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Abstract

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Keywords: transportation modelling, service quality, logistics, product distribution, customer satisfaction
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Introduction

Zeglat (2008) indicates that service quality has a positive, though indirect, effect on profitability because service quality in affecting customer satisfaction and retention, productivity, as well as market share, invariably affects the profit accruing to an organisation. It has been observed that firms strive to achieve customer satisfaction and loyalty through improved service quality as it leads to improved financial performance (Chi Cui *et al.*, 2003). Earlier studies on customer satisfaction had also identified a link between service quality and customer satisfaction (Bolton and Drew, 1992; Cronin Jr and Taylor, 1992; Levesque and McDougall, 1996). Zeithaml (2000) notes that service quality is an important indicator of customer satisfaction. In a seminal work on service quality and customer satisfaction, Parasuraman *et al.* (1988) list reliability, responsiveness, as well as competence as major factors that determine customers' perception of service quality. Although all these factors, to a large extent, influence the level of satisfaction with a given product of service, there are suggestions by authors such as Zeithaml (2000) that reliability is the most important dimension of service quality. Reliability refers to the ability to perform and complete promised service, quality and accuracy to the standard agreed upon by an organisation and its customer (Alhkami and Alarussi, 2016). Recent works in this area have established that there is a very strong positive correlation between reliability and customer satisfaction (Alhkami and Alarussi, 2016).

The intended outcome of this study is two-fold. First, is an establishment of the overall level of satisfaction by customers with the services of a building materials wholesaler with warehouses in Suleja (near Abuja) and Enugu, Nigeria. The level of satisfaction would be assessed based on quality of product and customer services in areas such as product availability. The second aspect of the study is to evaluate the distribution pattern of the company and determine the optimal distribution pattern in terms of cost. It is envisaged that establishing the shortest sales path that minimizes the total cost/time would ensure faster product delivery from the warehouses or warehouses, at reduced cost. It would also reduce or eliminate the tendency to keep orders until a certain quantity is reached before despatching the products to customer. Therefore, by optimizing product distribution, delivery would meet customers' expectations and by extension improve service quality.

There is an increased awareness of the relationship between service quality and organisational growth has grown (Nakhuda, 2016). It is the ability to consistently conform to customers' expectations (Lewis and Booms, 1983). It is therefore, an expression of the "match between what the customer expects and what the customer experiences" (Rushton *et al.*, 2010). A conceptual model of service quality with various gaps experienced at each stage is shown in Figure 1 below. Although there is a small body of literature that link service quality with financial performance, there are, however, indirect links through other constructs such as customer satisfaction exist. Parasuraman *et al.* (1985) suggest that this may be because service

quality is a vague and indistinct construct, having requirements which according to Takeuchi and Quelch (1983) are not easily expressed by consumers. These views notwithstanding, service quality could be measured based on the basis of consistency of performance and dependability (a guarantee that a firm performs a service right the first time), the preparedness to provide required service, as well as the availability of requisite skills and knowledge (Parasuraman *et al.*, 1985).

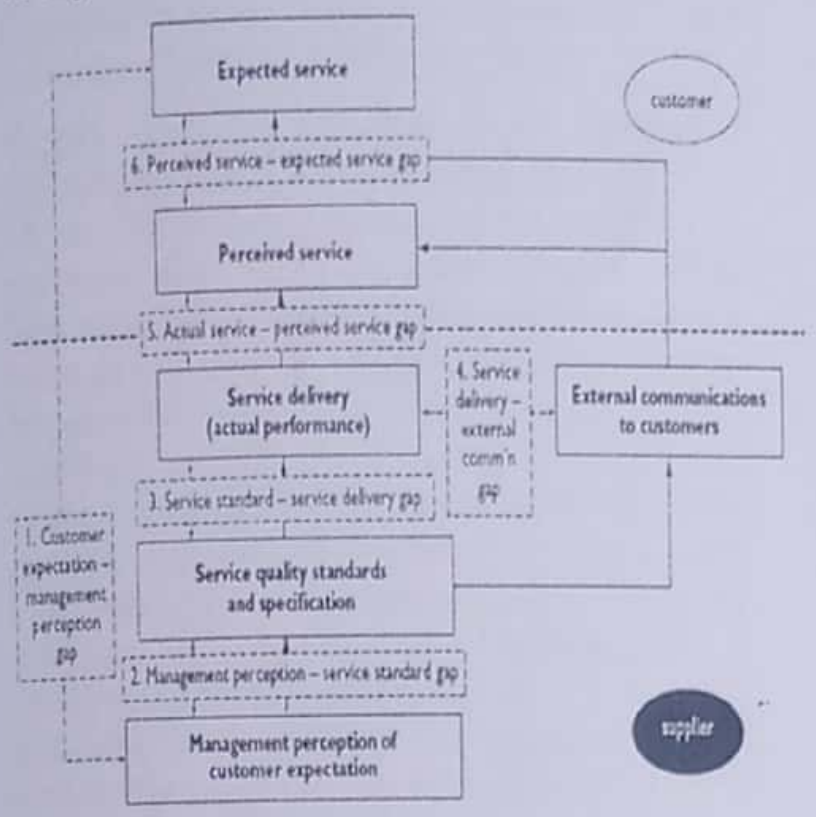

Figure 1: Conceptual model of service quality and service gaps. Source: Rushton *et. al.* (2010)

A link exists between the level of satisfaction over services provided and perception of service quality (Bolton and Drew, 1992; Cronin Jr and Taylor, 1992; Jamal and Naser, 2003). According to Boulding *et al.* (1993), satisfaction could be described as transaction-specific satisfaction or cumulative satisfaction. Shiv and Huber (2000) observe that these descriptions deal with the post-consumption experience(s) of the consumer, compared with the pre-consumption experiences. Inference from earlier studies is that both forms of satisfaction are influenced by the emotion of the consumer. While Homburg *et. al.* (2005) for instance note that that transaction-specific satisfaction is satisfaction as an overall affective evaluation of consumers' first consumption experience with a product, other sources describe cumulative satisfaction in terms of an overall evaluation based on accumulated experiences of a product over time (Olsen, 2007; Walsh *et al.*, 2008). Anderson *et al.* (1994) argue that transaction-specific satisfaction is most likely to give specific information about a particular product or service, while cumulative satisfaction is a more fundamental indicator of the firm's past, current, and future performance.

Bolton and Drew (1991) as well as Bitner (1990) observe that satisfaction leads to service quality, there are, however, views that service quality leads to satisfaction, to the extent that it exerts a positive influence on it (Carrillat *et al.*, 2007). It is, perhaps, on the strength these arguments that Boulding *et al.* (1993) advise on the need for firms to compete on the service aspects of their augmented products. But in spite of this advice, Cronin Jr and Taylor (1992) insinuate that satisfaction is not predicated on quality only as consumers do not essentially buy the highest quality service but also consider convenience, price, or availability of product or service. Along this line of thought, the effect of customer satisfaction on loyalty has been variously emphasized (Zeithaml *et al.*, 1996; Bolton, 1998; Bolton and Lemon, 1999; Fornell *et al.*, 1996; Mittal and Kamakura, 2001; Fornell *et al.*, 2010).

Fornell *et al.* (1996) showed that customer's overall satisfaction with services/products has a strong positive effect on customer's loyalty intentions. Intended behaviours of customers is noted to be positively associated with perception of service quality (Boulding *et al.*, 1993). This is suggested by sources such as Grewal *et al.* (2010) who believed that customer satisfaction is linked to long-term shareholder value and financial growth. This is because it affects customer retention, which invariably impacts on revenue and profitability (Reichheld and Sasser, 1990). This view is supported by studies which show that higher levels of customer satisfaction and quality are associated with market success (Lele and Sheth, 1987). Again, higher level of customer satisfaction positively impacts on market share and profitability (Anderson *et al.*, 1994). The level of customer satisfaction can equally be linked directly to the sales recorded by an organisation (Hwang and Zhao, 2010), as well as increases in shareholder value and average net income (Anderson *et al.*, 2004).

There is a need, for firms to be responsive to customers' needs, and strive to satisfy these needs with a view to enhancing revenue growth. Gunasekaran *et al.* (2008), for instance, encourage organisations to develop agile supply

chains so as to get their products to the market faster, and at a minimum total cost. Therefore, appropriate strategies and techniques for efficient and effective distribution of these products are required in order to ensure on time and cost distribution and delivery, thus ensuring that customers are satisfied. On the contrary, inadequate and inefficient distribution system impact negatively on the marketing and distribution of these products/services thereby missing the delivery target. This leads to high holding and transportation cost, as well as customer dissatisfaction (Ajiboye and Afolayan, 2009; Harriet *et al.*, 2013).

Supply chain management is an integrating philosophy utilised in managing the total flow of a distribution channel from supplier to ultimate customer (Ellram and Cooper, 1990). The adoption of supply chain management has been credited with helping organisations to focus attention on the interactions of channel members, thereby ensuring that an end product or service that offers the best comparative value for the end user is produced (Langley and Holcomb, 1992). Maximal benefit from the adoption of supply chain management is predicated on the efficiency of the logistics network (Tracey, 1998). The Council of Supply Chain Management Professionals (CSCMP), describes logistics as "the process of planning, implementing, and controlling the efficient, cost effective flow and storage of raw materials, in-process inventory, finished goods and related information from point of origin to point of consumption for the purpose of conforming to customer requirements (Vitasek, u.d). Slack *et al.* (2010) observes that because logistics involves the movement of tangible products from the point of manufacture to the point of consumption, it is used synonymously with the term physical distribution management or distribution.

According to Ballou (1997), the overriding aim of logistics is to get the right goods or services to the right place, at the right time, and in the desired condition, while making the greatest financial contribution to the firm. Rushton *et al.* (2010) observe that while profit is boosted by increased sales, which result from the provision of high and reliable service, through on time in full (OTIF) deliveries, costs can be minimized through efficient logistics operations. Hence, the need to analyse product distribution pattern of organizations. This notion derives from insights from earlier studies which show that the cost of transportation in organizations constitutes a substantial part of logistic costs (Coyle *et al.*, 2009; Bowersox *et al.*, 2010 Kumar and Shirisha, 2014). It has been noted that transportation cost also influences product selling price (Kumar and Shirisha, 2014), cost price (Reed *et al.*, 2010), as well as operating cost (Bhatnagar, 2010). A school of thought has it that it may be difficult to maximise customer service and minimize distribution cost at the same time, for according to Kotler and Armstrong (2012), maximum customer service requires rapid delivery, large inventories, flexible assortments, liberal returns policies among other services, all of which increase distribution costs. This contrasts with minimum distribution costs which imply slower delivery, smaller inventories, and larger shipping lots, all of which lead to a lower level of overall customer service (Kotler and Armstrong, 2012). While this difficulty is acknowledged, it should be noted that physical distribution goes a long way in making a product or service accessible for use or consumption by the customer (Kotler and Armstrong, 2012).

Efficient, cost effective distribution network, in spite of obvious constraints, could be enhanced through the use of linear programming (LP) techniques. This is in line with the views of Hillier and Lieberman (2001) who observe that LP helps in the allocation of limited resources in a best possible way. Marriott (1990) describes LP as a schedule of actions used to maximise or minimise a linear function of several variables when all, or some of these variables are subjected to constraints that are expressed in linear terms either as equations or inequalities. Sharma (2013) notes that LP techniques could be used to minimise the cost of transporting products from points of supply to points of consumption, and or maximise total value or utility derivable from products. When carried out within certain requirements and assumptions, the attainment of an optimal solution is feasible using either the simplex or transportation model (Gupta and Hira, 2011). However, because the complexity of the simplex method increases with increase in the number of variables and constraints, the transportation method or model becomes preferable (Hillier and Lieberman, 2001; Gupta and Hira, 2011). A typical

transportation model for moving a given unit of product from a source at a given cost to a given destination with specified units of demand is shown in Figure 2.

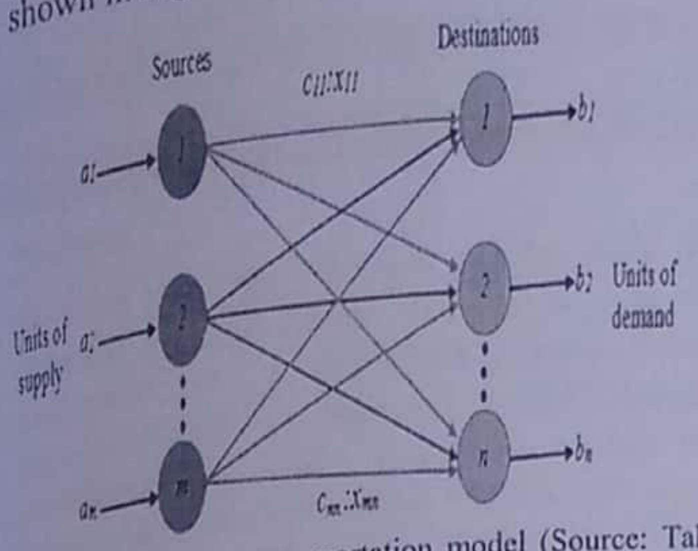

Figure 2: A typical transportation model (Source: Taha (2007))

For Figure 2 above, if Z equals the total distribution cost and X_{ij} ($i = 1,2,\ldots,m;\ j = 1, 2, \ldots, n$) equals the number of units to be distributed from source i to destination j, then the linear formulation of the transportation problem, in line with Hillier and Lieberman (2001) and Sivarethinamohan (2008) could be given as: $X_{ij} \geq 0$ for all i and j

$$Minimise\ Z = \sum_{i=1}^{m}\sum_{j=1}^{n} X_{ij}\, C_{ij} \quad \ldots (1)$$

Subject to:

$$\sum^{n} X_{ij} = S_i \quad for\ i = 1,2,3,\ldots,m \ \ (supply) \quad (2)$$

$$\sum^{m} X_{ij} = D_j \quad for\ j = 1,2,3,\ldots,n \ \ (demand) \quad (3)$$

(4)

Where: $S_i = a_i$ quantity of commodity avialable at origin i, $D_i = b_i$ = quantity of commodity needed at source j,
C_{ij} cost of transporting one unit of commodity from origin i to destination j ;and
X_{ij}: quantity transported from origin i to destination j.

A feasible solution to a transportation problem according to (Hillier snd Lieberman, 2001) exists if and only if:

$$\sum_{i=1}^{m} S_i = \sum_{j=1}^{n} D_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

This is an ideal situation, which in nature is not always possible. Thus, it is possible to have a situation total supply is not equal to total demand requirement;

$$\sum_{i=1}^{m} S_i \neq \sum_{j=1}^{n} D_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(6).$$

In this circumstance depicted by equation (6) above, Sivarethinamohan (2008) suggests the creation of a dummy source or destination to absorb the excess demand or supply as the case may be.

Methods and Materials

Materials

Case company is a building materials manufacturers' representative (wholesaler), that stocks building materials at its warehouses in (Suleja in North Central Nigeria and Enugu in South East, Nigeria). Therefore, this study focuses on the movement of the products from the warehouses to the final consumers (outbound distribution). Quantities of bricks and floor tiles in stock at the two warehouses are shown on Table 1 while Table 2 show the total quantity of bricks and floor tiles demanded by the customers.

Table 1: Quantity of Bricks and Floor tiles in Stock (pallets/year)

S/N	Warehouse	Quantity (pallets/year)		
		Bricks	Floor tiles	Total
1	Suleja	598	489	1087
2	Enugu	709	775	1484
TOTAL		1307	1264	2571

Table 2: Quantity demanded (pallets/year)

S/N	Customers	Quantity Demanded (Pallets/Year)		
		Bricks	Floor tiles	Total
1	Wuse 2, Abuja	364	364	728
2	Ikeja	229	218	447
3	Uyo	208	213	421
4	Kaduna	31	52	83
5	Aba	312	312	624
6	Port Harcourt	74	49	123
7	Makurdi	65	36	101
Total		1283	1244	2527

The distribution cost per pallet of bricks and floor tiles from the warehouses (source) to various destinations is shown on Table 3 while Table 4 is the transportation matrix for the transportation problem.

Table 3: Transport Cost per Pallet from Warehouses to Customers (₦)

Warehouse	Wuse 2, Abuja	Ikeja	Uyo	Kaduna	Aba	Port Harcourt	Makurdi
Suleja	3862.40	52185.00	46789.00	11715.00	44943.00	44801.00	23714.00
Enugu	46075.00	70228.00	22504.00	61983.00	20467.00	27936.00	24832.00

Table 4: Transportation Matrix for the Transportation Problem

Source	Cost/Unit Distributed (N) Destination							Supply
	Wuse 2, Abuja	Ikeja	Uyo	Kaduna	Aba	Port Harcourt	Makurdi	
Suleja	3862.40	52185.00	46789.00	11715.00	44943.00	44801.00	23714.00	1087
Enugu	46075.00	70228.00	22504.00	61983.00	20467.00	27936.00	24832.00	1484
Demand	728	447	421	83	624	123	101	

Method

In order to achieve the aim of this study, both primary and secondary sources of data were utilised in the data collection process. Primary data were collected using survey instruments of questionnaire and personal interview. Respondents were polled/interviewed on aspects such as length of business relationship with the case study company, as well as level of satisfaction with various aspects of the case study's activities, services and products. These data were synthesized, summarised and presented using descriptive statistics, specifically, frequency analysis, using SPSS statistical software.

Secondary data which includes the transportation costs incurred by the company in moving the product from one point to another, sales data, as well as quantities of products extracted from the company's sales records. A transportation model of the distribution of the products from the warehouses to the various consumers was formulated, and subsequently solved using TORA software.

Solution to the transportation problem was found using Vogel's Approximation Method (VAM) - an iterative method used in the computation basic feasible solution of a transportation problem. This method has been chosen over the North West Corner Method (NWCM) and the Least Cost Method (LCM) because the basic feasible solution obtained through it is closer to the optimal solution than the other two methods (Das *et al.*, 2014; Sharma, 2013). The VAM methods also takes into account the cost associated with the alternative route(s), which is not the case with the North West Corner Method (Sharma, 2013).

The Product Distribution Network

The channel of distribution which shows the connections between the source (warehouses) and destinations (customers) of the case study company is shown in Figure 3.

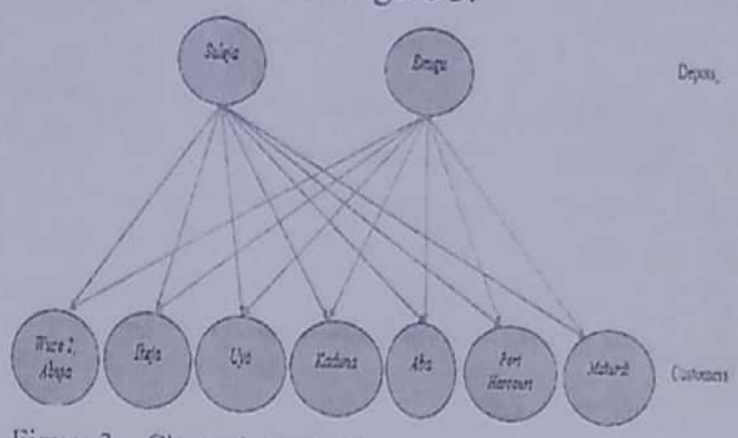

Figure 3: Channel of Distribution

Formulation of Transportation Problem

In view of the fact that the products distribution was between two locations - the warehouses (sources) and customers (destination), the problem was formulated as a transportation modelling problem instead of transhipment. The network representation of the distribution showing sources, destinations, quantities as well as associated costs is shown in the Figure 4.

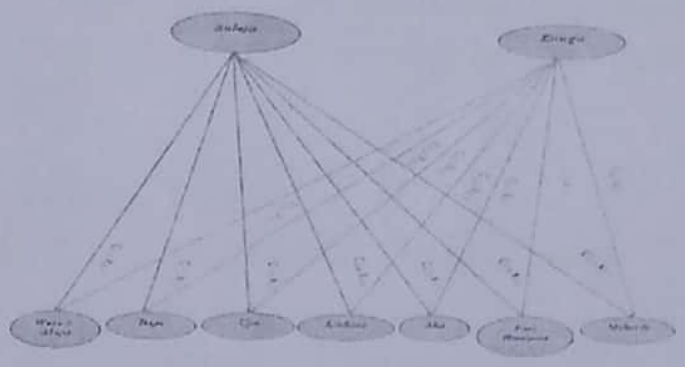

Figure 4: Network Representation

The information about the product distribution network shown in Figure 3 and Figure 4 above could be represented in a transportation matrix as shown in Table 5.

Table 5: Transportation Matrix for a Transportation Problem

Source	Cost/Unit Distributed (₦) Destination							Supply
	Wuse 2, Abuja	Ikeja	Uyo	Kaduna	Aba	Port Harcourt	Makurdi	
Suleja	$3862.4X_{1,1}$	$52185X_{1,2}$	$46789X_{1,3}$	$11715X_{1,4}$	$44943\ X_{1,5}$	$44801\ X_{1,6}$	$23714\ X_{1,7}$	1087
Enugu	$46075\ X_{2,1}$	$70228\ X_{2,2}$	$22504\ X_{2,3}$	$61983\ X_{2,4}$	$20467X_{2,5}$	$27936\ X_{2,6}$	$24832\ X_{2,7}$	1484
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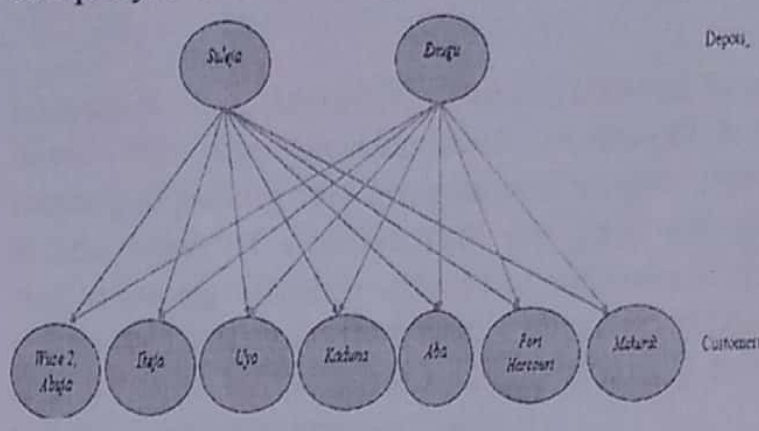

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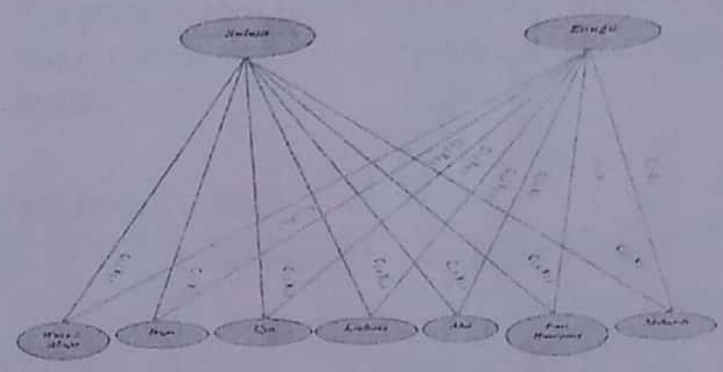

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emand	728	447	421	83	624	123	101	

The information contained on Tables 1 to 5 could be combined to arrive at the required transportation problem shown below:

$$Z_{min} = C_{1,1}X_{1,1}+C_{1,2}X_{1,2} + C_{1,3}X_{1,3} + C_{1,4}X_{1,4} + C_{1,5}X_{1,5} + C_{1,6}X_{1,6} + C_{1,7}X_{1,7} + C_{2,1}X_{2,1} + C_{2,2}X_{2,2} + C_{2,3}X_{2,3} + C_{2,4}X_{2,4} + C_{2,5}X_{2,5} + C_{2,6}X_{2,6} + C_{2,7}X_{2,7}$$

Therefore, the transportation problem becomes:

$$Z_{min} = 3862.4X_{1,1}+52185X_{1,2} + 46789X_{1,3} + 11715X_{1,4} + 44943X_{1,5} + 44801X_{1,6} + 23714X_{1,7} + 46075X_{2,1} + 70228X_{2,2} + 22504X_{2,3} + 61983X_{2,4} + 20467X_{2,5} + 27936X_{2,6} + 24832X_{2,7}$$

Subject to:

Capacity constraints; $X_{1,1}+X_{1,2} + X_{1,3} + X_{1,4} + X_{1,5} + X_{1,6} + X_{1,7} \leq 1087 X_{2,1} + X_{2,2} + X_{2,3} + X_{2,4} + X_{2,5} + X_{2,6} + X_{2,7} \leq 1484$

Demand constraints; $X_{1,1} + X_{2,1} = 728;\ X_{1,2} + X_{2,2} = 447;\ X_{1,3} + X_{2,3} = 421;\ X_{1,4} + X_{2,4} = 83;\ X_{1,5} + X_{2,5} = 624;\ X_{1,6} + X_{2,6} = 123;\ X_{1,7} + X_{2,7} = 101$

And $X_{1,1}+X_{1,2} + \cdots + X_{2,7} \geq 0$

Results

Analysis of Questionnaire

One hundred and twelve questionnaires exploring the perception of the quality of service provided by the case study company were administered to the company's customers, with an aim to establishing the overall level of satisfaction. A hundred percent response rate was recorded because willing customers were not allowed to go home with the questionnaires. Although this method of polling could introduce a level of error, it was however decided that the error margin would not significantly affect the outcome of the exercise. Distribution of respondents according to the length of their business relationship with the company is shown on Table 6.

Table 6: Distribution by Length of Relationship

	Frequency	Percent	Valid Percent	Cumulative Percent
<3yrs	41	36.6	36.6	36.6
3-5 yrs	28	25.0	25.0	61.6
6-8yrs	27	24.1	24.1	85.7
above 8yrs	16	14.3	14.3	100.0
Total	112	100.0	100.0	

The perception of respondents on the quality of products sold by the case study company is shown on Table 7. It shows that while about 62.5% of the respondents was very satisfied with the quality of the products, about 5.4% was not satisfied with the products. It should be noted that although the number of customers that are not satisfied is lower than those that are satisfied, other factors such as the 'volume of buy' that was not captured in the survey, may actually make this group a significant one. Nonetheless, because this is not the focus of this paper, it is not explored further.

Table 7: Level of Satisfaction with Product Quality

	Frequency	Percent	Valid Percent	Cumulative Percent
Very satisfied	70	62.5	62.5	62.5
Satisfied	24	21.4	21.4	83.9
slightly satisfied	12	10.7	10.7	94.6
Not satisfied	6	5.4	5.4	100.0
Total	112	100.0	100.0	

The analysis of customers' level of satisfaction with purchases made from the company is shown on Table 8. It shows that while a cumulative 72.3% of the respondents was satisfied with purchase experience, a cumulative 27.7% was not satisfied.

Table 8: Level of Satisfaction with Purchase Experience.

	Frequency	Percent	Valid Percent	Cumulative Percent
Very satisfied	31	27.7	27.7	27.7
Satisfied	50	44.6	44.6	72.3
Slightly satisfied	19	17.0	17.0	89.3
Not satisfied	12	10.7	10.7	100.0
Total	112	100.0	100.0	

The level of overall satisfaction expressed by customers is of significance in this study. It could be seen from Table 9 that while a cumulative

48.2% is satisfied with the company, 52.7% is not satisfied (that is, slightly satisfied or not satisfied).

Table 9: Level of Overall Satisfaction

	Frequency	Percent	Valid Percent	Cumulative Percent
Very satisfied	17	15.2	15.2	15.2
Satisfied	37	33.0	33.0	48.2
Slightly satisfied	36	32.1	32.1	80.4
Not satisfied	22	19.6	19.6	100.0
Total	112	100.0	100.0	

The information on Table 10 shows that the level of satisfaction expressed on Table 9 impacts on the ability of the company to retain its customers. Only 20.5% of the respondents said they would definitely buy again from the company. This contrasts with the 36.6% that is undecided and 42.9% who would definitely not buy from the company again.

Table 10: Likelihood of Continued Patronage.

	Frequency	Percent	Valid Percent	Cumulative Percent
Definitely will	23	20.5	20.5	20.5
Probably	41	36.6	36.6	57.1
Probably will not	48	42.9	42.9	100.0
Total	112	100.0	100.0	

An insight into the cause of this this could be seen from the further comments and suggestions made by the respondents. The comments show that about 41% of the respondents wants the company to improve on product delivery; 36% wants improvement in customer services, and 27% did not comment. There are also observations by respondents that the company on many occasions did not keep to delivery schedule.

In view of the information contained on Table 9 and the complaints by customers about poor delivery record of the company, there is need to analyse the distribution pattern of the company and determine the best and cost effective distribution model. This, it is hoped, would enhance the ability of the company to consistently deliver requested products within the requested delivery timeframe at an acceptable cost. This would create value by accommodating customers' delivery requirements in a cost effective manner (Bowersox *et al.*, 2010).

Optimal Solution to the Transportation Problem using VAM

The Vogel's Approximation Model uses the concept of opportunity cost or penalty resulting from not taking the correct decision. Further details of this method can be found in most operations research textbook (Taha, 2007; Sivarethinamohan, 2008; Sharma, 2009; Hillier and Lieberman, 2001; Gupta and Hira, 2011; Sharma, 2013). For this particular study, TORA, an operations research software tool developed by Hamdy Taha (Taha, 2006) is used. The initial basic feasible solution returned and optimal solution to the transportation problem after two iterations, with an objective value (optimal transportation cost) of ₦58,385,972.20 (Table 11).

Table 11: Basic Feasible Solution using VAM

Iter 1	ObjVal=	60095397.20	D1	D2	D3	D4	D5	D6	D7	D11	Supply
	Name		Wuse 2	Ikeja	Uyo	Kaduna	Aba	Port Harcourt	Makurdi	DummyD	
			v1=3862.40	v2=52185.00	v3=4461.00	v4=11715.00	v5=2424.00	v6=9893.00	v7=23714.00	v8=18043.00	
S1	Suleja	u1=0.00	3862.40	52185.00	46789.00	11715.00	44943.00	44801.00	23714.00	0.00	1087
			728	175		83			101		
			0.00	0.00	-42328.00	0.00	-42519.00	-34908.00	0.00	-18043.00	
S2	Enugu	u2=18043.00	46075.00	70228.00	22504.00	61983.00	20467.00	27936.00	24832.00	0.00	1484
				272	421		624	123		44	
			-24169.60	0.00	0.00	-32225.00	0.00	0.00	16925.00	0.00	
	Demand		728	447	421	83	624	123	101	44	
Iter 2	ObjVal=	58385972.20	D1	D2	D3	D4	D5	D6	D7	D11	Supply
	Name		Wuse 2	Ikeja	Uyo	Kaduna	Aba	Port Harcourt	Makurdi	DummyD	
			v1=3862.40	v2=52185.00	v3=4461.00	v4=11715.00	v5=2424.00	v6=9893.00	v7=6789.00	v8=18043.00	
S1	Suleja	u1=0.00	3862.40	52185.00	46789.00	11715.00	44943.00	44801.00	23714.00	0.00	1087
			728	276		83					
			0.00	0.00	-42328.00	0.00	-42519.00	-34908.00	-16925.00	-18043.00	
S2	Enugu	u2=18043.00	46075.00	70228.00	22504.00	61983.00	20467.00	27936.00	24832.00	0.00	1484
				171	421		624	123	101	44	
			-24169.60	0.00	0.00	-32225.00	0.00	0.00	0.00	0.00	
	Demand		728	447	421	83	624	123	101	44	

Discussion

The decision by a customer to continue patronizing a given business outfit is influenced by the customer's assessment of how the services received offers good value for money (Carrillat *et al.*, 2007). It is this 'good value for money' experience that influences a customer's perception of service quality, which moderates

the expression of satisfaction (Alhkami and Alarussi, 2016). Indeed, the study by Bhargava and Pareek (2013) showed that customers have high expectations for prompt service. However, the outcome of the survey carried out shows that the company was rated low on reliability (speed of service), which according to Zeithaml (2000) is an important dimension of service quality. The inability of the case study to meet the expectation of customers on this important aspect most likely led to the percentage of customers (79.5%) that would most likely not patronise it again (Table 10). This result is in line with the conclusion that service quality plays a crucial role in customer satisfaction, retention, loyalty drawn in earlier studies such as Naik *et al.* (2010).

The reliability of product delivery could be enhanced through a proper planning of the delivery network so that they can achieve a just-in-time supply at a cost that is profitable to the organisation. This is in line with the view in McColl-Kennedy and Schneider (2000) that businesses that aspire to prosper must establish functional and appropriate measures to improve critical aspects of their operations (for instance, service quality). Organisations shuld ensure a balance within them and stakeholders which is the view that is based on the fact that good service quality would enhance customer satisfaction (Naik *et al.*, 2010). Anderson *et al.* (2004) notes that customer satisfaction is empirically proven to have a positive relationship with shareholder value. Keiningham and Vavra (2001) took this further by showing that every percentage increase in customer satisfaction leads to about 2.37% increase in return on investment (ROI). An improvement in customer retention ability of an organisation by a few percentage is capable of increasing the profits of the organisation by up to 25% or more (Griffin, 2002). Consequently, suggestions or actions to improve delivery of product must also show how these can minimize operational cost involved, for it to be acceptable to the shareholder of the business. It is on the basis of the above that the need to minimise distribution cost emanates.

It could be seen from Table 11 that the total minimal cost of transporting the products from the warehouses to the various destination is ₦58, 385,972.20. It is worth noting that the quantity supplied and that demanded were not equal, therefore, the problem is unbalanced. Consequently, a dummy destination was created for the Enugu warehouse to absorb the surplus 44 pallets, thereby balancing the product distribution transportation model (Sivarethinamohan, 2008). From the results obtained, the minimized objective of the overall transport cost of the products to the warehouses and customers is ₦58,385,972.20 against an original transportation cost of ₦60,095,397.20, saving the company ₦1,709,425.00 from the transportation cost of the products.

Optimal distribution pattern that extracted from the basic feasible solution of the transportation problem is summarised in a shipping list (Table 12) which details the route, shipment quantities, cost per unit as well as shipment cost. The following destinations with their respective quantities, Wuse 2, Abuja (728), Ikeja (276), and Kaduna (83) are better served from the Suleja warehouse, while Ikeja (171), Uyo (421), Aba (624), Port Harcourt (123), Makurdi (101) are better served from the Enugu warehouse. The excess supply of 44 is absorbed by a Dummy destination by the Enugu warehouse. The excess supply of 44 represents a 1.71% over supply and should not be a source of concern. Again, the warehouse where it should be kept belongs to the company. Therefore, additional resources would not be spent keeping and securing them as these facilities (warehouse and security personnel) are already in place. It equally serves as a buffer stock, from which any unforeseen shortfall and emergency delivery (either due to fresh or replacement orders) could be made.

Table 12: Optimum Distribution Pattern.

From	To	Shipment	Objective Coefficient	Objective Contribution
Suleja	Wuse 2, Abuja	728	3862.40	2811827.20
Suleja	Ikeja	276	52185.00	14403060.00
Suleja	Kaduna	83	11715.00	972345.00
Enugu	Ikeja	171	70228.00	12008988.00
Enugu	Uyo	421	22504.00	9474184.00
Enugu	Aba	624	20467.00	12771408.00
Enugu	Port Harcourt	123	27936.00	3436128.00
Enugu	Makurdi	101	24832.00	2508032.00
Enugu	DummyD	44	0.00	0.00

Conclusion

The study sought to explore customers' perception of the quality of services received from a furniture manufacturing company and determine the optimal product distribution pattern capable of enhancing customer satisfaction, reducing operational cost incurred by the company. The result of the survey carried out showed that customers were not satisfied with the delivery of product bought from the company, resulting perhaps, to the indecision to continue patronizing the company. The solution to the product distribution transportation problem of the company showed that a better and efficient distribution pattern reduces the distribution cost of the company (from the warehouses to the customers), from sixty million, ninety-five thousand, three hundred and ninety-seven naira and twenty kobo (₦60,095,397.20) to fifty-eight million, three hundred and eighty-five thousand, nine hundred and seventy-two hundred naira and twenty kobo (₦58,385,972.20). Apart from the savings made, the optimal distribution schedule achieved is likely to improve delivery efficiency of the company. And this invariably leads to a higher rating on reliability, which is shown to be an important aspect of service quality.

Based on the outcome of this study, the management of the case study company is encouraged to continually explore ways to enhance its outbound logistics network as a way of minimizing cost and improving service quality (based on enhanced reliability ranking by customers). It was also established that the products demanded fall short of that in stock. Based on the current demand and supply schedule, the company is advised to adopt the following distribution schedule: Wuse 2, Abuja (728), Ikeja (276), and Kaduna (83) are better served from the Suleja warehouse, while Ikeja (171), Uyo (421), Aba (624), Port Harcourt (123), Makurdi (101), Dummy destination (44) are better served from the Enugu warehouse.

A major limitation experienced during this study is the reluctance by customers to give adequate information about business transactions with the case study company. The case study company does not have a computerized documentation of quantities supplied and demanded by customers in the sales department.

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