

A STRUCTURAL ANALYSIS OF DIGITAL CUSTOMER ENGAGEMENT DRIVERS AND THEIR INFLUENCE ON CUSTOMER SATISFACTION IN NIGERIA'S PORT LOGISTICS SERVICE ECOSYSTEM

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ABSTRACT: In the rapidly evolving digital economy, customer engagement has emerged as a critical determinant of business success, particularly within complex service ecosystems such as port logistics. In Nigeria, where port operations are vital to trade and economic development, the adoption of digital tools to enhance customer interaction and satisfaction is gaining prominence. This study conducts a structural analysis of the key drivers of digital customer engagement and investigates their influence on customer satisfaction within Nigeria's port logistics sector. By exploring the influence of digital customer engagement drivers on customer satisfaction in Nigeria's port logistics service ecosystem, the research aims to provide actionable insights into optimizing digital engagement strategies for improved service delivery and stakeholder experience. To achieve this objective, the main source of data was through primary source with the use of questionnaire. The researcher adopted the survey research design approach and data were collected from 323 respondents drawn from the port logistics service firms' customers' base. A total number of 318 copies of the questionnaire were retrieved in useable form representing 98.5 percent of data analyzed using the Simple Regression Model (SRM). Data generated from the study were processed using descriptive and inferential statistics and hypotheses tested at 0.05 level of significance. Findings revealed that digital customer engagement drivers had significant influence on customer satisfaction within Nigeria's port logistics service ecosystem. Thus, the study recommended that the port managers should utilize predictive analytics to deliver proactive services by examining historical customer behavior, shipment patterns, and cargo categories to anticipate future customers' needs.

Keywords: Digital Customer Engagement Drivers, Port Service Personalization, Online Payment Integration, Customer Satisfaction.

Introduction

In the rapidly evolving global economy, digital transformation has become a cornerstone for enhancing customer experience and operational efficiency across various sectors. The port logistics service ecosystem in Nigeria, a vital conduit for international trade and economic development, is no exception. As logistics operations grow more complex, the need for seamless, responsive, and customer-centric services has intensified. In this context, **digital**

customer engagement (DCE) has emerged as a strategic tool for fostering stronger relationships between service providers and customers.

Digital customer engagement encompasses the use of digital technologies—such as mobile apps, web platforms, social media, and online payment integration, personalization and real-time communication tools— to interact with, inform, and support customers throughout their service journey. These engagement drivers, when effectively deployed, have the potential to enhance customer satisfaction by improving transparency, responsiveness, and service reliability. However, in Nigeria’s port logistics sector—characterized by infrastructural challenges, regulatory complexities, and service delays—the adoption and impact of DCE initiatives remain underexplored (Etuk, Akpan and Awah, 2025).

Understanding the influence of digital engagement drivers—such as ease of access to information, responsiveness to queries, personalized communication, and online service integration—on customer satisfaction is crucial for improving service delivery and competitiveness. This study aims to investigate how these digital engagement mechanisms affect customer satisfaction within Nigeria's port logistics ecosystem. By identifying the most impactful drivers, the research seeks to provide actionable insights for policymakers, port authorities and logistics firms striving to modernize operations and meet rising customer expectations in a digital age.

Statement of the Problem

In Nigeria's rapidly evolving port logistics service ecosystem, digital transformation has become a key priority for enhancing operational efficiency and customer experience. However, despite increasing investments in digital platforms—such as online tracking systems, customer portals, mobile applications, and social media channels—customer satisfaction remains inconsistent and often below expectations. This disconnect suggests that the mere availability of digital engagement tools does not automatically translate into improved customer outcomes.

Key drivers of digital customer engagement—such as system usability, responsiveness, personalization, reliability, online payment integration and communication—may not be effectively aligned with customer expectations or contextual realities in Nigeria's port logistics sector. Moreover, there is limited empirical evidence examining how these drivers influence customer satisfaction in this specific environment, where challenges such as infrastructural deficiencies, regulatory inefficiencies, and human capital gaps persist.

Without a clear understanding of which digital engagement factors significantly affect customer satisfaction, service providers risk misallocating resources or under-delivering value. This study seeks to address this critical gap by exploring the influence of digital customer engagement drivers on customer satisfaction, providing data-driven insights to support more strategic digital transformation efforts within Nigeria’s port logistics service ecosystem.

Objectives of the Study

The main objective of this study was to examine the influence of digital customer engagement drivers on customer satisfaction of Nigeria’s port logistics ecosystem. The specific objectives therefore include to:

- Examine the influence of port service personalization on customer satisfaction of Nigeria’s port logistics service ecosystem.
- Ascertain how online payment integration influences customer satisfaction of Nigeria’s port logistics service ecosystem.

Research Questions

This study attempt to provide answers to the following research questions:

- What is the influence of port service personalization on customer satisfaction of Nigeria's port logistics service ecosystem?
- To what extent does online payment integration influences customer satisfaction of Nigeria's port logistics service ecosystem?

Research Hypotheses

The following hypotheses were postulated to guide the study

Ho₁: Port service personalization does not significantly influence customer satisfaction of Nigeria's port logistics service ecosystem.

Ho₂: Online payment integration does not significantly influence customer satisfaction of Nigeria's port logistics service ecosystem.

Review of Related Literature

Concept of Digital Customer Engagement Drivers

The Nigerian port logistics sector is undergoing a significant transformation, embracing digital technologies to enhance operational efficiency and customer satisfaction. Digital customer engagement drivers—such as online payment integration, real-time tracking, port service personalization and automated services—play a pivotal role in this evolution. Understanding these drivers is crucial for stakeholders aiming to improve service delivery and maintain competitiveness in the global maritime industry.

Digital customer engagement drivers refer to the technological tools and strategies employed to interact with customers, streamline services, and foster long-term relationships. In the context of port logistics, these include:

- **Online Service Platforms:** Web-based portals enabling customers to access services such as cargo tracking, payment processing, and documentation.
 - **Real-Time Tracking Systems:** GPS and IoT technologies providing live updates on cargo movement, enhancing transparency and trust.
 - **Automated Communication Channels:** Chat bots and automated emails facilitating timely information dissemination and customer support.
 - **Mobile Applications:** Apps offering on-the-go access to port services, improving convenience for users.
- Nigeria has initiated several digital initiatives to modernize its port operations:
- **Digitalization Roadmap:** The Nigerian Ports Authority (NPA) aims to achieve full digitalization of port operations by 2025, focusing on creating a paperless and efficient system. ([Ship Technology](#))
 - **Electronic Truck Call-Up System (ETO):** Implemented to manage truck traffic and reduce congestion at ports, enhancing operational efficiency.
 - **Electronic Regulatory Port Portal (ERPP):** Developed by the Nigerian Shippers' Council to streamline regulatory processes and improve transparency. ([shippingposition](#))
 - **Online Terminal Services:** Platforms like the one launched by the West Africa Container Terminal (WACT) at the Port of Onne allow customers to manage cargo movements digitally, offering real-time visibility and control. ([The Guardian Nigeria](#))

The adoption of digital customer engagement drivers has led to:

- **Enhanced Transparency:** Real-time tracking systems provide customers with up-to-date information on cargo status, fostering trust. ([adubiexpress.com](#))
- **Improved Efficiency:** Automated processes reduce delays and errors, leading to faster service delivery.

- **Increased Accessibility:** Mobile applications and online platforms make it easier for customers to access services anytime, anywhere.
- **Personalized Services:** Data analytics enable the customization of services to meet individual customer needs.

Digital customer engagement drivers can aid to transform Nigeria's port logistics ecosystem, offering opportunities for improved efficiency, transparency, and customer satisfaction. While challenges exist, strategic investments in infrastructure, capacity building, and policy development can facilitate the successful integration of digital technologies, positioning Nigeria's ports as competitive players in the global maritime industry.

Port Service Personalization and Customer Satisfaction

Port service personalization involves tailoring port services to meet the specific needs and preferences of individual customers. This approach aims to enhance customer satisfaction, loyalty and operational efficiency by delivering customized experiences. In the context of port logistics, personalization can encompass various aspects, including real-time cargo tracking, customized communication channels and flexible service offerings (Taylor and Francis, 2025).

Nigeria's port sector has been undergoing significant reforms aimed at enhancing efficiency and competitiveness. The Nigerian Ports Authority (NPA) has embarked on a digitalization roadmap to transform port operations into a fully digital ecosystem by 2025. This initiative includes the deployment of systems such as the Oracle Enterprise Business Suite and the Billing/Revenue and Invoice Management System (RIMS) to streamline operations and improve customer service. Despite these efforts, the digitalization process remains in a hybrid stage due to economic challenges and infrastructural constraints. Many stakeholders still rely on manual processes, which hampers the full realization of personalized services (Nwachukwu, 2023).

Adopting a customer-centric approach is crucial for enhancing user acquisition and retention in the logistics industry. Companies like Sendy Fulfilment have demonstrated the effectiveness of understanding customer pain points and tailoring services accordingly. By focusing on reliable, affordable, and tech-driven delivery solutions, they have been able to build trust and foster loyalty among their clientele.

In the Nigerian context, implementing loyalty programs and leveraging data analytics can further deepen customer engagement. These strategies enable service providers to offer incentives, understand customer behavior and refine service offerings to meet evolving customers' needs. The integration of advanced technologies such as Artificial Intelligence (AI) and Machine Learning (ML) plays a pivotal role in personalizing port services. These technologies facilitate the analysis of extensive datasets to uncover patterns and insights that inform decision-making processes. By continuously learning from customer interactions, AI and ML systems can predict future behaviors and preferences, enabling proactive service customization. Furthermore, the adoption of Internet of Things (IoT) technologies can enhance real-time communication with customers, allowing for prompt responses to inquiries and concerns. This capability reinforces a commitment to exceptional service and builds trust with customers (Etuk, 2025).

Port service personalization plays a pivotal role in enhancing customer satisfaction within Nigeria's port logistics ecosystem. By aligning services with individual customer needs and expectations, ports can improve service quality and foster customer loyalty. Addressing infrastructural, technological, and human resource challenges is essential to fully realize the benefits of personalized services.

Online Payment Integration and Customer Satisfaction

The integration of online payment systems has revolutionized service delivery across various sectors in Nigeria, including the port logistics industry. As ports serve as critical nodes in global trade, the efficiency and reliability of their services, including payment processes, significantly impact customer satisfaction. Understanding how online payment integration influences customer experiences in Nigeria's port logistics sector is essential for enhancing service quality and competitiveness.

Nigeria has witnessed a significant shift towards electronic payment systems, driven by advancements in Information and Communication Technology (ICT) and the Central Bank of Nigeria's cashless policy initiatives. Electronic payment methods, such as mobile banking, internet banking, and point-of-sale (POS) systems, have become increasingly prevalent, offering convenience and efficiency to users. A study by Fenuga and Kolade (2010) highlighted that electronic payments have a substantial impact on service delivery, improving management efficiency and customer satisfaction in Nigerian banks.

The adoption of online payment systems in the port logistics sector enhances customer satisfaction through several avenues:

- **Convenience and Efficiency:** Online payments eliminate the need for physical presence, reducing transaction times and queues. This convenience aligns with customer expectations for swift and seamless services.
- **Reliability and Trust:** Secure and reliable payment platforms build customer trust. The study by Mbamalu (2022) emphasized that reliability and trust are critical determinants of customer satisfaction in e-service contexts.
- **Accessibility:** Online payments provide 24/7 access to services, catering to customers' needs beyond traditional working hours.

However, Awah, Akpan and Affiah (2025) posits that challenges such as network reliability, cybersecurity concerns, and limited digital literacy can hinder the effectiveness of online payment systems, potentially affecting customer satisfaction negatively. In the context of Nigeria's port logistics services, integrating online payment systems can streamline operations such as cargo handling fees, customs duties, and other related charges. According to them, efficient payment processes can lead to:

- **Reduced Delays:** Prompt payments facilitate quicker clearance and movement of goods, enhancing overall service delivery.
- **Transparency:** Digital payment records provide clear transaction histories, aiding in dispute resolution and fostering trust.
- **Customer Empowerment:** Providing multiple payment options empowers customers to choose methods that best suit their preferences, improving their overall experience.

The integration of online payment systems holds significant promise for enhancing customer satisfaction in Nigeria's port logistics service ecosystem. By offering convenience, reliability, and efficiency, these systems can transform service delivery and customer experiences. However, successful implementation necessitates addressing infrastructural, security, and educational challenges to fully realize the benefits of digital payment integration.

Customer Satisfaction

Customer satisfaction is a pivotal metric in assessing the performance and competitiveness of port logistics services. In Nigeria, the efficiency and quality of port services directly influence trade facilitation, economic growth, and stakeholder confidence. Understanding the determinants of customer satisfaction within this sector is essential for implementing improvements and fostering sustainable development. Customer satisfaction in port logistics refers to the degree to which port users' expectations are met or exceeded by the services provided. Key factors influencing satisfaction include service reliability, responsiveness, assurance, empathy, and tangibility.

These dimensions are often evaluated using models like SERVQUAL, which assesses the gap between customer expectations and perceptions of service delivery ([InderScience](#)).

Several studies have explored customer satisfaction within Nigeria's port logistics ecosystem. Ugboma et al. (2007) employed the SERVQUAL model to assess service quality at Nigerian ports, their study findings revealed that dimensions such as reliability and responsiveness significantly impact customer satisfaction. Sakyi et al. (2020) conducted a terminal-level analysis of service quality across Nigerian seaports, their study findings revealed that responsiveness and assurance were the least rated service quality dimensions, indicating areas needing improvement to enhance customer satisfaction. Naziah et al. (2020) in their study evaluated stakeholder satisfaction with the performance of selected Nigerian seaports, their study findings revealed that while environmental performance was rated high, congestion remained a significant concern affecting overall satisfaction.

Customer satisfaction is integral to the success and competitiveness of Nigeria's port logistics sector. By addressing infrastructural, operational, regulatory, and technological challenges, port authorities and stakeholders can enhance service quality, meet customer expectations and foster economic growth. Continuous assessment and improvement of service delivery are essential for achieving sustained customer satisfaction in the evolving maritime industry ([InderScience](#)).

Theoretical Framework

In this section the theory considered relevant for this study was;

Technology Acceptance Model (TAM) propounded by Fred Davis (1986)

This is one of the most widely used models in understanding how users come to accept and use technology. It was developed to explain and predict users' acceptance of new technologies. The model proposes that two major factors influence a person decision to adopt and use technology:

- Perceived usefulness (PU): The degree to which a person believes that using a particular technology will enhance their performance or make a task easier.
- Perceived ease of use (PEOU): The degree to which a person believes that using the technology will be free of effort.

TAM suggests that when people perceive a technology as useful and easy to use, they are more likely to accept and adopt it. This model has been widely applied in studying technology use across various sectors, including marketing and consumer behavior.

Review of Empirical Studies

Nwidua (2025): Electronic payment systems and customer patronage of shopping malls in south-south zone, Nigeria. The study aimed to explore the relationship between electronic payment systems and customer patronage of shopping mall. The method for data analysis involved a descriptive survey research method. The finding of the study revealed that card payment system, electronic funds transfer and e-wallet payment system had a significant relationship with customer patronage of shopping malls in south-south zone, Nigeria. They recommended that shopping mall operators in the zone who were yet to introduce sustainable electronic payment system should introduce it immediately to promote customer patronage and repeat purchase.

Amadi and Ikeni (2022): Digital marketing strategy and customer satisfaction with airline operators in Nigeria. The study aimed at empirically exploring the relationship between digital marketing strategy and customer satisfaction of airline operators in Nigeria. Data obtained were analyzed using the spearman's rank correlation coefficient statistical tool, The study findings revealed a positive and significant relationship between the

dimensions of digital marketing strategies (such as mobile website and search engine marketing) and the measures of customer fulfilment(customer engagement and electronic word-of-mouth) They recommended that airline operators should develop corporate web pages and design their websites to be user-friendly, facilitate the process of buying tickets, follow a transparent policy, prepare a web-based campaigns that will surprise, amaze and entertain customers. These will improve customer engagement and electronic word-of-mouth.

METHODOLOGY

Design of the Study

The study utilized a survey research design. Information on both the independent and dependent variables was collected from different segments of Nigeria's port logistics service ecosystem. This approach allowed the researcher to reach and interact with a large number of customers within the region's port logistics services.

Population of the Study

The study focused on all customers of Nigeria's port logistics services, rendering the target population virtually unlimited.

Sampling and the Sample Size determination

Since the population size for the study was infinite, sample size for this study was determined using the Topman Formula at 5% level of tolerable error.

The formula is given as

$$n = \frac{Z^2 \cdot pq}{e^2}$$

Where n = required sample size

z = the value of z-score associated with the degree of confidence is 95% confidence level being 1.96 from the Z-score table.

p = 0.7 decimal (positive)

q = 0.3 decimal (negative)

e = acceptable tolerance level of error (stated in percentage points)

$$\begin{aligned} n &= \frac{Z^2 \cdot pq}{e^2} \\ &= \frac{1.96^2 \cdot (0.7 \times 0.3)}{0.05^2} \\ &= \frac{3.8416 \times 0.21}{0.0025} \\ &= \frac{0.806736}{0.0025} \\ &= 322.6 \\ &= 323 \end{aligned}$$

Therefore, the sample size of the study was 323.

Sampling Procedure

The study adopted a convenience sampling technique to administer the research instrument. This method involved selecting participants who were both accessible and available, and who agreed to participate in the research.

Methods of Data Collection

The data analysis involved both descriptive and inferential statistical methods. A simple regression analysis was used to evaluate how customer engagement drivers influenced customer satisfaction. All hypotheses were tested at a significance level of $P > 0.05$.

Sources of Data

The main source of data employed in this study was the primary data source. The primary data source was a structured questionnaire which was served on respondents. The questionnaire was made up of two sections: section “A” generated data on demography, while section “B” was made up of two sub- sections which were the independent variable (customer engagement drivers) and the dependent variable (customer satisfaction).

DATA PRESENTATION AND ANALYSIS

Data Analysis

Test of Hypothesis One

Port service personalization does not significantly influence customer satisfaction of Nigeria’s port logistics service ecosystem.

Table 1: Model Summary of the Influence of Port Service Personalization on Customer Satisfaction of Nigeria’s Port Logistics Ecosystem

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.717 ^a	.791	.713	.81620

a. Predictors (constant), Port Service Personalization

Source: Field Survey, 2025

Analysis of Variance of the Influence of Port Service Personalization on Customer Satisfaction of Nigeria’s Port Logistics Ecosystem

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	1935.941	1	1698.853	25742.749	.000 ^b
1 Residual	852.582		3185.731		
Total	2788.523	319			

a. **Dependent Variable:** Customer Satisfaction

b. **Predictors:** (Constant), Port Service Personalization

Source: Field Survey, 2025

The regression in table 1 shows that the coefficient of the constant terms (that is, the explanatory or predictor) variable. Payment Systems Reliability has R-value of (.717) which indicates a positive relationship between the explanatory variable and the criteria variable. The R-square, the coefficient of determination value is (.791). This means that 79.1 percent of the variation on the Customer Satisfaction can be explained from the independent variable (Port Service Personalization). The table also shows the adjusted R-square for the model as (.713). But adjusted R-square is very useful in multiple regression analysis where it adjusts the R-square by the number of predictor values in the model. This adjustment allows the easy comparison of the explanatory power of the models with different numbers of independent variables. The F-ratio in the ANOVA table shows the overall regression

effect in the model. The F-ratio value is 25742.749 which is significant at 0.000 and is less than 0.05 percent level of significance. Therefore we reject the null hypothesis and accept that Port Service Personalization contribute towards Customer Satisfaction of Nigeria’s port logistics service ecosystem.

Hypothesis 2

Online payment integration does not significantly influence customer satisfaction of Nigeria’s port logistics service ecosystem.

Table 2: Model Summary of Online Payment Integration on Customer Satisfaction of Nigeria’s Port Logistics Service Ecosystem

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.779	.837	.741	.59521

a. Predictors: (Constant), Online Payment Integration

Analysis of Variance of the Influence of Online Payment Integration on Customer Satisfaction of Nigeria’s Port Logistics Service Ecosystem

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	1852.963	1	1572.752	2649.475	.000 ^b
1 Residual	864.795		3187.871		
Total	2717.758	319			

a. **Dependent Variable:** Customer Satisfaction

b. **Predictors:** (Constant), Online Payment Integration

Source: Field Survey, 2025

The regression result in table 2 revealed that the regression coefficient of R-value is (.779) which indicates that there is a strong positive relationship existing between online payment integration and customer satisfaction of Nigeria’s port logistics service ecosystem. The model summary table shows that the R-Square regression coefficient is (.837), which indicate that online payment integration accounts for 83.7 percent of the total variation on the customer satisfaction of the port logistics service ecosystem in the study area. The ANOVA table shows the F-ratio for the regression model which indicates the statistical significance of the overall regression model. The F-ratio value is 2649.475 which is statistically significance at 0.000 level, since the probability value (P-V=0.000) is less than 0.05 percent, we reject the null hypothesis and upheld the alternative. This means that there is a significant influence of Online Payment Integration on Customer Satisfaction in the port logistics service ecosystem.

Discussion of Findings

The first hypothesis of this study states that port service personalization does not significantly influence customer satisfaction of Nigeria’s port logistics service ecosystem. The findings of the study revealed a significant influence of Port service personalization on customer satisfaction of Nigeria’s port logistics service ecosystem. The F-ratio in the ANOVA table 1 shows the overall regression effect in the model. The F-ratio was 25742.749 which was significant at 0.000 and was less than 0.05 percent level of significance. This is in consonance with the study of Amadi and Ikeni (2022) who found out that there was a significant relationship between digital marketing strategy and customer satisfaction with airline operators in Nigeria.

The second hypothesis of this study states that online payment integration does not significantly influence customer satisfaction of Nigeria’s port logistics service ecosystem. The findings of the study revealed a significant influence

of online payment integration on customer satisfaction of Nigeria's port logistics service ecosystem. The F-ratio in the ANOVA table 2 shows the overall regression effect in the model. The F-ratio was 2649.475 which was significant at 0.000 and was less than 0.05 percent level of significance. This is in consonance with the study of Nwidua (2025) which revealed a significant relationship between electronic payment systems and customer patronage of shopping malls in south-south zone, Nigeria.

SUMMARY, CONCLUSIONS AND RECOMMENDATION

Summary

The main thrust of this study has been presented in the preceding sections. This section is concerned with the summary of major findings. The study investigated the influence of digital customer engagement drivers on customer satisfaction in the Nigeria's port logistics service ecosystem. Two hypotheses were formulated to guide this study and all the hypotheses were tested at 0.05 level of significance through the use of simple regression analysis. The two null hypotheses were rejected and the alternative hypotheses accepted. This resulted from the fact that the regression results were all significant, the computed F-values for all the two hypotheses show statistical significance of the overall regression model, this means that there was statistical significant influence of Digital Customer Engagement Drivers such as (port service personalization and online payment integration) on Customer Satisfaction in the Nigeria's port logistics service ecosystem.

To achieve the objectives, a survey research design was used to reach out to the respondents of the port logistics service firms. The population of the study was infinite. The Top man sample size determination formula at 5% level of tolerable error was used to determine the sample size of 323. The convenience sampling technique was employed in the administration of the research instrument for the study.

Conclusion

Based on the findings of this study, the following conclusions were established.

- Port Service Personalization has significant influence on Customer Satisfaction in the Nigeria's port logistics service ecosystem.
- Online Payment Integration has significant influence on Customer Satisfaction in the Nigeria's port logistics service ecosystem.

Recommendations

Based on the findings of this study, we recommend that Nigeria's port logistics service managers should:

- Utilize predictive analytics to deliver proactive services by examining historical customer behavior, shipment patterns, and cargo categories to anticipate future customers' needs.
- Implement modern, secure and flexible online payment system such as pay portals, mobile money and card payments in order to provide safe, fast and convenient transactions to boost customer trust and satisfaction.

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