"Inventory management and customers` satisfaction in the public health sector in Delta State, Nigeria: marketing analysis"

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INVENTORY MANAGEMENT AND CUSTOMERS' SATISFACTION IN THE PUBLIC HEALTH SECTOR IN DELTA STATE, NIGERIA: MARKETING ANALYSIS

Abstract

This study investigates the effects of inventory management on customers` satisfaction with lead time as a moderator variable in government-owned hospitals in Delta State, Nigeria. It aims to contribute to the extant literature on inventory management and customer satisfaction in developing countries, focusing on Delta State in Nigeria. Two hundred and sixty-five (265) questionnaires were distributed, comprising one hundred and five to measure inventory management variables administered among Medical Doctors, Nurses, Pharmacists, and Medical Laboratory Scientist. Similarly, one hundred and sixty questionnaires designed to measure customer satisfaction were administered to Patients. The study adopts multiple regression and structural equation modeling to analyze the data. Also, studying the impact of inventory management on customers` satisfaction some marketing analysis approaches were used. The obtained results support the appropriateness of the model as lead time possesses the qualities of a moderator between strategic supplier partnership, lean inventory, and information technology that are proxies of inventory management and customer satisfaction. Besides, the results record a positive and statistically significant relationship between strategic supplier partnership, lean inventory, and customer satisfaction at a 5 percent level of significance, respectively.

In addition, lead time has a positive and statistically significant relationship with customer satisfaction. Impliedly, this study concludes that inventory management proxies and lead time drive customer satisfaction. Thus, the government is recommended to focus on the lead time to avert the dearth of basic inventories in the hospitals.

Keywords	information technology, lead time, lean inventory, strategic supplier partnership, structural equation model
JEL Classification	L32, M11, M31

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INTRODUCTION

In the past, the primary goal of establishing most organization was to maximize profit without considering corporate social responsibilities and its impacts on customers. However, recent studies had shown that organizational focus had shifted from the holistic approach of maximizing profit to customer satisfaction (Jones et al., 1995; Rad, 2008). These findings had prompted business managers to strategize on how to meet customers' demand. Mehfooz et al. (2012) asserted that customer satisfaction is a very difficult task because of individual differences or personality. However, it was concluded that customer satisfaction could be achieved through effective inventory management.

Most of the studies on inventory management and customer satisfaction have been carried out in the manufacturing sector (Kwadwo, 2016; Nwangangi et al., Arasa, 2015; Nsikan et al., 2015) and retail

shops (Ogonu et al., 2016; Mehfooz et al., 2012; Levinson, 2005). It was established that improper management of inventory could lead to shortages of materials. However, the consequences of these are not life-threatening since such customers have the opportunity to get it from the organization's competitors. On the contrary, shortages of essential inventories in the public health sector can lead to the Patient's (customer) untimely death, making this study unique.

Customers in this context are the Patients who feel dissatisfied when there are shortages of drugs and other medical equipment to meet their expectations. Mehfooz et al. (2012) noted that customer dissatisfaction could be averted or reduced through proper inventory management. Arising from the above, the emphasis on the study of inventory management primarily from guiding against "overstock" and "stockout" of raw materials, work-in-progress and finished goods had gradually changed to customer satisfaction. The health sector can satisfy their Patients if they provide primary health care facilities needed by the Patients. The United States Agency for International Development – USAID (2006) asserted that most government hospitals in developing countries lack proper storage facilities to preserve drugs in their pharmacy department and most likely expired before getting to the hospitals. Impliedly, shortages of essential inventories would be a recurrent issue in the hospitals during emergency cases since no adequate storage of facilities. This presumption supports Francu and Francu (2012) works; Romanian Patients complained of shortages of drugs in the hospital.

Despite the advocacy on the importance of inventory management control in the health sector, the government failed to provide the required facilities needed in the hospital. Thus, the Auditor General's Office (2012) in Kenya noted that the pharmacy section of most government-established hospitals still lacked some vital, essential, and critical drugs, especially those used for blood thinners up to three months. This study, therefore, is a modest contribution to the existing works in the health sector to proffer enduring solutions to avoid stockout. Stockout would expose the customers (patients) to their competitors and lead to the Patient's sudden death, especially in emergency cases. Again, this study differs from most existing works by introducing lead time as a moderator between inventory management and customer satisfaction. It also uses multiple regression analysis, structural equation modeling analysis and marketing analysis to investigate the perceived complex relationship.

1. LITERATURE REVIEW AND HYPOTHESES

1.1. Customer satisfaction

Previous studies had established that customer satisfaction is a strategic management function (Turner et al., 2017; Ndengene et al., 2021). However, Turner et al. (2017) opined that strategic management could not predict customer needs effectively and therefore inadequately achieve customer satisfaction. Thus, customer satisfaction has to do with contentment derived from the services offered (Kotler & Armstrong, 2016). Satisfaction depends on a person's ideas, beliefs and opinions, making it difficult to measure due to its subjective nature (Mehfooz et al., 2012). Notwithstanding, there have been attempts to measure satisfaction based on customer emotional reaction or effectiveness (Giese & Cote, 2000), firms customer bases like size, quality, and loyalty (Morgamn & Rego, 2006; Eckert, 2007), profitability (Zerbini et al., 2007) and opinion of patients using the health care services (Jankauskienė & Jankauskaitė, 2011; Mendoza et al., 2002). Eckert (2007) explained that customer satisfaction could be ascertained by the number of customers in terms of the size of the customer pool, its quality, and the loyalty they have toward the organization. The study included additional variables that influence customer satisfaction, which is enumerated by Lee and Kleemer (2001) as prompt delivery of products to customers, producing goods to customers' specifications, partnership and relationship with suppliers, as well as the stock of the overall inventory to be kept. In the health sector, satisfaction is determined by Patient's expectations, characteristics and psychosocial features (Prasanna et al., 2009). Cosma et al. (2020) noted that the quality of significant

care delivery is a major determinant of patients' satisfaction.

Cacioppo (2000) opined that customers spread information to other prospective customers if they derive satisfaction or dissatisfaction from the organizational products and services. The study revealed that dissatisfied customers tell nine other potential customers, while satisfied customers tend to tell five potential customers about the corporate products or services. This study believes that dissatisfied customers can tell millions of people within a minute via social media about their dissatisfaction with the products or services and vice-versa. Therefore, organizational management should note that customers can either 'make or mar' their businesses.

1.2. Inventory management

Studies on inventory management have shown that the success of any firm, the fate of the economy, and how an organization survives in the future depends on how inventory is being managed (Umair et al., 2019). Inventory management is a term employed by firms to monitor and evaluate their investments in inventory (Stevenson, 2010). Previously, there were no emphases on inventory management because excess inventory was interpreted as an indication of a healthy and wealthy firm, then overstock inadvertently was being encouraged (Susan & Michael, 2000; Ogonu et al., 2016). However, the focus has shifted to proper inventory management where the emphasis of the manager is to strategize how to hold inventories at the lowest cost, and to ensure that there are enough and uninterrupted supplies for smooth operations of the firm (Mpwanya, 2005; Bhausaheb & Routroy, 2010). Therefore, there should be a trade-off between holding little inventories and keeping inventories in excess. This infers that shortages of inventories can lead to loss of customers since it will affect providing adequate services. At the same time, high inventories can result in additional costs spent for holding and storage, and other related costs leading to an increase in prices of goods and services (Umair et al., 2019). Rosenfield and Simchi-Levi (2010) asserted that inventory management has a high financial impact on customer satisfaction and overall financial performance of the organization.

1.3. Strategic supplier partnership

The strategic supplier partnership concept was developed in the 1980s to reduce waste and shortening lead times of inventories from the suppliers to the customers (Bicheno, 1996). This concept can only achieve its purpose if there is a good working relationship between the major actors: customers, and suppliers (Mukopi & Iravo, 2015; Ogonu et al., 2016). Furthermore, the strategic supplier partnership recommends that the relationship between the customer and the supplier should not be short-term but long-term. The span of a period is necessary to give the supplier opportunity to understudy the customer to build up relationships and confidence, which will, in turn, propel investment and encourage improved efficient service delivery. In recent times, the concept of strategic supplier partnership has metamorphosed into Vendor Managed Inventory (VMI), where the supplier displays the inventory on a store shelf in the site or close to its end-users (customers) (Mehfooz et al. 2012). Its application has shifted the costs ought to be borne by the customer, such as ordering, holding, and storage costs to the supplier, which directly boosts the customers' profit margin (Loughrin, 2008). Previous empirical studies reported a conflicting relationship between strategic supplier partnership and customer satisfaction. For instance, Mukopi and Iravo (2015) found a strong relationship between strategic supplier partnership and customer satisfaction, while Ogonu et al. (2016) observed a weak relationship between the two variables.

1.4. Lean inventory

The concept of lean inventory has been introduced into the inventory management literature. It can be traced to Krafcik (1988), who developed the way to correct the weaknesses of 'buffered approaches' of inventory management. Krafcik (1988) asserted that keeping excess inventories and workers is a waste of resources, which will increase the prices of the products or services and adversely affects customer satisfaction. Howell (2001) also defines lean as a target to avail customers what they wanted and deliver immediately without wasting any waste. Thus, 'lean' helped organization management to guide against waste and ensure customer satisfaction as a priority. Womack et al. (1990)

pioneered the principle and application of lean production. It was noted that storing inventories in the form of safety stock affects the firm's profit since it can lead to an increase in storage fees, handling, and waste of materials.

Furthermore, Brigham and Gapenki (2010) noted that previous studies have shown that organizations, which applied lean production principles, reduced the costs for about 20-30%. Studies have shown that organizational managers adopt the uses of Just-in-Time (JIT) and Materials Requirements Planning Systems (MRP) as lean production methods to solve the problems of excess inventories (Mukopi & Irava, 2015; Ogonu et al., 2016). Ogonu et al. (2016) found a strong positive relationship between lean inventory management and customer satisfaction. It was noted that the correlation coefficient between customer satisfaction and lean inventory management is 0.795, which is the highest among the variables used in the study. Furthermore, the correlation coefficient between customer satisfaction and information technology, and strategic supplier partnership were 0.725 and 0.352, respectively.

1.5. Information technology

Information technology assists inventory managers in accurately calculating the re-order level, minimum stock level, maximum stock level, and delivery period. This helps to guide against shortages and stock out, negatively impacting customers' satisfaction (Ogonu et al., 2016; Mohamed, 2018). Thus, Lyson (1996) proved that the use of technology (Electronic Point of Sales) assisted the organization in restricting stocks to customers' demand, reduced the risk associated with obsolescence and deterioration of inventories. The study concluded that the use of technology has led to improved services rendered to the customers. Ogonu et al. (2016) found a significant association between information technology and customer loyalty, a proxy for customer satisfaction in the Supermarket sub-sector in Nigeria. In the same vein, Qosasi et al. (2019) stated that "when firms adopt information and communication technology (ICT), it helps their business to build up a closer relationship with supply chains and customers." It was concluded that ICT plays a vital role in reducing the cost of goods and services

among SMEs in Indonesia and has impacted customer satisfaction.

Furthermore, viewing ICT and inventory management, Eckert (2007) carried out a study on the effects of inventory management on customer satisfaction in a small grocery business. The study establishes that clients were not fully satisfied with the organizational performance. Within 12 months, the organization ran out of stock on 20 different occasions when they were subjected to a manual approach of inventory management control system. Thus, when the organization introduced technology to manage inventory, there were no more stock shortages; customers were happy for six months under review when the inventory management control equipment was being used. Impliedly, information technology has a direct effect on customer satisfaction.

1.6. Lead time

The mediating role of lead time on inventory management has scantly appeared in the literature, which warrants further investigation. Lead time in this context can be referred to as the period order is placed for inventories and when they are received. It has become a recurrent problem for the organization since management cannot accurately predict the expected numbers of customers daily to plan against stockout properly. Furthermore, most managers lack proper planning for inventories and cannot accurately determine the distance between hospitals and suppliers of their stocks (drugs). Therefore, organizational management should adopt adequate strategies to manage lead time to guide against shortages of inventories which would, in turn, lead to satisfying the customer's needs (Darko et al., 2018; Nordas et al., 2006). Previous empirical studies have proved lead time and customer satisfaction relationship (Mfwaya, 2013; Wildding, 2003). Wildding (2003) noted that customers are more satisfied if their suppliers meet and deliver orders they placed within the stipulated time. In the same vein, Mfwaya (2013) found a significant positive relationship between lead time and customer satisfaction in the telecommunication industry in Kenya.

This study aimed to examine the impact of the proxies of inventory management (supplier part-

nership, lean inventory, and information technology) and moderating variable of lead time on customer satisfaction.

In the light of the preceding review, the hypotheses proposed in this study are:

H1a: Strategic supplier partnership, lean inventory, and information technology have a significant and positive effect on customer satisfaction.

H2a: Lead time mediates the significant and positive effect of Strategic supplier partnership, lean inventory, and information technology on customer satisfaction.

2. METHODS

The case study research design is adopted in this study. It concentrates only on the public health sector to gather data from its stakeholders on inventory management and customer satisfaction. In applying quantitative approach in gathering this study data, the questionnaires were modified in line with existing literatures to capture the interest of the Patients. Data on inventory management, strategic supplier partnership, lean inventory, lead time and information technology were gathered designated to the health workers. Two hundred and sixty-five questionnaires were distributed to both health workers and Patients among the selected hospitals in Delta State. Out of which, one hundred and five was distributed among Medical Doctors, Nurses, and Pharmacist Laboratory Scientists. However, customer satisfaction data were collected from one hundred and sixty questionnaires administered to Patients.

The research assistants were employed. They were trained to explain the importance of this study and the questionnaire content to the respondents before administering it. Arising from the above, two hundred and forty-nine were collected and found useful; this response rate of 94 percent is considered adequate for this analysis.

The model specification for this study is formulated as:

$$CUSAT = \beta_0 + \beta_1 SSP + \beta_2 LI + \beta_3 IT + \varepsilon_l, \quad (1)$$

$$CUSAT = \beta_0 + \beta_1 SSP + \beta_2 LI + \\ + \beta_3 IT + \beta_4 LT + \varepsilon_l, \quad (2)$$

$$LT = c + \beta_1 SSP + \beta_2 LI + \beta_3 IT + \varepsilon_l, \quad (3)$$

where $CUSAT$ – Customer satisfaction, SSP – Strategic supplier partnership, LI – Lean inventory, IT – Information technology, LT – Lead time.

2.1. Data analysis

The study adopts a structural equation model (SEM) that deal with the relationship between the dependent and explanatory variables, including a moderating variable (Tarurhor & Emudainohwo, 2020; Tarurhor, 2017; Civelek, 2018). Thus, structural equation modeling is most suitable and adequate for this study since there is a presence of moderating variable (lead time), which interface between the dependent variable (customer satisfaction) and the independent variables (strategic supplier partnership, lean inventory, and information technology) because of its relational nature (Kumar & Upadhaya, 2017).

This study considers the determination of minimum numbers of respondents used when structural equation modeling analysis is adopted in a study. For instance, Sumwarno (2002) stated that the number of structural equation modeling analysis samples that would provide a reasonably stable result is between 200 to 600 respondents. Bentler and Chou (1987) suggested a minimum of 150, while Celik and Yilmaz (2013) argued that the sample size should be between ≥ 200 and ≤ 500. Kumar and Upadhaya (2017) noted that a sample size of fewer than 500 respondents could not capture indirect effects in a structural equation modeling analysis. Arising from above, this study implies multiple regression analysis to the structural equation model analysis to establish the impact of the moderating variable as the sample size is two hundred and sixty-five (265).

3. RESULTS AND DISCUSSIONS

265 questionnaires were distributed, out of which 258 were retrieved, but nine (9) had incomplete

information. Impliedly, only 249 questionnaires were found valid and used for this analysis, as shown in Table 1. This number satisfies the minimum benchmark for a sample size of studies where SEM is used for analysis.

Table 1. Questionnaire distributions

Categories	Numbers distributed	Useful questionnaire
Health Workers	105	100
Patients	160	149
Total		249

Table 2 shows that lead time is the most influential variable that affects customer satisfaction reporting 4.08 mean value, comparing to information technology having 3.77 and thus being the lowest contributing indicator to customer satisfaction.

Table 2. Descriptive statistics

Source: Authors' estimate (2020).

Variable	Obs	Mean	Std. Dev.	Min	Max
CUSAT	149	3.838019	.5058798	2	5
SSP	100	3.864028	.4827012	2.285714	5
LI	100	3.898451	.4612343	2.714286	5
IT	100	3.767068	.5494314	2	5
LT	100	4.080321	.582581	2.333333	5

Table 3 shows that there is a percentage increase of 12.98% in R^2 and 12.97% for adjusted-R^2 from model 1 to model 2. The R^2 was 43.43% in model 1 when lead time was not included and further rose to 56.41% when the moderating variable of lead time was included. In the same vein, the inventory management variables of SSP, LI, and IT could explain 42.73% of customer satisfaction in model 1, when the moderating variable of lead time was excluded. However, it increases to 55.70% in model 2, by the presence of lead time, implying that the unexplained customer satisfaction by proxies of inventory management was 44.40% as against 57.27% of Model 1.

Table 3. Regression results

Source: Authors' estimate (2020).

Variable	Model 1	Model 2
Coefficients –SSP	0.2417884*	0.2255082*
LI	0.5750739*	0.397737*
IT	−0.0283682	0.0271497
LT		0.3352586*
R^2	0.4343	0.5641
Adjusted R^2	0.4273	0.5570
F	62.68	78.94

Note: *$P < 0.001$.

Similarly, when variable moderation was excluded, as shown in model 1, the study result showed a negative relationship of −0.0283682 between information technology and customer satisfaction, while a positive relationship of 0.0271497 when lead time was included in model 2. Furthermore, lead time possesses a moderator role in the relationship between the proxies of inventory management and customer satisfaction.

Table 4 reports the fit indices or fit statistics used to ascertain whether the model is suitable for using SEM in the study. Kline (2005) suggested that studies using SEM should report Chi-square, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and SRMR. These results, shown in Table 4, confirmed that the model is suitable for this study because they satisfied the acceptable benchmark.

Table 4. Fit statistics

Source: Authors' estimate (2020).

Variable	Result	Cut-off for good fit
Chi-Square	241.108	≥ 0.95
RMSEA	0.000	≤ 0.08
CFI	1.000	≥ 0.90
SRMR	0.000	≤ 0.08

The diagram in Figure 1 and SEM results in Table 5 shows that strategic supplier partnership (SSP) has a positive effect (0.048) on lead time (LT) (model 3), while lean inventory(li) also indicates a positive statistically significant effect of 0.53 on the lead time at 1% level of significance. In the same vein, the lead time relationship with information technology (IT) shows a negative statistically significant relationship at 5% significantly (−0.17). This result reaffirms the significant effect of moderating role, as it is statistically significant with explanatory variables of SSP and IT.

The strategic supplier partnership relationship on customer satisfaction reports 0.23 positive effects, statistically significant at 1%. This finding supports the works of Ogonu et al. (2016). However, it conflicts with the study of Mukopi and Iravo (2015). There is a positive effect (0.4) of lean inventory and customer satisfaction, which is also statistically significant at 1%. This result also supports Ogonu et al. (2016) in the study on supermarkets
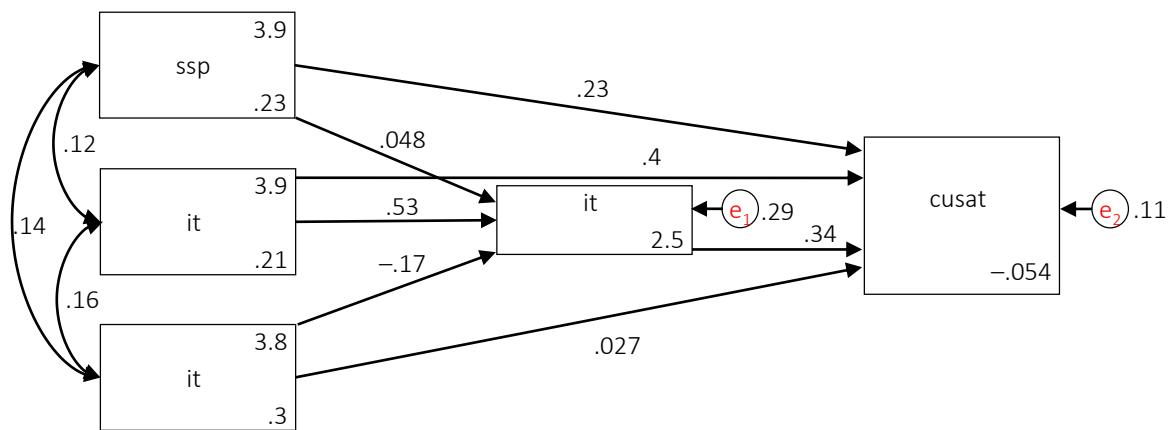
Figure 1. SEM diagram

in Nigeria. However, the study's outcome reports a non-significant relationship between information technology and customer satisfaction.

Furthermore, the relationship between the moderating variable of lead time and customer satisfaction reports a positive and statistically significant association of 0.34 at a 1% level of significance. This result supports Mfwaya's (2013) study in Kenya.

The LR test is statistically significant, reporting a Chi-square value of 241.08 with a P-value of 0.000.

This is a confirmation that the SEM model is valid for this study.

Table 5. SEM results

Variable	Model 2	Model 3
Coefficients –SSP	0.2255082*	0.048411
LI	0.397737*	0.5289596*
IT	0.0271497	−0.1655972**
LT	0.3352586*	

*Note: *P < 0.001, **P < 0.005.*

LR test of model Vs. saturated: chi2 (0) = 0.000, Prob > chi2=241.108.

CONCLUSION

This study has expanded literature on the impact of inventory management, including a moderating variable of lead time on customer satisfaction in government-owned hospitals in Delta State. The findings established a positive and statistically significant relationship between strategic supplier partnership, lean inventory, lead time, and customer satisfaction at a 1% level of significance. However, the result shows a non-significant relationship between information technology and customer satisfaction.

Lead time possesses the characteristics of a moderating role in this study. Thus, the presence of lead time in model 2 reports that R^2 of 56.41% and its exclusion, as shown in model 1, had R^2 of 43.43%. This means that the moderating variable had contributed about 12.98% impacts on customer satisfaction. Besides, lead time had caused information technology to positively affect customer satisfaction as against a negative effect (−0.0283682) when excluded from model 1. This study recommends the government to come out with a policy framework on the maintenance of lead time that hospitals managements should key into as this will guide against shortages of inventories in the public health sector.

Notwithstanding the efforts made on this study, it is not without some limitations. Firstly, the research focuses only on government-owned hospitals including privately owned hospitals associated with a lot of unqualified staff and shortages of inventories. Furthermore, the sample size to capture direct and indirect effects by SEM is less than 500; hence, the study could not measure these.

AUTHOR CONTRIBUTIONS

Conceptualization: Emmanuel Mitaire Tarurhor, Henry Osahon Osazevbaru.
Data curation: Henry Osahon Osazevbaru.
Formal analysis: Emmanuel Mitaire Tarurhor.
Funding acquisition: Emmanuel Mitaire Tarurhor, Henry Osahon Osazevbaru.
Investigation: Emmanuel Mitaire Tarurhor.
Methodology: Emmanuel Mitaire Tarurhor.
Resources: Henry Osahon Osazevbaru.
Software: Emmanuel Mitaire Tarurhor.
Supervision: Henry Osahon Osazevbaru.
Validation: Emmanuel Mitaire Tarurhor, Henry Osahon Osazevbaru.
Writing – original draft: Emmanuel Mitaire Tarurhor, Henry Osahon Osazevbaru.

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