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Cement Distribution Pattern from Dangote Cement, Obajana, Nigeria

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Abstract:
This study attempts cement distribution pattern flow from Dangote cement, Obajana, Nigeria. Data were obtained from both primary and secondary sources. Information was gathered from drivers of the company using systematic sampling technique. The respondents were sampled based on every tenth person sampled on the field. In all, 253 respondents were successfully interviewed. Data were analyzed using descriptive and inferential statistics, showing figures and tables of some variables. The results reveals that road transport is the only mode employed by the company, with 66.7% of the respondents attesting to the safety of the mode, howo truck vehicles is the commonly used at 57.7% while 800 bags capacity trucks is highest at 68.4%. The spatial frequency flow indicates that Portharcourt is highest at 64 trucks out of the 253 trucks sampled followed by Abuja with 56 trucks, while Yola has the highest delivery time and cost to deliver 600 bags at 250,000.00 naira for 24 hours total journey time. The study therefore recommends the use of rail, road, and water integration to reduce the level of travel impedance and cost while also removing all barriers that delays cement in transit.

Keywords: *Distribution, Transport, Freight, JIT, Cost, Time, cement, Nigeria*

1. Introduction

Distribution is an important component of production system of a company. It therefore involves the act of spreading out products in the areas of supply to an area of demand for such products (Christopher, 2005). Ploughing through the plethora of literatures, one will come to realise that there are as many different definitions as many of those who care to write about it. However, a broad conceptual consensus on the notion of distribution is beyond anybody's reasonable doubt. Previous studies here like the works of Ajiboye (2001), Adebumiti, (2007; 2013), Olasumbo (2001), Somuyiwa (2010), Ubogu (2010), Haruna (2010), Ogunsiji (2005), likewise the works of Ghiani, *et al.*, (2004), Tseng, *et al.*, (2005), Sreenivas & Srinivas, (2007), Ruston & Oxley (1998), Kotler, et al., (1999), Hesse and Rodrigue (2000) have so far provided an understanding into the concept of distribution of goods from one location to another. However, the opinion of Rushton and Oxley (1998) sum it all when they observed that in reality, no true definition can be wholly applied to distribution because products differ, and companies also differ.

Similarly, the ability to ensure accurate delivery of a product and raw materials, especially over long distances and significant elevation change which is vital to the overall operation and success of a production plant have necessitated the concept of transportation into distribution systems (Flowmaster, 2010). Adebumiti (2013) therefore asserted that transportation is required in the whole production procedures, from manufacturing to delivery to the final consumers and that only a good coordination between each component would bring optimal benefits. Likewise, Mbagwu (1977) examined freight transportation, on the basis of which he asserted that freightage is an important element of production cost and would be minimized by reducing as much as possible the distance over which the commodities or goods are moved and that this enables the producers to operate at higher margin of profit.

Cement products is an essential component of industrial and building construction projects, thus associated with long distance haulage and significant elevation change in spatial space. The increased demand for cement products in Nigeria have resulted in increased distribution network and spatial patterned supply chain systems along specific economic corridors culminating in increased spatial flows, haulage trucks ownership as well as cost and time turn around value chain. This paper thus seeks to examine the cement distribution flow pattern from Dangote cement, Obajana, Nigeria and this is with a view to examining some of the salient components involved in effective distribution network pattern of cement manufacturing and supply chain systems.

2. Study Area

Obajana town is situated in Kotonkarfi, Kogi state, Nigeria. Its geographical coordinates are 7° 55' 0" North and 6° 26' 0" East. The blueprint (2012) reported that Obajana town used to be a very small village within the Oworo community, which means "a place of substance that provides for everyone." Though the place was hitherto barely known, but with its present status as the home of the Dangote cement, it has since assumed international recognition. It is about 45km from Lokoja and 220 km southwest of the Federal Capital Territory (FCT) which greatest fortune is a large deposit of limestone which is the most important raw material for cement production. Obajana town is bounded by nearby towns such as Zariagi, Lokoja, Oshokoshoko and Kabba.

Based on 1991 census projects, the population of Obajana by early 2003 was expected to be 500 people but by January 2003 respondents put this value at about 650 and 1,000 with an average of 780 people. During a survey in June 2004, the population of Obajana was estimated to be 1500 made up of 63.2% strangers and 46.8% indigenes. By September 2004 respondents put the population of Obajana at 3,000 and 3,500 during the day, and between 1400 and 1800 at night (OICI, 2005). The higher the population during the day is due to an influx of factory workers and job speculators residing outside Obajana, but despite the fact that no recent census could ascertain the current figure, field observation shows that the population would have grown to about 20,000, especially with the influx of thousands of truck drivers in the village on a weekly basis.

Road transport is the most predominant means of movement in Obajana town. The intra city road structures are not well paved while the town is linked to the major Kabba – Lokoja expressway for its intercity movements. The road transport system is mainly by the use of bicycles, motor bicycles, motor cars, buses, trucks, and trailers. These vehicles travel to various parts of the state and country. Dangote Obajana cement airstrip facility serves as the gateway for air travelers from and to the town. The town is not linked by railway and waterways services.

Figure 1

3. Methodology

The basic sources of data adopted in this research are the use of primary and secondary data source. The primary source of data was from responses to a structured questionnaire administered systematically to truck drivers. Data available to the researcher shows that Dangote Obajana cement has a total number of 1800 trucks, and private truck carriers' accounts for about 817 trucks. Systematic sampling technique was used in sampling these population in a systematic manner of every tenth respondents encountered on the field. On the basis of these capacities, 10 % samples from this population were selected and this brings the total subject sample to be 180 questionnaires for Dangote drivers, and 82 for private truck drivers. In all, a total number of 262 questionnaires were administered to the respondents out which 253 copies were successfully returned (see Table 1). Secondary data were sourced from journals, existing studies and Dangote cement bulletin provided by Vetiva capital management limited (2010) gave insight into the location and volume of trucks available. Data were analyzed using descriptive and inferential statistics, showing figures and tables of some variables. All data were coded into the SPSS statistical tool package.

Category of Respondents	Number of Sample Size	10% of Sample Size Administered (Questionnaires)	Number of Sample Size Returned (Questionnaires)
Dangote Drivers	1800	180	173
Private Truck Drivers	817	82	80
Total	2617	262	253

Table 1: The Sample Population of Truck Drivers
Source: Field Survey, 2012

4. Theoretical and Conceptual Frameworks

Theories, models and concepts are tools used to mirror reality. In other words, the application and use of theories is necessary for the better understanding of this type of research work. The need to provide adequate explanation on the importance of distribution on the effective and efficient movement of cement products were the driving force for searching of appropriate theories, models and concept for this study.

4.1. Total System Concept of Distribution

A system is a group of interrelated actions otherwise known as sub-systems interacting together to form a whole, they function simultaneously for the assurance of the successful operation of the system. The sub-systems are so important that should any of the sub-system made to malfunction; the whole system will be affected causing a total collapse.

Physical distribution is a classic example of a system approach to business problems from a company's point of view (Ajiboye, 2001). System approach indicates that the company's objective can be realized by recognizing the mutual inter-dependent of the basic functional areas of the firm such as production, marketing, finance, personnel and distribution. Kent and Flint (1997) observed system approach to management as a unified purposeful system made up of interrelated parts. The same reason can be applied to the area of physical distribution. The physical distribution section must balance each functional area and see that none is stress to the point where it becomes detrimental to the others.

Ogunsiji (2005) therefore observed that the objective of physical distribution system is with a specified level of service provided to the customer, to minimize cost involved in physically moving and storing products from its production point to the point of purchase, in order to save money and improve service. To achieve this objective, distribution system employs the use of three interrelated concepts of the system approach. These concepts are the total cost approach, the avoidance of sub-optimization and the cost trade-offs.

The total cost approach is built on the assumption that all relevant functions are physically moving and sorting materials and products should be considered as a whole and not individually (Ibid). The following function should be included on the total cost approach to physical distribution. These are transportation, warehousing, inventory location and plant location, inventory control of materials and products, material handling, information flow, order processing and packaging. The key to the total cost approach is that all items are considered simultaneously when attempting to meet specified service levels. When testing for alternative approaches, the cost of some will remain the same. The objective is to find the alternative with lowest total cost (Ibid).

The avoidance of sub-optimization occurs when each member best effort fail to produce optimal result. Sub-optimization occur when each separate distribution activities is judged by its ability to achieve given management objectives which are at cross purpose with each other. Another common cause of sub-optimization is a department that is not in the physical distribution area of responsibility causing another department to operate at less than full efficiency (Ibid).

The cost trade-offs concept acknowledges that changing pattern or function of distribution will cause some cost to increase and cause other cost to decrease. The net effect however should be an overall cost decrease for a given level of performance (Ibid).

Ogunsiji (2005) however concluded that the combination of these three basic considerations of physical distribution such as total cost, avoidance of sub-optimization, and cost trade-offs forms the basic foundation of decision making process leading to optimization in the form of what is called the *"Total physical distribution concept"*. This concept is not unique because of the function performed since each function is the same. Rather, the uniqueness comes from the integration of all these functions into a unified whole that seeks to minimize distribution cost for a given level of customer service and inflow service.

The concept is relevant to this study in the sense that it will help both manufacturers and distributors of cement products to make accurate combination of all these subsystems in order to ensure the highest level of accessibility, availability and profitability.

4.2. Concept of Just- in- Time (JIT)

According to Christopher (2005), Just in Time (JIT) is a management approach, which originated in Japan in the 1950s. It was subsequently adopted by Toyota and many Japanese manufacturing formations with considerable success in raising productivity by eliminating waste. Christopher (2005) observed that since its wide application in manufacturing in the 1970s, JIT has been widely regarded as an operations management approach designed for manufacturing firms to improve performance through waste reduction. The management philosophy underlying JIT is to continuously search for ways to make processes more efficient with the ultimate goal of producing goods or services without incurring any waste.

Kaneko and Nojiri (2008) reported that in the face of challenging global competition, business firms are concentrating more on the needs of customers and seeking ways to reduce costs, improve quality and meet the ever-rising expectation of their customers, To these ends, many of them have identified Just-in-Time (JIT) management approach as an area to build cost and service advantages (Chase, *et al.*, 2006). Kinney and Wempe's (2002) definition cited in (Lai and Cheng, 2009) suggests that firms practicing JIT are associated with increased profit margins as the waste reduction emphasis of JIT helps reveal activities that add no value.

Generally, these activities and their related costs are either hidden by excessive buffer inventories, or are ignored because holding buffer inventories is a convenient solution to such problems as failure of production lines or other systems (Kumar, 2010). With the implementation of JIT, excessive inventories are no longer allowed to mitigate these problems and the adopters of JIT are more inclined to develop cost-saving solutions, thereby increasing profit margins.

Lai and Cheng (2009) observed that the goal of JIT in reducing waste and improving services is relevant and applicable to distribution systems. Similar to manufacturing, JIT can be embraced as an operating management approach designed to eliminate waste. Waste can be defined as anything other than the minimum amount of equipment, space and workers' time, which are absolutely essential to add value to the product or service. As distribution initiatives involves activities in the supply chain, firms can embrace the philosophy of JIT to identify waste and improve service in the processes, for example, to plan the manpower and

facilities requirements to meet the distribution needs, to reduce product introduction time by responsive delivery, to improve distribution service quality by forging supplier and customer partnerships and so on. In sum, there are many areas where the philosophical emphases of JIT on waste reduction and service improvement can be applied to improve distribution systems performance.

Adebumiti (2007) reported that the theory of just in time (JIT) arises as a result of the need to balance demand and supply. The just in time system aims at coordinating the flow of resources so that supply exactly matches demand and materials or products arrives as they are needed. Here, it means that the overall objective is aimed at improved quality of service rendered to customer, which must be manifested in cost reduction, increased sales and revenue generation to the company.

Kumar (2010) viewed JIT as an integrated, problem-solving management approach aimed at improving quality and facilitating timeliness in supply, production and distribution. Godfrey (1999) explains further that quality is an important issue when considering just in time operations. The author asserted that the emphasis on quality should promote a discipline within the organization which will ensure that products flowing through the system arrive first in time and every time. This is very important because goods inasmuch as they need to get to the consumer in time, it must also be in good quality if sales must increase.

4.3. Channels of Distribution

Oyedijo (1984) revealed that distribution is a critical marketing function and it deals with how to move goods from the producers to the consumers. That is why Ajiboye (2001) asserted that distribution is an important and complex marketing management variable which makes use of functional middlemen. In other words, in other to avoid the problems faced in the distribution of goods, an efficient and effective distribution channel is required to accomplish these tasks.

Distribution channels are a route through which goods move from the manufacturer to the final end user. Heidingsfield (1965) defined distribution channel as the sequence of markets or discrete exchange which a given product passes through under the supervision and control of middlemen from production point to the consumers. Wentworth (1985) described channel of distribution as asset of institution which performs all the functions concerned with moving a product and its title from production to consumption.

Oyedijo (1984) observed it simply as the course through which goods move from the producer to the buyer and consist of a series of institutions each of which performs separate marketing tasks to facilitate the flow of goods. Berry (2010) examined the channels of distribution as quality of organization which accomplishes all the tasks concerned with moving a good from production to consumption. Channel of distribution is a course engaged by a product between the points of its production and the point of its consumption (Okon, 2002).

Fawcett & Christopher (1992) identified the channel of distribution as a route taken by a commodity between the point of its production and point of its sale or consumption. They classified channels of distribution into five stages as follows:

Manufacturer ------Retailer-----Consumer

Manufacturer----Own Warehouse---Retailer---------Consumer

Manufacturer----Wholesaler's Warehouse--------- Retailer--------- Consumer

Manufacturer ---------Retailer's Warehouse outlets --------- Consumer

Manufacturer ---------Third party distributor---------Retailer---------Consumer

They explained further that no matter the route taking by a product, the main objective is that it moves from its production point to its final destination.

5. Results and Discussion

5.1. Demographic characteristics of respondents.

In the study, out of the 253 respondents sampled, the male and female group has a frequency of 252 and 1 representing a percentage rate of 99.6% and 0.4% respectively. Thus, table 2 indicates that the male are more than their female counterparts, concerting to a general belief that males are mostly found in the business of truck driving.

Sex	Frequency	Percentage
Male	252	99.6
Female	1	0.4
Total	253	100.0

Table 2: Percentage distribution of sex
Source: Field Survey, 2012

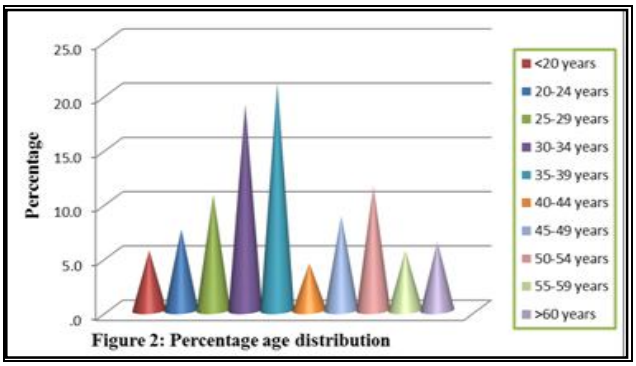

Figure 2

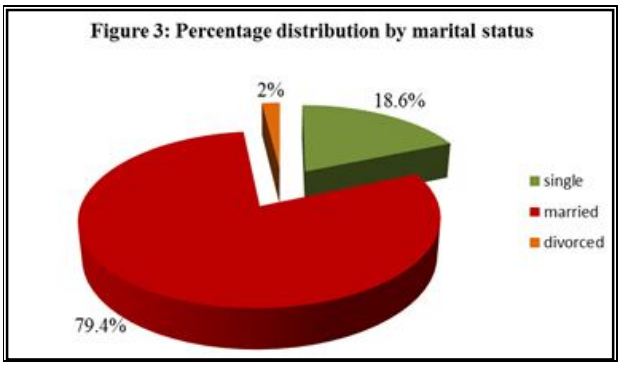

Figure 3

Analysis on figure 2 shows that 20.9% of them within the age bracket of 35-39 constitute the highest age range followed by the age bracket of 30-34 having 19.0%, while those within the range of 40-44 constitutes the least at 4.3%. The higher range of 20.9% and 19.0% for those within the age bracket of 35-39 and 30-34 years might as well justify those in their active working age.
Further analysis of the respondents on figure 3 about their marital status to determine their level of maturity shows that 79.4% of them are already married, followed by those who are yet to marry with 18.6% while only 2% of them sincerely came out to say they are divorced.

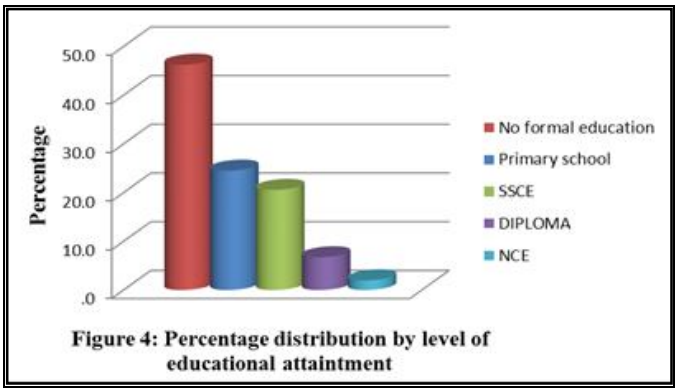

Figure 4

The level of eduactional attaintment no doubt plays a critical role in the distribution of cement from the study area, figure 4 reveals that 46.2% have no form of formal education, this increase might be attributed to the fact that no formal certificate is required as a prequisite for been a driver. However, those that went to primary school amounts to 24.5 %, those with SSCE accounts for 20.6% while a sizeable number have DIPLOMA and NCE reprensenting 6.7% and 2% respectively. It is however noteworthy to mention that the recent employment of graduates into the driving section would increase the number of graduates in the truck driving section of the company over a period of time.
The level of driving experience have a critical role to play on the safety of the truck, goods and other road users. The table 3 below shows that drivers with the experience of less than 5 years have the highest percentage with 28.1%, while those with experience above 20 years amounts to 13.0% of the respondents. However, the overall percentage of 71.1% for those driving above 5 years shows that more experience drivers are employed to carry cement from the company to various locations. This is because reponsibilty in job tends to come with certain maturity and exposure that brings out indivdual development, commitment and responsibilties than those with lesser job exposure.

Years in driving	Frequency	Percentage
<5 years	71	28.1
5-9 years	64	25.3
10-14 years	45	17.8
15-19 years	40	15.8
>20 years	33	13.0
Total	253	100.0

Table 3: Distribution of level of driving experience.
Source: Field Survey, 2012

5.2. Effective Distribution System of the Company

Distribution no doubt plays a substantial role in the operations and marketing of goods produced from any manufacturing environment. Thus, putting in place an effective distribution system for its goods is critical for the survival of any company involved in industrial initiative be it cement or any other for goods bound for consumer consumption because having an effective distribution will no doubt create an opportunity to compete in the market place. The analysis of the distribution of respondents on the imperative of distribution system to the survival of company on Table 4 shows that most of the respondents agree to the role played by effective distribution system in getting raw materials to keep the company moving as well as distributing the products to the final consumer. Higher levels of 93.3 percent of the respondents concede to this belief while a significant low size of 6.7 percent believes that distribution is not an imperative factor.

Elements	Frequency	Percentage
Yes	236	93.3
No	17	6.70
Total	15	100

Table 4: Percentage distribution of effective distribution system to the survival of the company.
Source: Field survey, 2012

Further analysis about the present distribution system employed by the company, reveals that all the respondents administered, overwhelmingly agreed that the present distribution system employed by Dangote Obajana cement is effective. Somuyiwa (2010) revealed that it is a general perception amongst most companies involved in manufacturing enterprises that their operation is effective because they lack the general knowledge about the various departments involved in distribution making it difficult to determine the efficiency of those various sub-sections of distribution system. Perhaps, that is why all the respondents held the view that the present distribution system employed by Dangote Obajana cement is effective because they lack the overall productivity output of various sub units of the fleet departments.

5.3. Perception of Respondents on the Present Choice of Mode of Transport

Road transportation have remained the most significant means of getting goods to consumers today by offering door to door services and quick accessibility to areas not linked by water. The pie chart illustration indicates that 66.7% of the respondents believe that the present choice of road transport as a means of moving out cement from the plant is safe, while 26.6% of the respondents believe the present choice of mode is not safe. However, the higher percentage of 66.7% might as well be that it is a shared belief that people have when they are not presented with many alternatives.

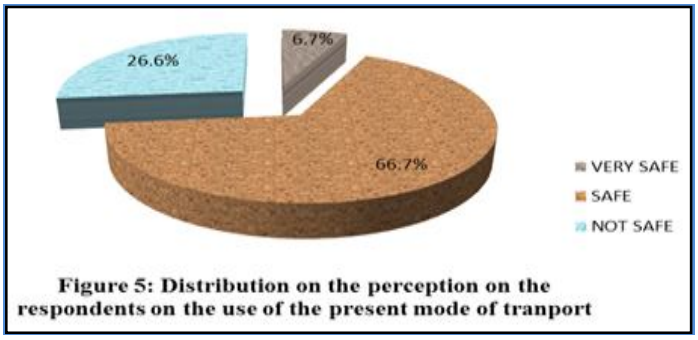

Figure 5

5.4. Alternative Modes of Transport

Although road transportation offers dynamic role of making goods available at the doorsteps of consumers, but its resultant lack of economic of scale in terms of size to carry larger quantity of goods over a longer distance at a particular time is imminent. Adesanya (1998) opined that the use of roads is largely attributed to the natural advantage provided by the existence of vast land mass in Nigeria, when compared with waterways, and perhaps the inadequate attention being given to the rail system. Analysis from figure 6 reveals that 46.7 percent of the respondents supports the idea of using road and rail as alternative to using road as a single mode of moving out cement from the plant, 33.3 percent of them subscribes to using rail while 20 percent wants the use of rail-water integration.

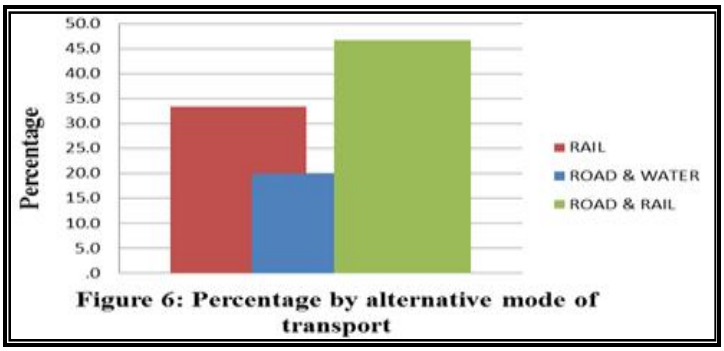

Figure 6

The work of Ubogu (2010) did observe that an important element in an efficient multi-modal transport chain is a well-developed network of inland transport system that will facilitate the working of the whole. The author pointed out that multi-transport and door to door service are seriously constrained by poor condition of inland transport system and the inability of many transport providers to offer multi-modal transport services has imposed serious economic and social cost on the operators. The author buttressed that the integrated multi-modal transport system is an approach to planning, building and operating transportation that emphasizes optimal utilization of transport resources and connections between modes. In other words, the integration of rail and road will no doubt ensure reduction in transport cost and also reduce capital investments in truck purchases and frequent maintenance. The use of bulk ships to transport cement from the available water to areas linked with water will also increase the frequency of supply at minimum cost and effort. Interview conducted by the researcher on this issue with the fleet head reveals that similar idea was practiced in Lagos operations of Dangote cement where about 103 trucks of cement was loaded on the rail from Lagos to Kano using only 4 days for onward delivery and return. Hence, the use of rail road integration will no doubt save time and cost for the company.

5.5. Types and Capacity of Freight Trucks used in Transporting Cement from Dangote Obajana Cement

The types and capacity of freight trucks is determined by the goods to be carried, field survey shows that most of the trucks are designed to carry specific amount of cement. Analysis on table 5 reveals that most of the trucks use for transporting cement are of different make and brand with the Chinese product *HOWO* topping the list with 57.7 %, followed by American *MARK*, 13.4%, while American *GINNOFF*, has the lowest number of trucks indicating 1.2% of the trucks sampled. The Chinese howo topping the list of the vehicle brand is as a result of the strategic relationship between the company and the Chinese investors. It is noteworthy to say that most of the technical aspect of the company is handled by the Chinese technocrats including the construction of the second and third production line and the on-going fourth line thus creating a very strong business partnership and exchange of equipment and resources.

Types of Trucks	Frequency	Percentage
HOWO	146	57.7
DAF	32	12.6
MARK	34	13.4
IVECO	13	5.1
BENZ ACTROSS	12	4.7
MAN DIESEL	13	5.1
GINNOFF	3	1.2
Total	253	100.0

Table 5: Percentage distribution of the types of freight trucks used.
Source: Field survey, 2012

Further analysis on table 6 shows that most of these trucks either carry 800 bags or 600 bags. Those carrying 800 bags accounts for 68.4 % while those carrying 600 bags amounts to 31.6 % of the trucks sampled. The higher number of trucks carrying 800 bags might not be unconnected with maximizing economics of scale which allows a larger amount of goods to be moved at the same time in other to maximise space and time which in turn leads to higher profit margins.

Capacity of Trucks	Frequency	Percentage
800 Bags	173	68.4
600 Bags	80	31.6
Total	253	100.0

Table 6: Percentage distribution of the capacity of freight trucks used.
Source: Field survey, 2012

5.6. Freight Trucks Ownership in Nigeria

Freight transportation in Nigeria has gone the way of road transportation with about 2,500 trailers in dry cargoes plying Nigerian roads daily owing to the neglect of the rail sector (Obasanjo, 2012). Freight transportation is an important aspect of distribution systems because it enhances the movement of goods over long distances and to various geographical regions. However, freight truck ownership continues to be a problem for intending private owners because of the capital intensive nature of the transport vehicle used in conveying cement as a result of the nature of the product. Hence, analysis on figure 7 reveals that only a smaller size of 4 % of the respondents lay ownership to the truck they are driving due to the capital intensive nature of the transport media in question while 96 % of them are owned by various bodies as shown on table 7 with the company itself having 68.4 % of the trucks administered, while those owned by industrial establishments accounts for about 6.7 percent of trucks sampled and the remaining 20.9% were owned by independent haulage companies.

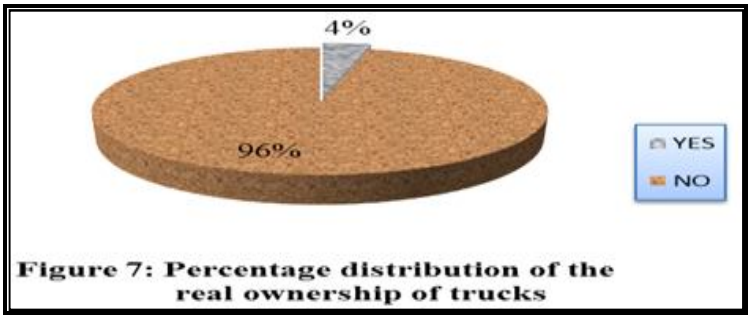

Figure 7

Onakomaiya (1981) therefore revealed that unlike trading which requires relatively low capital for entry, transport is a capital intensive and risky business into which very few merchants can venture into and that even though several modes of transport are available in a given environment and circumstance and that the mode to use and choice is however influenced by the transport media which is inherently unequal in cost structure, speed and carrying capacity.

Ownership	Frequency	Percentage
Owned by the company itself	173	68.4
Owned by an industrial establishment	17	6.7
Owned by an independent haulage company	53	20.9
Total	243	96.0

Table 7: Percentage distribution of which organization is the owner of the trucks.
Source: Field survey, 2012

The frequency distribution pattern on figure 8, shows that out of the 253 truck drivers administered on the field , Portharcount have the highest frequency of 64 trucks with Abuja coming second with 56 trucks. The frequency of flow to these locations prompted the researcher to inquire more. The frequency of flow to these locations is however in two similar direction, the frequency to Portharcourt was due to the high demand from Niger Delta Development Company (NDDC) and various oil companies majorly for infrastructure constructions while infrastructure construction projects and huge contract investments by the federal government and estate developers necessitated the high frequency level to Abuja. Other locations such as Maiduguri is third with 12 trucks, while Dutse is least with only one truck

5.7. Transport Cost and Time

Transportation cost and time plays an importatnt role in the distribution process of any commodity or goods that is been transported. The analysis on table 8 depicts the average cost of carrying 30 tonnes of cement to these locations, and effort was also made to determine the average cost per tonne per kilometer as well as average cost per bag per kilometer moved. The table also indicates the average time spent in hours from obajana cement to these locations.

However, a further analysis of the table 8 reveals some differences in the cost of delivery to certain destinations, nevertheless, the Von Thunen theory was based on the assumption that transport cost increases linearly in relation to distance might not be applicable in all situations. For example, the cost of transporting cement from locations like Abuja and Benin is slightly different even though Benin is farther than Abuja. Perhaps, the reduction in the price of movement to Abuja might not be unconnected with the frequency and higher rate of turn arround time. Similarly, the cost of movement to a location like Lokoja might not be unconnected with problem of loading and offloading within short distances and the various travel impedance associated with the journey especially the need to maneuver within the city center. Likewise, it is worth mentioning here that private trucks drivers generally lack or have little knowledge about freight per unit load system rather they quantity goods based on their subjective assumptions and the level of travel impedance to certain areas and not necessarily the distance of certain locations, for instance a

critical examination of the table clearly shows that the cost of movement along certain routes tends to increase uniformly due to the linear nature of the distance as postulated by Von Thunen than areas than incurs more traveling impedance.

5.8. Spatial Distribution Frequency Pattern of Cement from Dangote Obajana

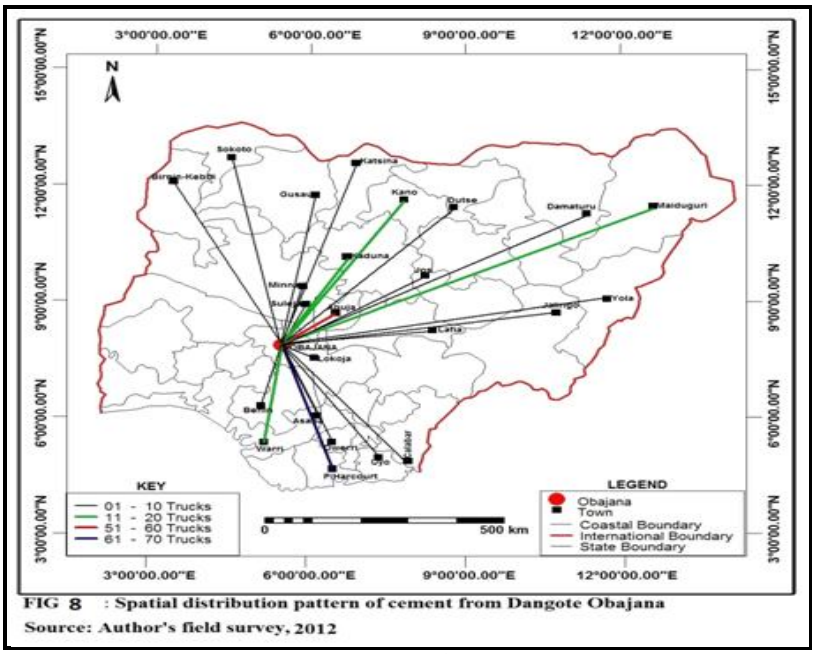

FIG 8 : Spatial distribution pattern of cement from Dangote Obajana

Source: Author's field survey, 2012

Figure 8

Destinations	Distance from Obajana (Km)	Average cost per 30 tons/per km (₦)	Average cost per ton/per km (₦)	Average cost per bag/per km (₦)	Average time taken (Hrs)
ABUJA	220	85,000.00	2833.33	141.67	5
ASABA	324	94,000.00	3133.33	156.67	7
BENIN	248	77,000.00	2566.67	128.33	4
BIRNIN KEBBI	565	175,000.00	5833.33	291.67	19
CALABAR	407	194,000.00	6466.66	323.33	21
DAMATURU	954	177,000.00	5900.00	295.00	25
DUTSE	709	157,000.00	5233.33	261.67	17
GUSAU	561	130,000.00	4333.33	216.67	17
JALINGO	756	192,000.00	6400.00	320.00	21
JOS	380	150,000.00	5000.00	250.00	15
KADUNA	358	104,000.00	3466.67	173.33	9
KANO	551	125,000.00	4166.67	208.33	15
KATSINA	631	136,000.00	4533.33	226.67	16
LAFIA	386	134,000.00	4466.67	223.33	14
LOKOJA	45	29,500.00	983.33	49.17	1
MAIDUGURI	881	200,000.00	6666.67	333.33	23
MINNA	313	87,000.00	2900.00	145.00	9
OWERRI	422	153,000.00	5100.00	255.00	13
PORTHARCOURT	381	186,000.00	6200.00	310.00	16
SOKOTO	652	190,000.00	6333.34	316.67	24
SULEJA	205	64,000.00	2133.33	106.67	6
UYO	497	186,000.00	6200.00	310.00	20
WARRI	321	106,000.00	3533.33	176.67	13
YOLA	909	250,000.00	8333.33	416.67	24

Table 8: Transport cost and time of delivering 30 tonnes (600 bags) of cement to these destnations from Obajana factory.
Source: Author's field survey, 2012

5.9. Distribution of the Factors that Determine Transport Rates for Cement Distribution to these Destinations

Though, distance plays a prominent role on the transport rates of cement to several locations as explained on analysis of table 8 but numerous factors also plays a determinant role in the pricing regime of any good or commodity and not only limited to cement alone and this factors cannot be excepted. Analysis on table 9 shows that majority of the driver administered attributed the price of transport to seasonal demand for it. They pointed out that prices varies according to the seasons from wet to dry season with higher price increase during the dry seasons due to increase demand for cement. A higher number of 243 respondents indicate seasonal demand for cement has an integral determinant for transport rate to these destinations while only 7 and 3 respondents held the opinion that incessant stoppages at security check points and fuel shortages are that determinant factors for their current pricing regime.

Means	Frequency	Percentage
Incessant stoppages at security check points	7	2.8
Fuel shortages/Scarcity	3	1.2
Seasonal demand for cement	243	96.0
Total	253	100.0

Table 9: Distribution of deteminants of transport rates for cement distribution
Source: Author's field survey, 2012

5.10. Distribution of the Determinant Factors for the Time Taken to Reach these Destinations

Time is a critical factor on the life span of any good because it determines the rate of turn around, inasmuch as any good have to reach the market place in the right condition it has to reach it at the right time. Analysis of figure 9 on the determinants factors for time taken to reach these destinations reveals that most of the respondents attributed it to the need to stop at various rest stations in other to sleep, eat and pray. About 186 of them representing 75 percent said these reason necessitated the time spent on the road, 39 of them representing 15.4 % attributed it to traffic congestion in urban centres while 28 of them that is 11.1 % said it was as a result of delays due to incessant stoppages at road check points.

6. Policy Implications

In this study, an attempt was made to analyse cement distribution pattern from Dangote cement, Obajana, Nigeria In other for the research to be carried out both primary and secondary data were used. Questionnaires were designed to elicit information from respondents about their socio demographic status, modes of transport used, vehicle sizes and types, capacity of the trucks, frequency of spatial delivery as well the time and cost of moving out cement to various inventory location. Efforts were also made to determine those factors responsible for the cost and time taken. The results reveals that road transport is the only mode employed by the company, with 66.7% of the respondents attesting to the safety of the mode, howo truck vehicles is the commonly used at 57.7% while 800 bags capacity trucks is highest at 68.4%. The spatial frequency flow indicates that Portharcourt is highest at 64 trucks out of the 253 trucks sampled followed by Abuja with 56 trucks, while Yola has the highest delivery time and cost to deliver 600 bags at 250,000.00 naira for 24 hours total journey time. Based on these findings, the following recommendations are made. It is necessary for;

- The company to put action into place for future integration of the various transport modes to reduce the level and cost of travel impedance., like the use of bulk ships to area connected by water.
- The company can also in the interim connects to available rail corridor to reduce the numbers of trucks for cement distrubution, while encouraging larger movement of cement at a time thus reducing end user cost.
- The company and other stakeholders in the transportation sector to dialogue with the institutions concerned with issue of security to be more indulgent in their search in other to reduce delays for goods on transit.
- The company can also introduce the use of two drivers to improve the rate of turn around time thus increasing the productivity.

7. Conclusion

This study has examined the cement distribution pattern from Dangote cement, Obajana, Nigeria. The result has shown that it is necessary for the company to put action into place for the integration of the various modes while also reducing the level of travel impedance to reduce time travel and cost. However the study specifcally examined the cement distribution pattern of the company from the mode of transport used, vehicle types, vehicle capacity, spatial distribution pattern, time and cost of moving out cement is examined. It is hoped that recommendations made would improve the supply chain distribution pattern of the company.

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