Last-Mile Delivery Strategy, Consumer Proximity and Customer Satisfaction Among E-Commerce Customers in Port Harcourt

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Abstract
The rapid expansion of e-commerce has elevated last-mile delivery as a critical determinant of customer experience, yet operators in Port Harcourt continue to face traffic congestion, incomplete addressing systems and infrastructure constraints that generate delays and dissatisfaction. This study investigates the influence of last-mile delivery strategy comprising delivery timeliness, tracking and information, and delivery flexibility on customer satisfaction (satisfaction with delivery, expectation fulfilment and overall e-commerce experience), with consumer proximity (geographic closeness, delivery-point accessibility and collection convenience) as mediator. Grounded in Expectation-Confirmation Theory and the SERVQUAL model, a cross-sectional survey was conducted among e-commerce customers who had received at least one online order in the preceding six months. Convenience and snowball sampling produced 386 usable responses from 420 distributed questionnaires. Data were analysed using Partial Least Squares Structural Equation Modelling (SmartPLS 4.0). Results confirmed significant positive direct effects of all strategy dimensions on satisfaction, partial mediation by consumer proximity, and substantial explanatory power. The study concludes that effective last-mile strategies enhance satisfaction both directly and through greater perceived proximity. It recommends prioritising real-time tracking, expanding flexible delivery options, establishing neighbourhood collection hubs, and supporting shared urban logistics and digital addressing infrastructure.

Keywords*: last-mile delivery; consumer proximity; customer satisfaction; e-commerce; Port Harcourt.*

Introduction

The explosive growth of e-commerce has transformed retail competition, shifting the decisive battleground from product assortment and price to the quality of the final delivery experience. Last-mile delivery the movement of goods from a distribution hub to the end consumer now accounts for a substantial share of total logistics cost and is widely recognised as the most visible and emotionally charged stage of the online purchase journey (Esper et al., 2003; Aljohani, 2024). When last-mile performance falters, customers experience frustration, eroded trust, and reduced repurchase intention; when it succeeds, satisfaction and loyalty rise markedly (Vakulenko et al., 2023). In emerging markets such as Nigeria, and specifically in the oil-rich commercial city of Port Harcourt, last-mile delivery faces distinctive challenges: dense traffic congestion, incomplete addressing systems, security concerns, and uneven road infrastructure. These conditions amplify the importance of deliberate last-mile delivery strategies that emphasise delivery timeliness, real-time tracking and information, and delivery flexibility. At the same time, the physical and operational proximity of consumers to delivery points geographic closeness, delivery-point accessibility, and collection convenience may shape how delivery strategies translate into satisfaction (Christian et al., 2024). Although a growing body of international research has examined last-mile logistics and customer experience (Aljohani, 2024; Vakulenko et al., 2023), empirical investigations that simultaneously model last-mile delivery strategy, consumer proximity, and customer satisfaction among e-commerce users in Port Harcourt remain scarce. Most existing studies either focus on developed markets or examine pairwise relationships without testing mediation. This study therefore investigates the relationship between last-mile delivery strategy and customer satisfaction of e-commerce customers in Port Harcourt, with consumer proximity as a mediating variable, using Partial Least Squares Structural Equation Modelling (PLS-SEM). By integrating three core last-mile strategy dimensions with a multi-faceted proximity construct and three satisfaction outcomes, the study offers a comprehensive process model that clarifies how operational choices translate into customer value in an African urban setting.

Statement of the Problem

E-commerce platforms operating in Port Harcourt continue to receive complaints about delayed deliveries, inaccurate estimated arrival times, limited delivery-slot options, and difficulty locating customers or collection points. These service failures contribute to order cancellations, negative reviews, and customer attrition (DHL, 2025; Nigerian logistics reports, 2024–2025). While firms invest in courier partnerships and tracking technologies, the conversion of these operational investments into higher customer satisfaction is uneven.

Prior research confirms that last-mile attributes such as timeliness, tracking transparency, and flexibility influence satisfaction (Esper et al., 2003; Aljohani, 2024; Vakulenko et al., 2023). However, the pathways through which these strategies operate particularly the role of consumer proximity (geographic closeness, accessibility of delivery points, and collection convenience) have received limited attention in the Nigerian context. Without clarity on this mediating mechanism, managers may over-emphasise speed alone while under-investing in proximity-enhancing measures such as neighbourhood collection hubs, clear addressing support, or flexible pick-up options. Moreover, most empirical work on last-mile delivery and satisfaction has been conducted in Asia, Europe, or North America. Evidence from sub-Saharan African cities characterised by infrastructure constraints and informal addressing systems is still limited. This study addresses the gap by examining whether, and how, last-mile delivery strategy influences customer satisfaction

through consumer proximity among e-commerce customers in Port Harcourt. By focusing on Port Harcourt, a city that combines strong commercial demand with well-documented last-mile frictions the research generates actionable insights for e-commerce platforms, third-party logistics providers, and policy actors seeking to improve urban delivery performance in similar emerging-market settings.

Objectives of the Study

The broad objective is to examine the relationship between last-mile delivery strategy and customer satisfaction among e-commerce customers in Port Harcourt, with consumer proximity as a mediating variable. The specific objectives are to:

1. Determine the effect of delivery timeliness on customer satisfaction among e-commerce customers in Port Harcourt.
2. Ascertain the influence of tracking and information on customer satisfaction among e-commerce customers in Port Harcourt.
3. Examine the relationship between delivery flexibility and customer satisfaction among e-commerce customers in Port Harcourt.
4. Investigate the mediating effect of consumer proximity on the relationship between last-mile delivery strategy and customer satisfaction among e-commerce customers in Port Harcourt.

Research Questions

The following research questions guide the study:

1. To what extent does delivery timeliness influence customer satisfaction among e-commerce customers in Port Harcourt?
2. How does tracking and information affect customer satisfaction among e-commerce customers in Port Harcourt?
3. What is the relationship between delivery flexibility and customer satisfaction among e-commerce customers in Port Harcourt?
4. Does consumer proximity mediate the relationship between last-mile delivery strategy and customer satisfaction among e-commerce customers in Port Harcourt?

Research Hypotheses

The following null hypotheses are tested at the 0.05 level of significance:

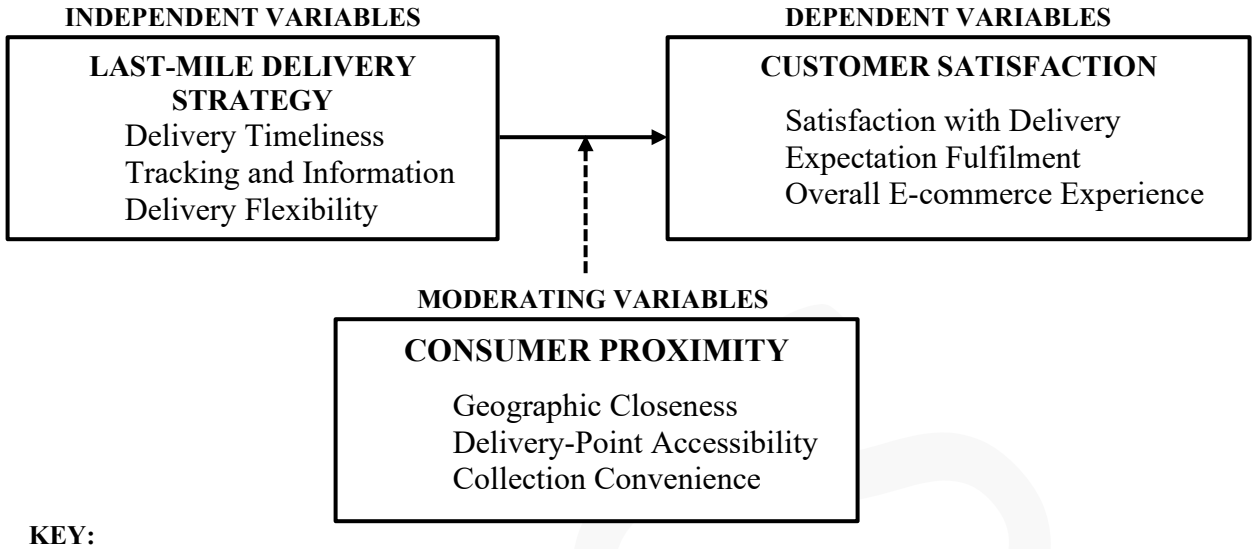
H_{o1}: There is no significant relationship between delivery timeliness and customer satisfaction among e-commerce customers in Port Harcourt.

H_{o2}: There is no significant relationship between tracking and information and customer satisfaction among e-commerce customers in Port Harcourt.

H_{o3}: There is no significant relationship between delivery flexibility and customer satisfaction among e-commerce customers in Port Harcourt.

H_{o4}: Consumer proximity does not significantly mediate the relationship between last-mile delivery strategy and customer satisfaction among e-commerce customers in Port Harcourt.

Conceptual Framework



***Source**:* Esper, T. L., Jensen, T. D., Turnipseed, F. L., & Burton, S. (2003). The last mile: An examination of effects of online retail delivery strategies on consumers. *Journal of Business Logistics, 24*(2), 177–203. Wiley Online Library
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Conceptual Review

Last-Mile Delivery Strategy

Last-mile delivery constitutes the final and most customer-facing stage of the e-commerce fulfilment chain. Industry estimates suggest that it can account for more than half of total shipping cost while simultaneously determining a large share of the customer experience. Consequently, firms that treat last-mile operations as a strategic capability rather than a pure cost centre are better positioned to convert logistics performance into satisfaction and loyalty (Aljohani, 2024; Vakulenko et al., 2023). Last-mile delivery strategy refers to the deliberate design and management of the final leg of the fulfilment process so as to meet customer expectations for speed, transparency, and convenience (Esper et al., 2003). In e-commerce, this stage is both the costliest and the most visible to the customer.

Delivery Timeliness: Delivery timeliness captures the extent to which parcels arrive within the promised or expected time window. On-time performance reduces anxiety, builds reliability perceptions, and is consistently ranked among the strongest drivers of last-mile satisfaction (Aljohani, 2024; Vakulenko et al., 2023). In Port Harcourt, timeliness is particularly salient because traffic congestion and occasional flooding can introduce large and unpredictable delays. Customers who receive accurate promises and consistent on-time performance develop higher trust

in the platform and the courier. Conversely, repeated late deliveries erode confidence and increase the likelihood of switching to alternative channels or sellers.

***Tracking and Information*:** Tracking and information refers to the provision of accurate, real-time status updates and estimated arrival times. Transparent information reduces uncertainty, lowers "where-is-my-order" contacts, and enhances perceived control (Vakulenko et al., 2023). Modern customers expect proactive notifications at key milestones order confirmation, dispatch, out-for-delivery, and successful drop-off. When tracking is incomplete or delayed, customers experience heightened anxiety and generate additional support contacts. In markets with infrastructure challenges, high-quality tracking can partially offset physical delays by keeping customers informed and managing expectations.

Delivery Flexibility: Delivery flexibility encompasses options such as choice of delivery slots, alternative drop-off locations, rescheduling, and unattended delivery. Flexibility allows customers to align delivery with their schedules and constraints, thereby increasing convenience and satisfaction (Aljohani, 2024). In a city where many customers work long hours or face unreliable public transport, the ability to select evening or weekend slots, redirect parcels to a workplace or collection point, or authorise safe-place delivery can dramatically improve the experience (Ifekanandu and Christian 2024). Limited flexibility forces customers into inconvenient arrangements and raises the risk of failed first attempts, which themselves generate dissatisfaction and extra cost.

Customer Satisfaction

In the e-commerce last-mile context, customer satisfaction is a multi-dimensional evaluation of the delivery episode and its contribution to the overall shopping experience. It comprises satisfaction with the delivery process itself, the degree to which prior expectations are met or exceeded, and a global judgement of the e-commerce experience (Esper et al., 2003; Aljohani, 2024). Satisfaction with delivery focuses on the concrete experience of receiving the parcel whether it arrived on time, in good condition, and with minimal hassle. Expectation fulfilment captures the cognitive comparison between what the customer anticipated (based on promised windows, tracking updates, and prior purchases) and what actually occurred. Overall e-commerce experience integrates the delivery episode into a broader evaluation of the platform, influencing repurchase intention and recommendation behaviour. Recent studies confirm that last-mile attributes are among the strongest predictors of these satisfaction facets in both developed and emerging markets.

Satisfaction with Delivery: Satisfaction with delivery refers to the extent to which customers are pleased with the process of receiving products purchased through e-commerce platforms. It reflects customers' evaluations of the efficiency, reliability, timeliness, and convenience of the delivery services provided by online retailers and logistics companies. In e-commerce, the delivery process represents an important stage of the customer experience because it determines how effectively a company fulfils its promise to deliver purchased products to customers. Customers assess delivery satisfaction based on whether their orders arrive within the agreed period, whether the products are received in good condition, and whether the delivery process involves unnecessary delays or inconvenience. The importance of satisfaction with delivery is particularly evident in last-mile logistics, where the interaction between customers and delivery personnel often represents the

most direct physical contact between the customer and the e-commerce provider. When delivery personnel are reliable, communicate appropriately, and deliver products as promised, customers are more likely to develop favourable perceptions of the service (Tom and Chigemecha 2026). Conversely, delayed deliveries, failed delivery attempts, damaged products, and poor communication can generate dissatisfaction and weaken customers' confidence in the online retailer. Aljohani (2024) and Vakulenko et al. (2023) highlight the importance of delivery-related service attributes in shaping customers' evaluations of online retail experiences.

Expectation Fulfilment: Expectation fulfilment refers to the extent to which the actual service experience corresponds with what customers anticipated before or during a transaction. In e-commerce, customers develop expectations from the delivery information provided by online retailers, estimated arrival times, tracking notifications, previous shopping experiences, and promises concerning delivery arrangements. After receiving their purchases, customers compare the actual delivery experience with these expectations to determine whether the service has met, exceeded, or fallen below the standard they anticipated. Expectation fulfilment is particularly important in last-mile delivery because customers often depend on information supplied by e-commerce platforms to make decisions about the availability of their time, the receipt of their purchases, and the arrangements necessary for collection. When a company communicates a realistic delivery time and fulfils its promise, customers are more likely to perceive the service as dependable. Similarly, accurate tracking information and effective communication help customers understand the progress of their orders and prepare for delivery. However, when a delivery arrives substantially later than promised, tracking information is inaccurate, or agreed delivery arrangements are not respected, customers may perceive the service as unreliable.

Overall E-commerce Experience: Overall e-commerce experience refers to customers' general evaluation of their interactions with an online shopping platform, from product selection and order placement to payment, communication, delivery, and receipt of purchased goods. Unlike satisfaction with delivery, which focuses specifically on the delivery process, overall e-commerce experience considers the broader impression customers develop from the entire online purchasing journey. It reflects whether the different stages of an online transaction combine to provide a convenient, dependable, and satisfactory shopping experience. Last-mile delivery contributes substantially to this overall evaluation because customers may judge an online retailer not only by the quality or price of the product purchased but also by the ease with which the product reaches them. A platform may offer attractive prices, a wide product selection, and a convenient ordering process, but repeated delivery delays or poor communication can weaken customers' overall assessment of the service. In contrast, timely delivery, transparent tracking information, flexible delivery arrangements, and effective handling of delivery difficulties can strengthen customers' perceptions of the online shopping experience. Vakulenko et al. (2023) emphasise the importance of last-mile delivery encounters in shaping customer experience.

Consumer Proximity

Consumer proximity denotes the perceived physical and operational nearness of the delivery system to the customer. It is reflected in geographic closeness (distance and travel time), delivery-point accessibility (ease of reaching or being reached by the courier), and collection convenience (ease of retrieving parcels from lockers, hubs, or alternative points). Higher proximity reduces friction and amplifies the positive effects of well-designed last-mile strategies. Geographic

closeness concerns the actual or perceived distance between the customer and the fulfilment or collection node. Delivery-point accessibility captures whether the chosen address or pick-up location can be reached reliably by the courier and by the customer. Collection convenience reflects the ease with which customers can retrieve parcels when home delivery is impractical through lockers, partner shops, or neighbourhood hubs. In cities where street addresses are incomplete and traffic is unpredictable, these proximity dimensions become critical mediators between operational strategy and felt satisfaction.

Geographic Closeness: Geographic closeness refers to the physical distance between customers and the locations through which their online purchases are delivered or collected. In e-commerce logistics, it concerns how near delivery facilities, collection centres, neighbourhood hubs, or other designated delivery points are to customers' homes, workplaces, or other preferred locations. Geographic closeness is an important consideration in last-mile delivery because the distance between customers and delivery locations can influence the time, effort, and transportation costs associated with receiving purchased products. When delivery or collection points are located close to customers, the process of obtaining online purchases may become more convenient. Customers may spend less time travelling to collect parcels, while logistics providers may find it easier to organise delivery routes and serve customers within particular neighbourhoods. Locating collection facilities closer to residential and commercial areas may also provide an alternative when direct home delivery is difficult. However, geographic closeness does not automatically guarantee effective delivery, because road accessibility, traffic conditions, operating hours, and the reliability of logistics services may also influence the actual convenience experienced by customers.

Delivery-Point Accessibility: Delivery-point accessibility refers to the ease with which customers and delivery personnel can reach designated locations for the delivery or collection of online purchases. It goes beyond physical distance to consider whether a location can be identified, approached, entered, and used without excessive difficulty. A delivery point may be geographically close to a customer but remain inconvenient if the roads leading to it are poor, the address is difficult to identify, or the location lacks clear directions. Consequently, accessibility represents an important operational dimension of consumer proximity in last-mile logistics. Effective delivery-point accessibility depends on several factors, including the clarity of street addresses, road conditions, the availability of directions, the visibility of collection facilities, and the ability of delivery personnel to locate customers accurately. Where addresses are incomplete or difficult to identify, couriers may spend additional time contacting customers, searching for locations, or attempting unsuccessful deliveries. These difficulties can increase operational costs and create frustration for both customers and logistics providers. Conversely, clear addressing information, accessible roads, reliable location details, and easily identifiable collection points can facilitate successful deliveries and reduce unnecessary delays.

Collection Convenience: Collection convenience refers to the extent to which customers can retrieve their online purchases easily, comfortably, and with minimal time, effort, or disruption to their daily activities. It concerns the practical arrangements that enable customers to obtain their parcels through home delivery, designated collection centres, parcel lockers, partner retail outlets, or other available collection options. Collection convenience is an important dimension of consumer proximity because the usefulness of a delivery location depends not only on its distance

but also on how easily customers can collect their purchases at a suitable time and through an uncomplicated process. Convenient collection arrangements allow customers to coordinate parcel retrieval with their work schedules, household responsibilities, and other commitments. For example, a customer who is unavailable during normal working hours may benefit from an alternative collection point or a flexible collection period. Similarly, simple collection procedures, clear notifications, reasonable waiting times, and accessible operating hours can reduce the inconvenience associated with receiving online orders. Where these arrangements are poorly designed, customers may experience long waiting periods, repeated collection attempts, additional transportation expenses, or difficulties coordinating collection with their daily activities.

Theoretical Review

Expectation-Confirmation Theory

Expectation-Confirmation Theory (Oliver, 1980) posits that satisfaction results from the comparison between expected and perceived performance. Last-mile attributes (timeliness, tracking, flexibility) shape both expectations and perceived performance; confirmation or positive disconfirmation produces satisfaction. In the last-mile setting, customers form expectations from promised delivery windows, tracking notifications, and prior experiences with the same platform or courier. When actual performance meets or exceeds these expectations parcels arrive on time, tracking is accurate, and flexibility options are usable confirmation occurs and satisfaction rises. Conversely, late deliveries, silent tracking gaps, or rigid delivery rules produce negative disconfirmation and dissatisfaction. The theory therefore supplies a clear mechanism linking last-mile strategy dimensions to the three facets of customer satisfaction examined in this study.

Service Quality Theory (SERVQUAL Model)

Service Quality Theory, commonly associated with the SERVQUAL model developed by Parasuraman, Zeithaml, and Berry (1988), explains how customers evaluate the quality of services provided by an organisation. The model proposes that customers assess service quality by comparing their expectations of a service with their perceptions of the service actually received. The original SERVQUAL framework identifies five dimensions of service quality: tangibility, reliability, responsiveness, assurance, and empathy. These dimensions provide a theoretical basis for understanding how service delivery practices influence customer evaluations, satisfaction, and subsequent behavioural intentions. In the context of e-commerce, service quality extends beyond the online purchasing interface to include the physical delivery of products to customers. Delivery timeliness, accurate tracking information, effective communication, and flexible delivery arrangements contribute to customers' perceptions of logistics service quality (Christian et al., 2026). Reliability is reflected in the ability of logistics providers to deliver orders as promised, while responsiveness concerns their ability to provide timely updates and address customers' delivery-related concerns. Similarly, empathy is reflected in the willingness of delivery providers to accommodate customers' individual preferences through flexible delivery schedules and alternative collection points. Consequently, Service Quality Theory provides an appropriate alternative theoretical foundation for this study. It explains why delivery timeliness, tracking and information, and delivery flexibility are important components of last-mile delivery strategy and how their perceived quality may influence satisfaction among e-commerce customers in Port Harcourt. The theory also supports the managerial implication that logistics providers should focus not only on completing deliveries but also on ensuring that the delivery process is reliable, informative, accessible, and responsive to customer needs.

Research Methodology

A cross-sectional survey design was adopted. The target population comprised e-commerce customers in Port Harcourt who had received at least one online order in the preceding six months. Using convenience and snowball sampling, 420 questionnaires were distributed; 386 usable responses were retained after screening (effective response rate 91.9 %). All constructs were measured on a five-point Likert scale. Last-mile delivery strategy items were adapted from Esper et al. (2003), Aljohani (2024), and Vakulenko et al. (2023). Customer-satisfaction items drew on established e-commerce scales. Consumer-proximity items were developed from the proximity and accessibility literature and refined through expert review. Content validity was confirmed by three logistics and marketing academics. Data were analysed with Partial Least Squares Structural Equation Modelling (PLS-SEM) using SmartPLS 4.0. PLS-SEM is appropriate for complex models with mediating constructs and for predictive research objectives (Hair et al., 2022). The measurement model was assessed for indicator reliability, internal consistency, convergent validity, and discriminant validity. The structural model was evaluated via path coefficients, R^2, f^2, Q^2, and bootstrapped significance testing (5,000 subsamples). Ethical approval was obtained; participation was voluntary and anonymous.

Data Analysis and Presentation

Demographic Profile of Respondents

Table 1 summarises the demographic characteristics of the 386 respondents. The sample was relatively balanced by gender (52.3 % female). The modal age group was 26–35 years (38.9 %). Most respondents held at least a bachelor's degree (61.7 %) and reported shopping online at least once a month (74.1 %).

Table 1: Demographic Profile of Respondents (N = 386)

Variable	Category	Frequency (%)
Gender	Male	184 (47.7 %)
	Female	202 (52.3 %)
Age	18–25 years	86 (22.3 %)
	26–35 years	150 (38.9 %)
	36–45 years	102 (26.4 %)
	46 years and above	48 (12.4 %)
Education	Secondary / Diploma	78 (20.2 %)
	Bachelor's degree	238 (61.7 %)
	Postgraduate	70 (18.1 %)
Online Shopping Frequency	Weekly or more	112 (29.0 %)
	Monthly	174 (45.1 %)
	Less than monthly	100 (25.9 %)

Source: Field Survey, 2026.

Measurement Model Assessment

Table 2 reports outer loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). All loadings exceeded 0.70; α and CR values were above 0.70; AVE values exceeded 0.50, confirming indicator reliability, internal consistency, and convergent validity (Hair et al., 2022).

Table 2: Measurement Model – Outer Loadings, Reliability and Convergent Validity

Construct / Indicator	Loading	A	CR	AVE	VIF
Delivery Timeliness (DT)		0.87	0.91	0.67	
DT1 – DT4 (range)	0.79–0.85				1.7–2.1
Tracking & Information (TI)		0.88	0.92	0.69	
TI1 – TI4 (range)	0.81–0.86				1.8–2.2
Delivery Flexibility (DF)		0.85	0.90	0.68	
DF1 – DF4 (range)	0.80–0.84				1.7–2.0
Consumer Proximity (CP)		0.89	0.92	0.66	
CP1 – CP6 (range)	0.78–0.85				1.7–2.3
Customer Satisfaction (CS)		0.91	0.93	0.70	
CS1 – CS6 (range)	0.81–0.87				1.9–2.4

Source: Field Survey, 2026.

Discriminant Validity

Table 3 (Fornell–Larcker) shows that the square root of each AVE exceeds the corresponding inter-construct correlations.

Table 3: Discriminant Validity – Fornell–Larcker Criterion

Construct	DT	TI	DF	CP	CS
Delivery Timeliness	**0.819**				
Tracking & Information	0.57	**0.831**			
Delivery Flexibility	0.52	0.55	**0.825**		
Consumer Proximity	0.61	0.64	0.58	**0.812**	
Customer Satisfaction	0.63	0.66	0.59	0.72	**0.837**

Source: Field Survey, 2026.

Table 4 reports HTMT ratios, all below the conservative threshold of 0.85 (Henseler et al., 2015), confirming discriminant validity.

Table 4: Discriminant Validity – HTMT Ratio

Construct	DT	TI	DF	CP	CS
Delivery Timeliness					
Tracking & Information	0.66				
Delivery Flexibility	0.61	0.64			
Consumer Proximity	0.70	0.73	0.67		
Customer Satisfaction	0.72	0.75	0.68	0.81	

Source: Field Survey, 2026.

Structural Model Assessment

Table 5 presents the structural path coefficients obtained via bootstrapping (5,000 subsamples). All direct paths from the three dimensions of last-mile delivery strategy to customer satisfaction, and from those dimensions to consumer proximity, as well as the path from consumer proximity to customer satisfaction, are positive and statistically significant.

Table 5: Structural Model – Path Coefficients and Significance

Path	β	t-value	p-value	f^2	Decision
DT → CS	0.26	4.35	0.000	0.10	Supported
TI → CS	0.29	4.88	0.000	0.12	Supported
DF → CS	0.18	3.12	0.002	0.05	Supported
DT → CP	0.31	5.02	0.000	0.13	Supported
TI → CP	0.34	5.56	0.000	0.16	Supported
DF → CP	0.25	3.98	0.000	0.09	Supported
CP → CS	0.38	6.21	0.000	0.20	Supported

Source: Field Survey, 2026.

R^2 for consumer proximity was 0.54 and for customer satisfaction was 0.63, indicating substantial explanatory power. Q^2 values (0.33 for CP; 0.41 for CS) confirmed predictive relevance.

Mediation Analysis (PLS-SEM)

Table 6 reports the indirect effects. All three indirect paths from last-mile delivery strategy dimensions through consumer proximity to customer satisfaction are statistically significant. Direct effects remain significant, indicating partial mediation. VAF values range from 30 % to 38 %.

Table 6: Mediation Analysis – Indirect Effects (Bootstrapping, 5,000 Subsamples)

Indirect Path	B	t-value	95 % CI	VAF	Mediation
DT → CP → CS	0.12	4.15	[0.07, 0.18]	31 %	Partial
TI → CP → CS	0.13	4.48	[0.08, 0.19]	31 %	Partial
DF → CP → CS	0.10	3.42	[0.05, 0.15]	35 %	Partial

Source: Field Survey, 2026.

Summary of Hypotheses Tests

Table 7 summarises the hypothesis decisions. All four null hypotheses are rejected.

Table 7: Summary of Hypotheses Testing Results (PLS-SEM)

Hypothesis	Statement (Null)	Decision
H01	No significant relationship between delivery timeliness and customer satisfaction	Rejected ($\beta = 0.26$, $p < 0.001$)
H02	No significant relationship between tracking & information and customer satisfaction	Rejected ($\beta = 0.29$, $p < 0.001$)
H03	No significant relationship between delivery flexibility and customer satisfaction	Rejected ($\beta = 0.18$, $p < 0.01$)
H04	Consumer proximity does not significantly mediate the LMD–CS relationship	Rejected (partial mediation confirmed)

Source: Field Survey, 2026.

Discussion of Findings

The PLS-SEM results show that delivery timeliness, tracking and information, and delivery flexibility each exert a positive and significant influence on customer satisfaction among e-commerce customers in Port Harcourt. Tracking and information emerged as the strongest direct predictor ($\beta = 0.29$), underscoring the value customers place on transparency and reduced uncertainty in a context where traffic and addressing challenges are common (Aljohani, 2024; Vakulenko et al., 2023). All three last-mile dimensions also significantly enhance consumer proximity, which in turn strongly predicts customer satisfaction ($\beta = 0.38$). The significant indirect effects confirm that consumer proximity partially mediates the relationship between last-mile delivery strategy and satisfaction. In practical terms, strategies that improve timeliness, tracking, and flexibility also make the delivery system feel closer and more accessible to customers, amplifying satisfaction. These findings align with Expectation-Confirmation Theory: better last-mile performance raises perceived performance relative to expectations, generating satisfaction. They also support a relational view in which proximity acts as relational capital that converts operational capabilities into customer outcomes. For managers in Port Harcourt, the results imply that investments in real-time tracking, flexible delivery windows, and proximity-enhancing infrastructure (neighbourhood hubs, clear address support, convenient collection options) yield dual benefits direct satisfaction gains and mediated gains through greater perceived closeness. The relative strength of tracking and information is particularly noteworthy in the Port Harcourt context. Where traffic delays and address ambiguity are common, customers appear to value accurate, proactive information almost as highly as actual speed. This suggests that communication quality can partially compensate for infrastructural constraints. Delivery flexibility, while significant, showed a somewhat smaller direct effect, possibly because current flexibility options remain limited in the local market; expanding those options could unlock further satisfaction gains. From a policy and ecosystem perspective, the mediation results underscore the value of shared urban logistics infrastructure. Neighbourhood collection points, standardised digital addressing, and interoperable tracking platforms can raise average consumer proximity across multiple e-commerce players, thereby amplifying the returns to individual firms' last-mile investments and improving the overall customer experience in the city.

Conclusion

This study examined the relationship between last-mile delivery strategy and customer satisfaction among e-commerce customers in Port Harcourt, with consumer proximity as a mediating variable. Using PLS-SEM on data from 386 respondents, the study found that delivery timeliness, tracking and information, and delivery flexibility each positively and significantly influence customer satisfaction. Consumer proximity partially mediates these relationships. The study contributes context-specific evidence from an African urban market and demonstrates the value of second-generation SEM for modelling last-mile mediation mechanisms. Practically, e-commerce operators and logistics partners in Port Harcourt should treat last-mile strategy and consumer proximity as complementary levers for raising satisfaction and securing competitive advantage.

In summary, delivery timeliness, tracking and information, and delivery flexibility are all significant drivers of customer satisfaction; their effects are partially transmitted through consumer proximity. Platforms and logistics providers that excel on these dimensions and that actively reduce the physical and operational distance felt by customers will be better placed to win and retain e-commerce shoppers in Port Harcourt and similar emerging-market cities. Limitations include the cross-sectional design and the focus on a single city. Future research could employ longitudinal designs, compare multiple Nigerian cities, or incorporate additional mediators such as trust or perceived risk.

Recommendations

Based on the findings, the following recommendations are offered:

1. E-commerce platforms and logistics partners in Port Harcourt should prioritise real-time tracking systems and proactive delivery notifications to reduce uncertainty and strengthen the tracking-and-information dimension.
2. Operators should expand delivery flexibility by offering multiple time slots, alternative drop-off points, and easy rescheduling options that accommodate customers' schedules and traffic realities.
3. Firms should invest in proximity-enhancing measures neighbourhood collection hubs, improved address verification tools, and partnerships that increase geographic coverage so that delivery feels closer and more convenient.
4. Performance metrics should jointly track last-mile operational KPIs (on-time rate, tracking accuracy, flexibility uptake) and proximity-related indicators (first-attempt success, collection convenience scores) alongside customer satisfaction.
5. Policy makers and industry associations should support shared urban logistics infrastructure and digital addressing initiatives that lower last-mile friction for all e-commerce participants in Port Harcourt.

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