Joseph Makoju stated in January 2013 that energy cost accounts for over 35% of production cost as price of low pour fuel (LPFO) had risen by over 300% from US$ 0.16/l in 2009 to US$ 0.69/l in November 2012. Corroborating this fact, Alf Karsten, the Managing Director of Cement Company of Northern Nigeria (CCNN) reported in December 2012 that the company spends averagely ₦300,000,000 (Three Hundred Million Naira only) to ₦350,000,000 (Three Hundred and Fifty Million Naira only) monthly on power to keep the factory working. This greatly increases the unit cost of a bag of cement (Hargreaves, 2013). The Managing Director of Lafarge Cement, Joe Hudson echoing all stakeholders in the industry called on the Federal Government to address lack of affordable power, lack of transportation infrastructure and dearth of skilled manpower (Hargreaves, 2013; Osagie, 2011b).

2.1. Transportation network (infrastructure)

According to (Agusto & Co, 2017), the cement industry still faces challenges with distribution due to the infrastructural deficiencies in the country. This is particularly significant for an industry whose product is heavy. In the absence of

operational rail and water transport infrastructure within the country, pothole ridden roads are the only option for use in the distribution of the product. This makes the distribution of cement in the country particularly expensive especially in periods of high crude oil prices as experienced in 2011. Thus, the high cost of cement distribution as occasioned by poor infrastructures, greatly increases the price at which the product gets to the end user.

2.2. Gap between demand and supply

According to (World Bank, 2018), Nigeria's booming demand could not be met by the country's cement production. The shortages of production facilities, as well as the low-capacity utilisation are among other factors that contributed to increase the gap between cement demand and production in Nigeria. For instance, in 2006, the cement market in Nigeria was about 10 million with only 3.7 million tonnes produced locally. The imported cement share represented around 65% of the total market. According to the 2013 Global Cement Report, Nigeria was the world's fourth largest cement importer, with 7 million Mt imported in 2006, after the USA, Spain and Bangladesh, demonstrating the important gap between the national supply and the country's demand. During the peak years of heavy importation, demand outstripped supply. However, since the production boom of recent years started, supply has outstripped demand. In recent years, the industry has been threatened by a weakening demand. Indeed in 2012, the gap between production and consumption estimates stood around 1.5 million tonnes each for Dangote and Lafarge, representing unsold stock at year end. These cement producers blame this gap on importation allowed during the period (Ibeto Cement was still importing as a result of court order in their favour) (Byiers et al., 2017b; Mojekwu et al., 2013b; Multitrade Group, 2010).

2.3. Competition among the Nigerian cement firms

There are few cement manufacturers in the country, including BUA and Lafarge, but Dangote Cement Plc is reputed to have the biggest installed capacity in the country, with Lafarge and its many subsidiaries as the second biggest. Recently, both companies have been in the middle of the 'cement war' with accusations of de-marketing each other (Ojelu, 2014).

Dangote Cement Plc is a fully integrated company that has operations in Nigeria and 14 other African countries, with current total production capacity of 29.75 million metric tonnes per annum from its three existing cement plants in the country – Obajana, Ibese and Gboko – with 13.25 million MT, 12.5 million MT and 4.0 million MT capacities, respectively (Dangote Plc, 2012). The Obajana Cement Plant in Kogi State is reputed to be one of the single largest in the world (Akinyoade & Uche, 2017). Dangote Cement is also the biggest quoted company in West Africa and the only Nigerian company on the Forbes Global 2000 Companies with operations in Benin, Ghana, Congo, Tanzania, Senegal, South Africa and Zambia, and Greenfield projects in Zambia, Senegal and other African countries, which are expected to have capacities for 1.5 million MT each per annum (Byiers et al., 2017b).

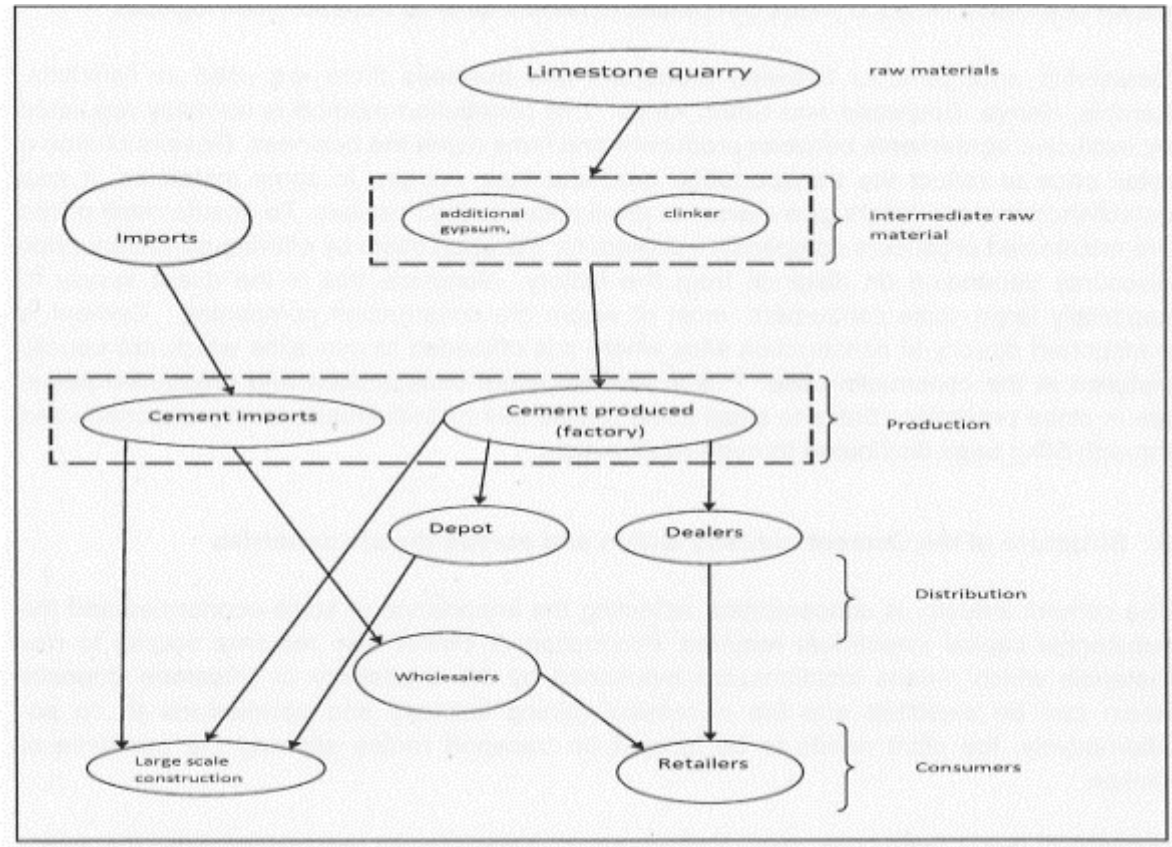
Lafarge Africa, on the other hand, is a member of the Lafarge Group created in 1833, with headquarters in France and reputed as the world leader in building materials, number one in cement production worldwide, number two in aggregates and concrete, and number three in gypsum. In Nigeria, the Lafarge Group has subsidiaries, including Ashaka Cement in Gombe State; UNICEM, which is based in Calabar, Cross River State, in addition to the Lafarge Cement Nigeria Plc plants in Ewekoro and Sagamu, both in Ogun State. These subsidiaries have installed capacities of 1.0 million MT, 5 million MT and 4.5 million MT (Ewekoro and Sagamu) respectively. while Lafarge, with 60 per cent equity shares owned by the Lafarge Group, recently became Lafarge Africa, a Nigerian listed holding company that will consolidate all the group's Nigerian and South African assets in a transaction worth $200m. Lafarge Africa is expected to have a combined production capacity of around 12 million MT made up of Lafarge, with its 4.5 million MT, and Lafarge South Africa Holdings, with its 3.6 million MT, and an expected expansion in 2017 that will raise the installed capacity to 17 million MT (Agusto & Co, 2017).

While Dangote has been aggressive in its expansion plan by expanding its production lines and building new plants in different parts of Africa, Lafarge Africa Plc is also consolidating its position in the country by taking full control of the ownership of its subsidiary companies. It recently got the approval from the Securities and Exchange Commission to acquire the minority shares of Ashaka Cement of 927 million, which represent 41.39 per cent of the company's equity, thereby giving Lafarge Africa 100 per cent stake. While Flour Mills of Nigeria Plc also recently sold 30 per cent minority equity investment in UNICEM to Lafarge Africa Plc.

2.4. Logistics strategies

Logistics Strategy is the science of evaluating the most cost-effective methodology of distributing goods to market while achieving service level objectives. It is important for companies to recognize that logistics strategy can be product-specific, customer-specific, location-specific and that supply chains for each industry are dynamic and evolving (Stock et al., 1998). Cement industry should do is that according to sale information, cement companies should prioritize

delivery schedules and meanwhile, exactly master the in-transit information of goods. Besides, it can avoid some logistics risks that may happen during logistics process (Aniki et al., 2014a).



Source: African Competition Forum (2014)

Figure 1 Cement Value Chain

Transportation and distribution logistics are an important element in the value chain. The distribution channels vary widely, not only across countries but also between companies within particular countries (Paelo et al., 2014). The most common distribution models involve the use of producers' own depots, dealership arrangements, subsidiary companies and direct supply. Traditionally, depots are often owned and operated by cement producing companies themselves or by subsidiary companies. Depots often offer cement at ex-factory or wholesale prices; a relatively lower price than the retail market. Distribution through subsidiary companies operates when a cement producing company uses its subsidiary to distribute cement consignment. Direct sales to consumers are usually feasible with large scale consumers such as large construction projects that require substantial amounts of cement in bulk. The dealership arrangement is organized through contract agreement between producers and established trading companies. Dealers charge a retail price to reflect the transportation costs and their margin. To ensure that retail prices are maintained, producers compensate dealers for transport costs by offering ex-factory price discounts depending on distance from the factory. Alongside this is the direct supply to especially large-scale consumers, most of who are construction companies. Cement is usually transported directly to construction sites where it is offloaded into silos install at site. Sales to small scale private use by individuals are conducted through the use of 50kg bags distributed through retail outlets (Mbongwe et al., 2014).

From the above, it is quite clear that the logistics is a very crucial aspect of the cement business and for a cement firm to remain profitable, it has to have a firm handle on it. In an industry as competitive as the Nigerian cement industry where all the firms are experiencing the same set of challenges and have very limited avenues to gain competitive advantages, an assessment of the various strategies employed by these firms is off importance. This thesis will assess the various strategies employed to find the similarities and differences in these strategies, if any.

3. Methodology

The study utilises data obtained from the three dominant players in Nigeria's cement industry; Dangote Cement, Lafarge Africa, and BUA Cement, covering the period before the COVID-19 pandemic (2014–2018). These firms were selected due to their strong operational presence within Nigeria and their combined control of more than 95% of the domestic cement market, despite maintaining limited export activities to neighbouring West African countries. Table 3.1 shows the distribution of installed production capacities among the selected firms. As of 2018, Dangote Cement recorded the highest installed production capacity at approximately 29.75 million tonnes (MT), whereas BUA Cement had the lowest installed capacity of about 7 MT (Oyebamiji, 2018).

Table 1 Companies and their Plants' installed capacities

S/n	Company	Plant	Capacity (million tons)
1.	DANGOTE	OBAJANA	13.25
		IBESE	12.5
		GBOKO	4
		TOTAL	29.75
2.	LAFARGE	UNICEM	5
		WAPCO	4.5
		ASHAKA	1
		TOTAL	10.5
3.	BUA	OBU	5
		SOKOTO (CCNN)	2
		TOTAL	7

3.1. Data sources

Data on cost of logistics, landing cost of cement, challenges faced by the firms and distribution strategy were hand-collected from the sample companies' annual reports. Microsoft Excel 2019 and EViews 10 was used for data analysis. Additionally, data on the challenges faced by the cement firms in Nigeria as well as their different channels of cement distribution were also collected from the quarterly and annual reports of each company.

REGRESSION MODEL

$$LC_{it} = \beta_0 + \beta_1 LNCS_{it} + \beta_2 LNCL_t + \beta_3 LNREV_{it} + \beta_4 DT_{it} + \beta_5 TPTY_{it} + E_{it} \quad \textbf{Eq.1}$$

Where:
Independent Variable:
LC_{it} = Landing cost of firm *i* for year *t*

Dependent Variables;

$LNCS_{it}$ = Natural logarithm of cost of sales of firm *i* for year *t*
$LNCL_{it}$ = Natural logarithm of cost of logistics of firm *i* for year *t*
$LNREV_{it}$ = Natural logarithm of sales revenue of firm *i* for year *t*

Control Variable;

DT_{it} = 1 if sample firm *i* owns distribution trucks during year *t*, and 0 otherwise
$TPTY_{it}$ = 1 if sample firm *i* used third-party logistics companies in year *t,* 0 otherwise

Distribution Trucks (DT): This is included as a dummy variable to assess the different strategies employed by the companies to reduce distribution costs which is an integral parts of the cement business.

Third-Party Logistics (TPTY): This is another dummy variable aimed at assessing if the companies chose to outsource distribution as a way of mitigating the linked to the dilapidated state of the roads.

3.2. Descriptive statistics

Table 2 Descriptive Statistics for Landing Costs Per Bag of Cement

DANGOTE					
	2014 **₦**	**2015** **₦**	**2016** **₦**	**2017** **₦**	**2018** **₦**
MEAN	1,400	1,392	1,667	2,414	2,496
MEDIAN	1,400	1,420	1,500	2,400	2,480
MAXIMUM	1,400	1,460	2,235	2,530	2,530
MINIMUM	1,400	1,260	1,400	2,235	2,480
LAFARGE					
MEAN	1,395	1,384	1,661	2,412	2,494
MEDIAN	1,400	1,420	1,490	2,400	2,480
MAXIMUM	1,420	1,450	2,235	2,480	2,550
MINIMUM	1,380	1,250	1,400	2,235	2,480
BUA					
MEAN	NIL	1,358	1,710	2,455	2,525
MEDIAN	NIL	1,285	1,560	2,435	2,525
MAXIMUM	NIL	1,500	2,285	2,560	2,550
MINIMUM	NIL	1,285	1,435	2,285	2,500

As shown, the companies have an almost homogenous result; mean landing cost fluctuated consistently over the estimated period. The reduction in price in 2015 may be attributed to the fact that Nigeria went into a recession which only started to improve in the later part of 2016.

4. Results and discussion

4.1. Correlation between dependent and independent variables

Table 3 below demonstrates the Pearson Correlation Coefficients among all variables. As presented, the estimation of landing costs (*LC*) is positively correlated with the estimations of cost of logistics, cost of sales and sales revenue (*LNCL*, *LNCS & LNREV* respectively) for the three companies. This shows that as they increase, the landing costs will increase. This justifies the interests and concerns as regards the effect of these variables on landing costs. The control variables correlations vary with company; for Dangote, while distribution trucks (*DT)* is positively correlated with landing costs, third party trucks (*TPTY*) is negatively correlated; for Lafarge both *DT* and *TPTY* are positively correlated; for BUA, *TPTY* is negatively correlated while *DT* is positively correlated. Since the same control variable may have different correlation with landing cost in the different countries, the effect of their employment in the regression models may be considered in the empirical research through this thesis.

4.2. Correlation among Independent Variables

Between the *LNCL*, *LNCS* and *LNREV*, the correlation coefficient for the 3 companies is above 80%. Higher correlation among variables may lead to multicollinearity so that the model might not demonstrate the best relation between

variables, however, high correlation among variables does not necessarily result in poor estimation (Dougherty, 2011). Since *LNCL*, *LNCL* and *LNREV* are explanatory variables in the models, they can affect the regressive results simultaneously. As regards the control variables, distribution trucks (*DT)* and the use of third-party trucks (*TPTY)* are not highly correlated for Dangote, Lafarge and BUA (-15.34%, 3.12% & 3.92% respectively). Since DT and TPTY are indicator or dummy variables which assume 1 or 0, the level of correlation between them may not impact the regression results (Allison, 2012).

Table 3 Correlation results

DANGOTE						
	LC	LNCL	LNCS	LNREV	DT	TPTY
LC	1					
LNCL	0.616440	1				
LNCS	0.354391	0.878374	1			
LNREV	0.364592	0.864727	0.783216	1		
DT	0.163881	0.352188	0.307350	0.239564	1	
TPTY	-0.937607	-0.580586	-0.235798	-0.345882	-0.15394	1
LAFARGE						
	LC	LNCL	LNCS	LNREV	DT	TPTY
LC	1					
LNCL	0.492713	1				
LNCS	0.792088	0.832338	1			
LNREV	0.503546	0.887532	0.778100	1		
DT	0.937505	0.490271	0.791457	0.487812	1	
TPTY	0.032746	-0.079679	0.000907	0.005998	0.031220	1
BUA						
	LC	LNCL	LNCS	LNREV	TPTY	DT
LC	1					
LNCL	0.460969	1				
LNCS	0.688171	0.921968	1			
LNREV	0.761761	0.869970	0.946868	1		
TPTY	-0.044336	0.047130	0.038642	0.046110	1	
DT	0.906729	0.326979	0.557975	0.624043	0.039239	1

(Eke, 2026)

4.3. Autocorrelation & multicollinearity

Because of the correlation levels of the explanatory variables in the three companies, tests for autocorrelation and multicollinearity are very necessary. To ensure there is no autocorrelation among the variables in the model, the residuals of the error term are plotted to check for patterns, the existence of which shows the presence of autocorrelation. All three companies showed signs of heteroscedasticity/autocorrelation (see figures 2,3 & 4).

To test for multicollinearity in the models, the values of centred Variance Inflation Factor (VIF) should be within the range of 0 – 10. As shown in table 4 below, for Dangote only *LNCL* showed high signs of multicollinearity, for Lafarge, none of the variables showed multicollinearity while for BUA, *LNCS, LNCS* and *LNREV* all showed high multicollinearity.

The impact of the high correlation and collinearity among variables will still be tested in the regression models and adjusted where necessary.

4.4. Dangote

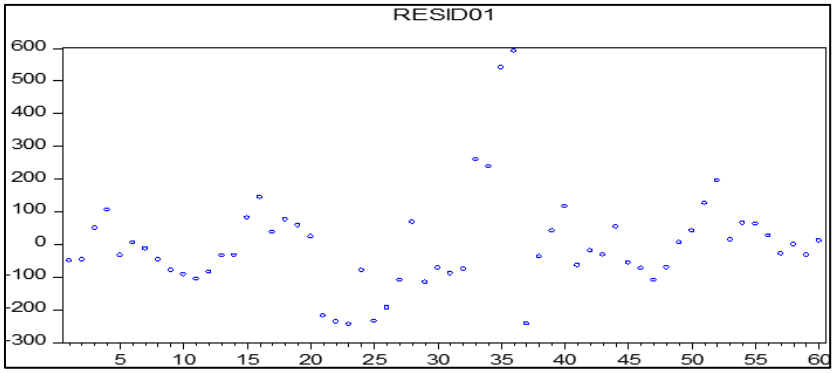


Figure 2 Test for Heteroscedasticity Among Residuals

4.5. Lafarge

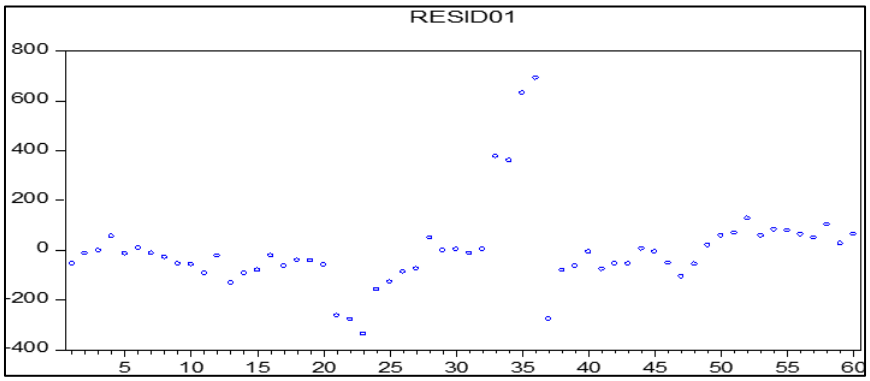


Figure 3 Test for Heteroscedasticity Among Variables

4.6. BUA

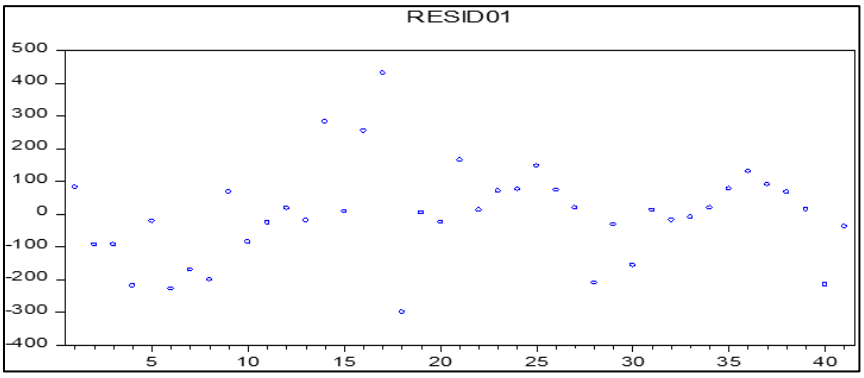


Figure 4 Test for Heteroscedasticity Among Variables

4.7. The Model

Since heteroscedasticity is found in the graph of the residuals, the equation is estimated adjusting for autocorrelation by adding AR (1) to the regression model. Appendix 3 shows the graph showing heteroscedasticity, the regression results before adjusting for autocorrelation and the regression result after for all three companies.

Additionally, the results of the adjustments also show through the Durbin-Watson that the error terms are no longer highly correlated. Both the adjusted r-squared and f-statistic show that the designed regression model has explanatory power(Dougherty, 2011); adjusted r-square at 87.95%, 97.47% and 96.19% for Dangote, Lafarge and BUA respectively.

Table 4 Regression results

	Dangote				**Lafarge**			
	Least Square		Adjusted for Auto-Corre		Least		Adjusted for Auto-corr	
	t-Statistic	Prob.	t-Statistic	Prob.	t-Statistic	Prob.	t-Statistic	Prob.
C	-2.88524	0.0056	0.001443	0.9901	-1.55734	0.1252	0.000441	1
LNCS	3.483827	0.001	0.125492	0.9006	1.955961	0.0557	-0.87216	0.3871
TPTY	-13.095	0	-0.04504	0.9642	-0.13033	0.8968	0.112554	0.9108
LNCL	-1.54917	0.1272	0.087679	0.9305	-1.38648	0.1713	0.545785	0.5875
DT	-0.11168	0.9115	-2.22441	0.0304	9.130375	0	0.214968	0.8306
LNREV	-0.73444	0.4659	0.740382	0.4623	0.717828	0.476	1.836479	0.0719
AR(1)	-	-	1.077158	0.2863	-	-	1.046048	0.3003
R^2	0.911949		0.978493		0.889721		0.977238	
Adjusted R^2	0.903796		0.976058		0.87951		0.974661	
Durbin-Watson stat	0.98929		1.859224		0.803213		1.936529	
Observations	60		60		60		60	

(Eke, 2026)

Table 5 BUA regression results

BUA				
	Least Square		Adjusted for Auto-Corre	
	t-Statistic	Prob.	t-Statistic	Prob.
C	-1.85449	0.0721	8.79E-05	0.9999
LNCS	1.232268	0.2261	-1.62738	0.1129
TPTY	-1.60367	0.1178	1.575691	0.1244
LNCL	-2.56439	0.0148	1.268133	0.2134
DT	6.890706	0.0001	-0.0283	0.9776
LNREV	3.05743	0.0043	1.805875	0.0798
AR(1)			0.709001	0.4832
R-squared	0.910446		0.967653	
Adjusted R-sq	0.897653		0.961945	
Durbin-Watson stat	1.677831		1.862044	
Observations	41		41	

Eke, 2026

4.8. Explanatory variables

For Dangote, as indicated in the adjusted regression result in *Table 5 above*, cost of logistics, cost of sales and sales revenue (*LNCL*, *LNCS* and *LNREV*) have positive but statistically insignificant relationship with landing costs. Thus, the result suggests that the landing cost charged by Dangote is not dependent on the cost of logistics, cost of sales or even the sales revenue. Similarly, for Lafarge and BUA, Cost of Logistics, Cost of Sales and Sales Revenue (LNCL, LNCS and

LNREV) are statistically insignificant to landing cost. However, the *LNCS* shows a negative relationship with landing costs. This further suggest that the landing costs of cement are not fixed based on these parameters.

This is in contrast with basic business theory of selling price equals cost price plus profit. Here, because of the nature of the market and the number of players, this study finds that these companies choose landing cost in accordance with market share; where Dangote is the leader and the other two companies sell slightly below the Dangote price.

4.9. Control Variables

As regards control variables, the results are mixed; for the ownership of distribution trucks (*DT*), Dangote and BUA result show a negative relationship while Lafarge shows a positive relationship, however, it is statistically significant in only Dangote. This may be explained by Owens et al. (2013) who suggest that the residual problem can cause the abnormal accruals to become too large in absolute values thereby affecting inferences.

The use of third-party trucks is insignificant in all 3 companies, however for Dangote it shows a negative relationship and positive relationship under Lafarge and BUA. This means that the use of third-party trucks does not influence the landing cost of cement. Which is consistent with the fact that the cost of logistics does not influence landing costs.

It is noteworthy that none of the variables affected by multicollinearity has a significant effect with the dependent variable, therefore the multicollinearity in these variables do not affect the models, see *Table 4* below.

Table 6 Test for Multicollinearity

Variance Inflation Factors			
	DANGOTE	LAFARGE	BUA
Variable	Centered VIF	Centered VIF	Centered VIF
C	NA	NA	NA
LNCL	23.89194	7.63406	10.77017
LNCS	9.467345	8.915912	17.66103
LNREV	5.193002	4.939956	11.79787
DT	1.202556	3.559967	1.004786
TPTY	3.847496	1.04626	2.687947

Table 7 Tabular presentation of the cement firms' challenges

Description	**Dangote**	**Lafarge**	**Bua**
Transportation	The biggest logistics challenge is the dilapidated state of the Nigerian roads; 1 out of 20 of deliveries delay due to issues related to bad roads	They recorded delivery delays for 4 out of 15 orders. About 75% of these delays were caused by bad roads.	Bad roads also pose a challenge to our deliveries, although the data of the extent of the effect were not recorded.
Power Supply	The dilapidated power sector in Nigeria continues to pose a challenge to businesses including those in the cement industry. The cost of alternative sources of power significantly increases the cost of production.		
Environment	The adoption of the Sustainable Development Goals (SDGs) by the Nigerian government has suggested a huge change to renewable energy alternatives for power.		

	Dangote is yet to implement such green energy alternatives; they generate energy using locally mined coal.	Lafarge is on the early stage of adopting Geocycle plan with customized waste management option across all the regions in Nigeria. As at 2018, 10% of its production were powered via its geocycle plan which involves the recycle of plastic & industrial waste.	BUA is yet to adopt any green energy plan, still using fossil fuel alternatives
Security	Dangote did not report any security issues in the period.	Lafarge reported that the company's gas pipelines were vandalised by Niger Delta militants which led to the closing of the Ewekoro plant for 6 weeks. This also increased cost of production and reduced production output to 75%; the company had to use an expensive mixture of black oil and gas.	Obu youth threatened to destroy the Obu plant because of some local disputes with the management of the company. This led to closing the Obu plant for 13 days within which the dispute was resolved.
Competition	Dangote is the market leader and has been waxing strong, increasing market share consistently. They are also the price setters of the industry.	Because of fierce competition with Dangote, Lafarge could not increase the price of its cement even when they had major struggles paying back the Central Bank of Nigeria (CBN) loan which led to losses in the 3rd Quarter of 2017.	BUA is also in fierce competition; struggling to maintain and increase their market share and depending on Dangote's price to fix theirs.
Economic	The economic condition of the country affects most businesses in Nigeria including cement. For instance, the fluctuations in global oil price in 2015 led to a recession in the oil-dependent Nigerian economy.		
Third-Party Logistics	Third-party logistics is not as sophisticated in Nigeria as it is in developed countries. The use of third-party logistics causes a lot of delays in deliveries.		
	Dangote operates a fleet of company-owned trucks for their logistics.	Lafarge operates a mixture of company-owned trucks and third-party trucks for logistics.	BUA does uses third-party logistics companies in addition to their self-collection strategy.
Government	To achieve the 2030 SDGs, the companies is likely to face sanctions as regards their use of non-renewable energy to power their plants.		

4.10. Channels of cement distribution

Road transportation remains the primary distribution channel for all cement manufacturers in Nigeria due to the poor state of rail and inland water transport infrastructure. The deteriorating condition of Nigerian roads has made cement distribution costly and inefficient, leading firms to focus largely on markets located near their production plants (Masetti et al., 2014). Lafarge, however, briefly adopted rail transport through a partnership with the Nigerian Railway Corporation in 2015, but the arrangement proved ineffective due to poor railway infrastructure and the high costs associated with combining rail and road transport. Consequently, the company discontinued the strategy.

Among the major firms, Dangote Cement has the widest market coverage, followed by BUA and Lafarge, largely due to the strategic locations of their plants. Logistics challenges also forced Lafarge to reduce supply to some key markets, including Abuja and Kaduna (Adebumiti & Faniran, 2014; Aniki et al., 2014b).

4.11. Distribution strategies

4.11.1. Dangote's strategy

Dangote Cement employs extensive logistics and distribution strategies to sustain its market leadership in Nigeria. The company has built strong relationships with distributors and retailers through incentives, subsidies, credit facilities, and exclusive supply arrangements, thereby strengthening brand loyalty across its distribution network.

A major source of Dangote's competitive advantage is its large haulage fleet, estimated at over 6,000 trucks, mainly 45-ton capacity vehicles. The company also operates dedicated depot trucks for short-distance deliveries at subsidized rates, significantly reducing logistics costs and improving market reach. In addition, Dangote introduced a hire-purchase truck scheme for distributors, which expanded distribution capacity and increased market penetration.

The company further strengthened its retail presence through the introduction of Micro Distribution Centres in 2017, where retailers received branded containers and sales support in exchange for exclusive sales of Dangote products.

Dangote also operates the largest depot network in Nigeria, with about 50 depots nationwide as of 2018. These depots enhance product availability, reduce delivery time, support flexible pricing strategies, and improve market coverage despite their associated operational costs.

4.12. Lafarge strategy

Lafarge relies largely on third-party transport providers, alongside a limited company-owned fleet, to distribute cement across Nigeria. The company partners with major haulage firms and subsidizes transportation costs to remain competitive. It also supports transport companies by providing trucks under managed agreements.

Lafarge adopts a structured route-to-market strategy based on customer territory agreements, assigning distributors specific market areas and sales targets tied to performance incentives. The company also encourages self-collection through bonuses for major customers with haulage capacity. Due to high logistics costs, Lafarge focuses mainly on markets close to its plants, particularly in the South-West, South-South, North-East, and parts of the South-East, with limited presence in the North-West and North-Central regions.

To improve distribution efficiency, Lafarge introduced initiatives such as the Key Distributor (KD) and Channel Partner (CP) schemes. The company also shifted from operating its own depots to using distributor-owned warehouses and retail outlets under branded partnership arrangements.

4.13. Bua's strategy

BUA Cement began local production at its Obu plant in 2015 with a small delivery fleet, prompting the company to adopt a self-collection incentive scheme that encouraged customers to transport cement directly from the factory in exchange for financial incentives. This strategy reduced distribution costs, increased market visibility in nearby regions, and significantly expanded market share. At one point, self-collection accounted for over 65% of total product dispatch. To improve nationwide coverage, BUA gradually expanded its fleet to about 800 trucks, focusing mainly on 45-ton vehicles due to their cost efficiency. The company avoided third-party haulage because of high transportation costs and instead relied on a combination of company delivery and self-collection strategies.

BUA initially operated without depots but later established sales depots in key locations such as Abuja, Lagos, Ilorin, and Ibadan to improve product availability and speed to market. The Abuja depot notably increased the company's market share in the region. Unlike Dangote and Lafarge, BUA focused more on distributors and end-users than the retail segment, relying on competitive pricing and product quality to drive market growth.

5. Conclusion

This study assessed the extent of the effect of the cost of logistics on the landing prices of cement in the three companies, the challenges the companies face and the distribution channels they employed over a five-year period (2014 – 2018) before the COVID-19 Pandemic. The study also discussed the various strategies the companies used in their logistics.

To the best of the researcher's knowledge, although there have been studies related to the Nigerian cement industry, no research has been focused on the effect of logistics on the landing price or the strategies they employ to gain competitive advantage over others.

The study found, for all three companies, no significant relationship between cost of logistics (*LNCL*), cost of sales (*LNCS*), sales revenue (*LNREV*) and landing cost (*LC*). In other words, for the three companies, these variables have no significant effect on the landing price which is consistent with the finding that landing costs are fixed by the companies at will; once Dangote fixes the price as the market leader, the other companies fix theirs at same or slightly lower, hence their high profit margins.

The study also shows the various challenges facing each of the companies in the following subheadings; transportation, power supply, environment, security, competition economic, third-party logistics and the government. All three companies were to some extent similarly affected by most categories except security and third-party logistics; Dangote did not report any security issues in the period of study and they have stopped using third-party logistics.

The study also highlighted the various strategies employed by these companies to remain ahead of their counterparts and found that each company devised a unique plan, although that from Dangote is currently the most effective from the significant increase in sales and market share.

In conclusion, the results of this study provide a basis for further research, to see what changes there has been after the COVID pandemic, among other things.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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