



Research Article

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Logistics Service Quality, Customer Satisfaction and Retention: Moderating Effects of Technological Capability

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Abstract

Purpose: This study aims to understand how well logistics service quality (LSQ) meets customer expectations, in order to gauge their satisfaction. It aims to investigate how customers perceive LSQ dimensions within business-to-customer (B2C) interactions, with a specific focus on examining the impact of technology-organization-environment contexts (TOE model) on the implementation of application technology in Vietnamese logistics companies. Additionally, the study explores how the integration of these dimensions contributes to improving customer satisfaction and retention rates. *Design/methodology/approach:* Data collected through a survey conducted on people who used the service of logistics service providers are analyzed using a quantitative comparative analysis approach. The analysis explores various ways to achieve customer satisfaction by considering different combinations of LSQ dimensions. *Findings:* The study outlines eight LSQ dimensions that contribute to customer satisfaction and discusses how these dimensions, in different configurations, lead to higher levels of customer satisfaction. While previous academic research has primarily focused on service quality from a quality management, this study addresses the existing gap by examining B2C relationships and emphasizing the role of third-party logistics (3PL) service providers. *Originality/value:* The findings of this study provide valuable insights for practitioners, offering guidance on how 3PL service providers can effectively combine LSQ dimensions to continuously improve the customer experience and enhance overall customer satisfaction and retention.

Keywords: Customer satisfaction, Logistics service quality, Retention

1. Introduction

In Vietnam's current landscape, the logistics service industry is a pivotal sector that leads in providing high-value services, supporting trade growth, and bolstering the economy's competitiveness. Despite its significance, many logistics service providers in Vietnam are small to medium-sized enterprises grappling with capital and infrastructure challenges, such as warehousing, information technology (IT), and transportation. This underscores the need for innovative technological advancements in the logistics sector. Logistics services are essential for sellers to gain a competitive edge, especially in the digital age and the prevalence of e-commerce (Baral et al., 2021). The primary objectives of Logistics 4.0 include reducing labor costs and standardizing the workforce in supply chain management. Technologies such as autonomous vehicles and warehouse robots are being explored to replace processes that currently require human judgment and operation. Given the strong connection between e-commerce and logistics, it is imperative that online orders are transported via various logistical means, including roads, railways, ships, and planes. Sellers should prioritize the quality of logistics services and consumer satisfaction. Customers have the option to purchase items through a digital platform and select the method of transportation for their delivery. The logistics demand arising from online shopping is a crucial aspect of business for logistics service providers (LSPs). Hence, in order to effectively analyze the relationship between LSQ, customer satisfaction (CS), and customer's retention, thorough research is important for LSP.

LSPs must assess their capacities to sustain steady and enduring client connections, ensure, and fulfill customers' ever-increasing demands concerning the excellence of logistics services linked to online buying (Vu et al, 2020). Online retailers must consistently improve their physical logistics and supply chain management to effectively leverage the unique benefits of online buying, such as ease and reduced search costs. Several LSQ frameworks have been documented in the literature. However, as highlighted by Juga et al. (2010) and Vu et al. (2020), the majority of these frameworks are specifically designed for industrialized nations.

Logistics is a critical driver of economic growth and globalization in Vietnam, accounting for roughly one-fifth (20.9%) of the nation's GDP, which translates to a yearly contribution of USD 20-22 billion. This vital service sector smooths out trade and strengthens the economy's competitive edge. With advancements in digital technologies and Industry 4.0, the logistics industry has a golden opportunity to amplify its economic impact by accelerating its digital transformation efforts.. Regrettably, there is a scarcity of extensive research on the service quality (SQ) of the logistics business in developing nations like Viet Nam.

According to Politis et al. (2014), service quality is crucial for the survival and success of commercial enterprises. Furthermore, Verkijika (2018) has examined the correlation between it and customer satisfaction, while another study has established a connection between customer satisfaction and customer loyalty. Logistics service quality is a crucial metric for assessing service quality and represents consumer contentment with the service. The information provided by Thongkruer and Wanarat (2021) is of great significance to both service users and logistical suppliers. Currently, there is a dearth of research investigating the standardized criteria for evaluating the quality of logistics services using logistics platforms in the logistics industry, particularly among small and medium-sized logistics enterprises in various developing countries, including Vietnam.

In order to address this gap, we scrutinize survey data to explore the impact of several LSQ constructs on the management of customer-3PL activities in B2C markets. Our aim is to determine how these constructs, when combined in different ways, contribute to obtaining high levels of satisfaction. By executing the analysis utilizing PLS-SEM and pertinent tests, we utilized quantitative research methods to ensure the reliability and validity of the data set and measures adopted. To begin, we offer a comprehensive overview of the literature around service quality and the pertinent LSQ concepts. The study has built upon existing research and formulated a model for the integration of application technology in Vietnamese logistics enterprises, focusing on the relationship between customer satisfaction and retention.

2. Literature Review

2.1 Literature Review

2.1.1 Technology-Organization-Environment contexts

The "Technology-Organization-Environment (TOE) framework", invented by Tornatzky and Fleischer (1990), helps explain how businesses decide to adopt new information technology products and services. This model elucidates how the adoption and integration of technological innovations are influenced by the technological, organizational, and environmental factors at play. The Technology-Organization-Environment (TOE) framework has been employed to elucidate the implementation of novel ideas in several sectors including manufacturing (Mishra et al., 2007), retail, wholesale, and finance (Zhu et al., 2006). In addition, the TOE model has undergone testing in several worldwide settings, such as Europe, America, and Asia, which include both developed and developing countries (Zhu and Kraemer, 2005).

"The TOE model delineates three fundamental contexts that are pivotal to a company's assimilation of advanced technology: technology, organization, and environment" (Kuan & Chau, 2001). This framework elucidates the factors that impact a company's adoption of information technology, emphasizing three constructs: the technological context, organizational context, and external environmental context (Chan et al., 2013).

While the specific elements found in the three contexts may differ in various studies, the TOE framework is built on a solid theoretical foundation and has consistent empirical evidence to support it. The TOE framework provides a distinct advantage compared to other application models when it comes to assessing the adoption of technology, its usage, and the generation of value. This advantage stems from its ability to incorporate and analyze the technological, organizational, and environmental factors. Furthermore, it imposes no limitations on the magnitude of the sector or the dimensions of the company. Zhu (2004) argues that this study offers a thorough understanding of the adoption and implementation of technology by users, the challenges it poses, its impact on value chain activities, exploring the impact of post-adoption spillovers on companies, and the determinants that influence firms' choices to embrace business innovation and improve organizational capabilities through technology.

Therefore, this study suggests using the dimensions of the LSQ, based on the TOE framework, to create three contexts using the o8-constructs LSQ model. The hypothesis is that there is a positive correlation between LSQ and customer satisfaction, as perceived by the customer.

2.1.2 Logistics service quality

"Logistics service quality" refers to the level of fulfillment of logistics services compared to the client expectations. Recent research has conducted in-depth investigations on LSQ. Mentzer et al. (1989) were the first to define and investigate the concept of "logistics service quality" (LSQ). They proposed that LSQ includes not only physical distribution services, but also other important characteristics as perceived by customers. Multiple studies have confirmed that service performance plays a crucial role in the logistics industry by generating value and contributing to gaining a competitive edge (Mentzer et al, 1989, Stank, 2003, Mentzer et al, 2001). Following the view point of Gil-Saura et al. (2010), Gaudenzi (2020), this study expanding the theoretical framework of LSQ. During the current decade, researchers in this subject have discovered numerous antecedents of the LSQ (long-term service quality) effect. This covers aspects of the service like "information quality, product quality, product condition, delivery services, reverse logistics, and customer services" (Hafez et al., 2021); "product availability, timeliness" (Revindran et al., 2020); "delivery quality, delivery pricing, order quality" (Choi et al., 2019), and "service recovery" (Rajendran et al., 2018).

Due to the significant growth of B2C and other online commerce, there is a notable constraint

caused by inadequate LSQ. Therefore, it is essential to analyze electronic LSQ in a B2C commerce setting (Murfield, 2017). Rao et al, 2011 proposed a measurement framework for electronic LSQ (e-LSQ) in the business-to-consumer (B2C) setting. The methodology encompasses order tracking, on-time delivery, item availability, and shipping alternatives. Currently, in ongoing research, “logistics service quality” pertains to the comprehensive assessment of the quality of logistics services offered by a company. This assessment encompasses included in three contexts: Organization: Personal contact, Information quality, Order accuracy, Order condition; Business environment: Price, Timeliness, Order discrepancy handling and Technology: Application quality. All these aspects work together to create the core strengths of logistics services. These strengths are crucial for fulfilling customer needs and exceeding their expectations, while also being adaptable to fit the unique demands of each client.

2.1.3 Customer's satisfaction & retention

The term customer satisfaction is extensively employed in the realms of business and commerce. Customer satisfaction refers to an individual's feeling of joy or unhappiness while evaluating performance in relation to their expectations (Lasserre, 2017). This word is used to assess a company's product and service offerings in order to meet client expectations. The term "Key Performance Indicator" is synonymous with the abbreviation "KPI" in the context of the company. Customer satisfaction has become a crucial element of corporate strategy in today's highly competitive market (Cheng et al., 2019; Tomi & Spasojevic Brkic, 2019). The topic of customer satisfaction is of great importance to companies and academics alike due to the substantial influence consumers have on firms. Ensuring customer pleasure is a primary objective for fostering sustainable growth in organizations (Afevork, 2013). LSQ not only directly affects satisfaction but also has a perceived impact on client retention. The importance of LSQ in attaining improved customer retention rates has been acknowledged (Micu, Aviaz & Capatina, 2013). Positive LSQ possesses the capacity to deter clients from shifting their preferences to alternative LSPs (Darzi & Bhat, 2018). The study conducted by Nugroho, Kempa, and Panjaitan (2020) has verified the indirect association between LSQ and retention, with satisfaction acting as an intervening variable.

Customer happiness can be impacted by various elements such as the quality of information, the quality of delivery, the quality of orders, customer service, and the price of delivery. The primary determinants that exert a substantial influence on client satisfaction are the caliber of information, caliber of delivery, and caliber of order. This conclusion is supported by previous research and empirical studies conducted by Harrison (2016), Rahayo and Patma (2021), Astuti and Dalam (2019), Yusra and Agus (2019), Rao and Sahu (2013), Karlal and Johnson (2018), and Cao and Gruca (2003). Furthermore, while evaluating customer satisfaction, it is important to include both the expenses associated with delivery and the level of customer service quality (Prasetyo et al., 2021, Albari, 2020; John & Karlay, 2018).

2.2 Hypothesis & research model

The organizational context encompasses the caliber of human resources, the intricacy of the management framework, the level of centralization, the extent of formalization, and the scale and reach of the enterprise (Kuan & Chau, 2001). In instances where an organization demonstrates a high readiness for IT innovation, its leadership and staff are inclined to instigate change, demonstrate increased dedication and perseverance, and partake in improved collaborative practices (Weiner, 2020; Wang et al., 2010). Consequently, this results in enhanced efficiency customer service, based on the adoption of application technology. Regarding this, we proposed the organizational context as the factor depends mainly on the company's capacity, in any LSP, the organizational context include Personal contact, Information quality, Order accuracy, Order condition.

Personal Contact Quality: is defined by staff's efforts to understand the issue, exhibit

courteous behavior, maintain confidentiality, be easily reachable, effectively handle inquiries and complaints, and possess sufficient product knowledge and competence. The happiness of customers with logistics services has an impact on the behavior and focus of the workforce of logistics service providers (Gupta, et. al., 2022). Effective communication between the client and the contact person is essential for enhancing customer expectations during the service delivery process (Parasuraman et al., 1985). Therefore, the hypothesis is constructed as H1.

H1: Personnel contact quality has a significant effect Customer satisfaction at Logistics Service

Information Quality is a concept that logistics service providers must provide clients with comprehensive, timely, accurate, sufficient, and reliable information. The provision of accurate and reliable information, regardless of its source (offline or online), plays a crucial role in satisfying the immediate requirements of customers (Gupta, et. al., 2022). Online vendors and potential buyers require personalized, thorough, trustworthy, and safe content that caters to the official community (Azemi, Zaidi, & Hussin, 2017). Therefore, the hypothesis is constructed as H2.

H2: Information quality has a significant effect Customer satisfaction at Logistics Service.

Order accuracy: According to Callarman (2020), order accuracy refers to the proportion of ecommerce orders that are successfully delivered to their intended location without any mistakes, such as selecting the wrong item or providing an inaccurate amount. High order accuracy ensures that your customers consistently receive the precise things they bought in optimal condition. These include the proper functioning of the acquired product, its suitability for the intended use, and if the client's expectations are fulfilled. Therefore, the hypothesis is constructed as H3

H3: Order accuracy has a significant effect Customer satisfaction at Logistics Service.

Order condition refers to the rules, criteria, product specifications, packaging procedures, and obligations established by shipping companies for the orders they accept and transport. Service quality is seen to be great only in the absence of any damage or faults in the goods that are delivered (Mentzer et al., 2001). This component is closely associated with customer grievances and the LSP's proficiency in managing discrepancies and problems in customer service. Thus, the hypothesis is formulated as H4.

H4: Order condition has a significant effect Customer satisfaction at Logistics Service.

The environmental context pertains to the industry landscape and the interactions between the company and its stakeholders and competitors (Kuan & Chau, 2001). As outlined by Wu et al. (2003), within the realm of digitalization, the influence exerted by influential trading partners due to the initial stages of expansion driven by a rapid surge in technology utilization is significant. Additionally, governmental backing represents the second factor within the environmental context that impacts the integration of technology within enterprises. In the environmental context of LSP, we suggest factors that depend primarily on the business environment such as: Order Difference Handling, Price and Timeliness.

Order discrepancy handling refers to the process of addressing any issues that arise with an order in the logistics industry. It involves taking necessary steps to protect the customer's interests while providing the service. Order deviation handling refers to the logistics company's capacity, effectiveness, and excellence in managing any discrepancies that may arise in orders during or after their delivery. Possible discrepancies include damage, improper item or quantity, poor quality, and other similar issues (Mentzer et al., 2001). Thus, the hypothesis is formulated as H5

H5: Order discrepancy handling has a significant effect Customer satisfaction at Logistics Service.

Price commonly referred to as shipping price or delivery fee, plays a crucial role in online retail for both consumers and sellers (Qiang, 2019). According to Manapul et al. (2022) customers are motivated to increase their purchase volumes or make a purchase in the first place due to various incentives such as free shipping, discounts on shipping fees for buying three products, vouchers, and similar offers. Furthermore, according to Chen & Ngwe (2018), the current e-commerce landscape provides customers with the opportunity to enjoy free delivery with a minimum purchase. Free shipping is commonly offered as a substitute to mitigate the extended delivery time and ensure customer contentment. Certain buyers prioritize price parity over transportation costs (Panko, 2019).

Therefore, the hypothesis is constructed as H6

H6: Price has a significant effect Customer satisfaction at Logistics Service.

Timeliness. Timeliness typically refers to the act of delivering goods or services punctually, which is demonstrated by the commitment of the logistics organization on its logistics platform. Timeliness, as defined by Mentzer et al. (2001), encompasses the duration between placing an order and getting the corresponding product. The efficiency of the delivery system is clearly shown by the amount of time it takes from when an order is placed to when the delivery is completed (Uvet, 2020). Therefore, the hypothesis is constructed as H7

H7: Timeliness affects Customer satisfaction at Logistics Service.

The technology environment includes internal and external technologies that are relevant to the adoption of innovation within the organization. Individuals' usage of an application is typically influenced by their perception of its ability to enhance their performance. Furthermore, even if prospective users perceive an application as valuable, they may concurrently perceive the system as excessively complex and the advantages gained from using it as surpassing the effort required to use it.

Application The quality of an application significantly impacts customer satisfaction with logistics services. A user-friendly, efficient, accurate, and transparent application enhances the customer experience by providing easy navigation, real-time tracking, order updates, and error reduction. Effective communication, responsive customer support, customizable preferences, and security are also crucial. A high-quality application leads to higher satisfaction and even more intention levels (Akram et al., 2021). Therefore, the hypothesis is constructed as H8 and H8a.

H8. Application quality has a significant effect Customer satisfaction at Logistics Service

H8a. Application quality has a moderating effect on relation between Customer satisfaction and Retention.

The association between LSQ and retention is mediated by satisfaction as an intervening variable (Nugroho, Kempa & Panjaitan, 2020). Ultimately, customer satisfaction has a direct impact on the customer's inclination to reorder, thereby fostering their loyalty and retention with the logistics company (Prasetyo et al., 2021; Albari, 2020). Therefore, this inquiry will utilize those characteristics to create a hypothesis H9.

H9: Customer Satisfaction has a significant effect on Retention at Logistics Service.

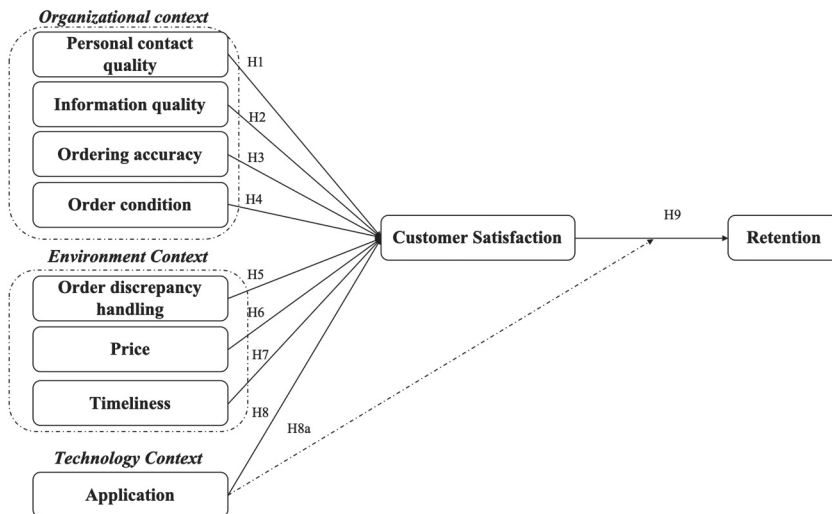


Figure 1. The conceptual model

3. Methodology

3.1 Instruments

The questionnaire is constructed follow the model of TOE are adapted from several sources (see Appendix B), each item was measured on a 7-point Likert scale with “1 = strongly disagree and 7 = strongly agree”. According to Hair et al., (2014) if the total number is not determined, the minimum sample must be multiplied by ten times the largest number of formative indicators used to measure one construct, which is now 28. From there, according to the PLS-SEM method, the minimum sample for this study is 280 surveys, of which the study has collected and processed with 403 samples of surveys is appropriate.

3.2 Data collection

The data is expected to be collected using the Google form questionnaire from June to September 2023, and the initial survey was sent to 20-30 people to make and submit contributions to the questionnaire before being taken to the mass survey. Some of the contributions revolved around the use of words, the clarity of questions and answers, specific words. After collecting about 446 samples of surveys, the study removed 43 unsolicited surveys to ensure the authenticity of the study which results in 403 valid responses to use for further analysis.

3.3 Statistical estimation technique

This study uses the the partial least squares path modeling (PLS – SEM), by Smart PLS version 3.2.8, method to process and validate the proposed research hypotheses. Because PLS – SEM is a data analysis technique that can test a series of relatively complex relationships built simultaneously between independent and dependent variables, in which each variable can be generated from multiple indicators (Hair et al., 2013, 2019). Meanwhile, Structural Equation Modeling (SEM) combines factor analysis and regression analysis into an integrated approach. For this study, the results will be presented as descriptive statistics, factor analysis by testing the measurement model and reliability, analysis of regression results and finally verification of the hypotheses based on the regression measurements.

4. Results and Discussion

4.1 Descriptive statistics

The data presented offers a comprehensive summary of the demographic attributes of the people included in the study. The gender distribution indicates that 45.16% of individuals identified as male, 44.67% identified as female, and 10.17% identified as a third gender. Regarding their function, 43.42% of individuals served as vendors, while 56.58% acted as buyers. The age breakdown indicates that 17.12% of the population were below 18 years old, 61.29% were between the ages of 18 and 27, and 21.59% were above the age of 27. Regarding occupation, the largest proportion (38.21%) consisted of full-time worker, with students (40.2%), private officers (12.9%), freelancers (7.44%), and self-employed individuals (1.24%) following suit. Collectively, this data offers a concise representation of the participants' demographic characteristics, encompassing gender, buyer/seller role, age distribution, and occupation.

Table 1. The summaries of the sample

	Demographic characteristic	Frequency	Percentage
Gender	Male	182	45.16%
	Female	180	44.67%
	Third Gender	41	10.17%
Buyer/Seller	Seller	175	43.42%
	Buyer	228	56.58%
Age	Under 18	69	17.12%
	From 18 To 27	247	61.29%
	Over 27	87	21.59%
Occupation	Full-time work	154	38.21%
	Freelancer	30	7.44%
	Private officer	52	12.9%
	Students	162	40.2%
	Self-employed	5	1.24%

4.2 SEM estimation results

The assessment of the measuring model for the selection process entailed evaluating loadings, reliability, convergent validity, and discriminant validity. Loadings were deemed acceptable if they surpassed 0.7, as they serve as an indication of the robustness of the relationship between indicators and constructs. The data presented in Table 2 indicate that all factor loadings exceeded the specified threshold after some sub-scales were deleted as weak factor loading values like OA₂, OC₂, IQ₂, and ODH₂. In order to evaluate the dependability of internal consistency, we analyzed the values of composite reliability (Hair et al., 2014). A threshold value of 0.7 was utilized, and all constructions had composite reliability scores surpassing this criterion, suggesting exceptional internal consistency. The evaluation of convergent validity, which assesses the degree to which indicators within a construct measure the same underlying notion, was conducted using the average variance extracted (AVE) (Hair et al., 2014). AVE values that exceed 0.5 are deemed acceptable. Table 3 demonstrates that the AVE values for all constructs surpassed the specified threshold, thereby establishing the presence of convergent validity.

The heterotrait-monotrait ratio (HTMT) was used to test discriminant validity, which assures that one construct is unique from others (Henseler et al., 2015). The threshold value of 0.9 was employed for similar constructions, whereas a threshold of 0.85 was chosen for dissimilar constructs. All of the HTMT values shown in Table 4 were below the specified thresholds, indicating that the discriminant validity is good.

In summary, the assessment of the measuring model for the selection process showed robust loadings, exceptional internal consistency reliability, adequate convergent validity, and decent discriminant validity. These data confirm the durability and accuracy of the measuring methodology employed in evaluating the selection process.

Table 2. Descriptive outer loading

	APP	CSA	IQ	Moderating Effect	OA	OC	ODH	PCQ	PRI-CE	RET	TI-ME
APP	1.000										
CSA * APP				0.941							
CSA		1.000									
IQ ₁			0.929								
IQ ₃			0.944								
IQ ₄			0.945								
OA ₁					0.935						
OA ₃					0.954						
OA ₄					0.942						
OC ₁						0.942					

OC ₃						0.947							
OC ₄						0.946							
ODH ₁								0.914					
ODH ₃								0.948					
ODH ₄								0.936					
PCQ ₁									0.904				
PCQ ₂									0.939				
PCQ ₃									0.934				
PCQ ₄									0.899				
PRICE ₁										0.972			
PRICE ₂										0.974			
PRICE ₃										0.952			
RET ₁												0.858	
RET ₂												0.954	
RET ₃											0.923		
TIME ₁													0.934
TIME ₂													0.944
TIME ₃													0.944
TIME ₄													0.941

Table 3. Results of the measurement model analysis

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
APP	1.000	1.000	1.000	1.000
CSA	1.000	1.000	1.000	1.000
IQ	0.933	0.933	0.957	0.882
APP Moderating effect	1.000	1.000	1.000	1.000
OA	0.938	0.939	0.960	0.890
OC	0.940	0.941	0.961	0.893
ODH	0.926	0.929	0.953	0.870
PCQ	0.939	0.941	0.956	0.845
PRICE	0.964	0.966	0.976	0.933
RET	0.899	0.913	0.937	0.833
TIME	0.957	0.959	0.969	0.885

After confirming the satisfactory evaluation of the measurement model, the structural model is analyzed to assess its ability to elucidate the data and determine the statistical significance of the path coefficient. Before delving into the assessment of the structural model, an examination of construct multicollinearity is conducted. Multicollinearity issues arise when the internal variance inflation factor (VIF) exceeds a value of 5, as outlined by Hair et al. (2014). Table 5 shows that the VIF values for all construct elements were below 5. The model's explanatory power is assessed using the coefficient of determination (R²), calculated for all endogenous constructs. The R² value for the usage intention construct, presented in Table 6, indicates a moderate level of explanatory capability within the model.

Table 4. Discriminant validity heterotrait-monotrait (HTMT) values

	APP	CSA	IQ	Moderating effect	OA	OC	ODH	PCQ	PRICE	RET	TIME
APP											
CSA	0.439										
IQ	0.382	0.559									
Moderating effect	0.027	0.220	0.231								
OA	0.323	0.534	0.841	0.196							
OC	0.365	0.569	0.869	0.190	0.885						
ODH	0.295	0.557	0.738	0.165	0.815	0.779					
PCQ	0.463	0.656	0.847	0.268	0.689	0.745	0.651				
PRICE	0.530	0.709	0.668	0.305	0.557	0.627	0.489	0.801			
RET	0.349	0.767	0.638	0.247	0.637	0.683	0.665	0.634	0.613		
TIME	0.342	0.591	0.764	0.178	0.812	0.780	0.890	0.660	0.572	0.704	

Note: The meaning of "APP= Application; CSA= Customer satisfaction; IQ= Information quality, Moderating effect = APP Moderate relation between CSA and RET; OA= Order Accuracy; OC= Order condition; ODH= Order discrepancy handling; PCQ = Personal contact quality; PRICE = price; RET = Retention; TIME = timeliness".

Table 5. Inner Variance inflation (VIF) values Construct

	APP	CSA	RET
APP			1.246
CSA			1.308
IQ		4.669	
Moderating Effect			1.057
OA		4.354	
OC		4.428	
ODH		3.951	
PCQ		3.989	
PRICE		2.564	
RET			
TIME		4.243	

The R² value in Table 6 indicates the research model's capacity to elucidate the influence of the determinants on changes in customer satisfaction. Additionally, R² can evaluate the model's effectiveness in explaining and predicting future results. Therefore, a high R² value can enhance the likelihood of accurate predictions (Hair et al., 2014). This research model elucidates a significant deviation in Customer satisfaction (R²= 0.551, Table 6), indicating that personal contact quality, information quality, ordering accuracy, order condition, order discrepancy handling, price, and timeliness account for 55.1% of the variability in Customer satisfaction. Furthermore, the research model elucidates that Retention (R² = 0.538, Table 6), indicating that Customer satisfaction accounts for 53.8% of customer retention while utilizing logistic services.

Table 6. Coefficient of determination (R²) values

	R Square	R Square Adjusted
CSA	0.558	0.551
RET	0.542	0.538

A comprehensive bootstrapping approach employing 500 samples is utilized to assess the statistical significance of the path coefficients. Figure 2 illustrates the results of the study conducted on the structural model.

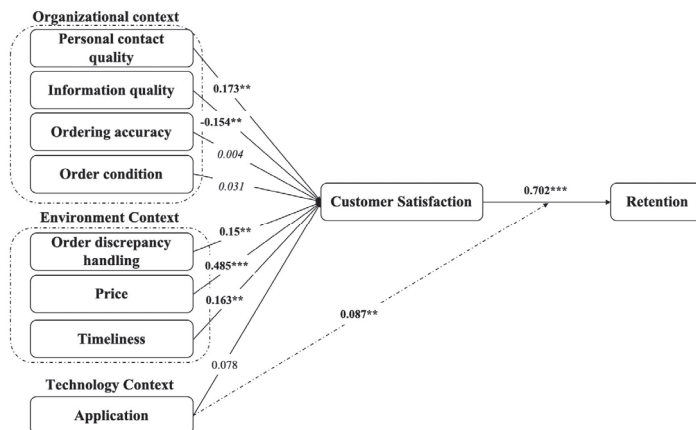


Figure 2. Results of hypothesis tests

Table 7 displays eight direct effect hypotheses and one moderating effect hypothesis. Out of the eight direct effect hypotheses, only H₃, H₄ and H₈ are not supported, while the other six hypotheses are supported. The variables Personal contact quality (H₁; $\beta = 0.173^{**}$), Order discrepancy handling (H₅; $\beta = 0.15^{**}$), Price (H₆; $\beta = 0.485^{***}$) and Timeliness (H₇; $\beta = 0.163^{**}$) have a positive and significant direct impact on Customer satisfaction. However, Information quality (H₂; $\beta = -0.154^{**}$) has a negative impact. Therefore, the hypotheses H₁, H₂, H₅, H₆ and H₇ are supported. Conversely, customer satisfaction has a substantial impact on client retention (H₉; $\beta = 0.702^{***}$).

Additionally, this study demonstrates that the hypotheses regarding moderating effects are supported. Based on these findings, the influence of Application quality in the connection between Customer satisfaction and Retention is moderated (H_{8a}; $\beta = 0.087^{**}$, Table 7). Meanwhile, customers will continue to keep using the logistics service of company if their application's quality is high.

Table 7. The results of the structural model

	Hypotheses	Coefficient	Standard Deviation	P-Values	Conclusion
H ₁	PCQ -> CSA	0.173	0.076	0.028**	Supported
H ₂	IQ -> CSA	-0.154	0.073	0.035**	Supported
H ₃	OA -> CSA	0.004	0.073	0.975	Not Supported
H ₄	OC -> CSA	0.031	0.072	0.581	Not Supported
H ₅	ODH -> CSA	0.150	0.069	0.028**	Supported
H ₆	PRICE -> CSA	0.485	0.056	0.000***	Supported
H ₇	TIME -> CSA	0.163	0.072	0.024**	Supported
H ₈	APP -> CSA	0.078	0.054	0.146	Not Supported
H _{8a}	Moderating Effect of APP -> CSA & RET	0.087	0.040	0.026**	Supported
H ₉	CSA -> RET	0.702	0.038	0.000***	Supported

Note: ** and *** represent significance at 5% and 1% respectively and the t-values are given in parentheses.

4.3 Robustness test with OLS

This study utilized principle component analysis (PCA) in Stata 16 to summarize variables into three dimensions: organization context, environment context, and technology context. The combination model consisted of three independent variables and customer satisfaction as the dependent factor (Figure 3). The study then employed ordinary logistic regression with three models to test the robustness of the effects of technology, organizational context, and environment context on customer satisfaction. This supports the findings of the PLS-SEM analysis and strengthens the impact of three dimensions that positively influence customer satisfaction with logistics service quality.

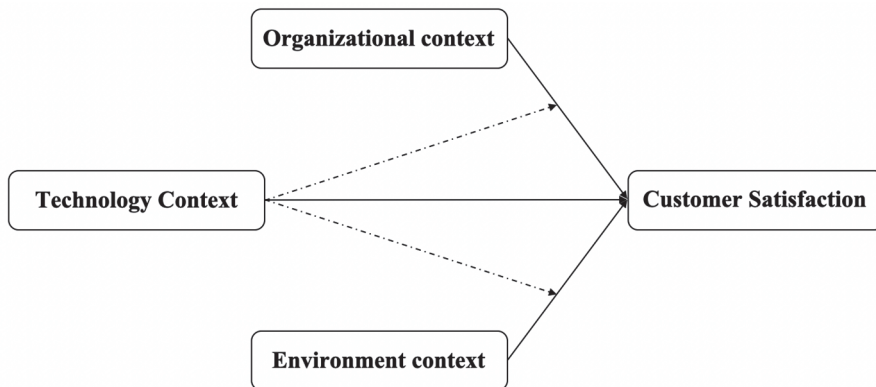


Figure 3. Robustness test model

Additionally, the study examined the moderating effect of technology context on the relationship between organizational context ($\beta = 0.03^*$) and environment context ($\beta = 0.042^{**}$) with customer satisfaction (Table 8). The results indicated that digitalization factors, such as the quality of the application, enhanced customer satisfaction with the logistics company organization and environment.

Table 8. Determinants of three models by using OLS

Variables	CUSTOMER SATISFACTION		
	Model 1	Model 2	Model 3
TECHNOLOGY CONTEXT	0.219 ^{***} (0.056)	0.235 ^{***} (0.055)	0.236 ^{***} (0.055)
ORGANIZATIONAL CONTEXT	0.06 [*] (0.036)	-0.082 (0.082)	0.045 (0.036)
ENVIRONMENT CONTEXT	0.273 [*] (0.042)	0.262 ^{***} (0.043)	0.086 (0.096)
Moderating effect of APP => ORGANIZATIONAL & CSA	-	0.030 [*] (0.018)	-
Moderating effect of APP => ENVIRONMENT & CSA	-	-	0.042 ^{**} (0.020)
Obs	403	403	403
R-squared	0.4818	0.4893	0.4911
Prob > F	0.0000	0.0000	0.0000
F(3, 399)	191.88	147.00	147.00

5. Discussion & Implications

5.1 Discussion

The study applied the TOE theory developed by Tornatzky and Fleischer (1990), which considers three factors influencing customer adoption of logistics services: organizational, environmental, and technological context. The aim of this study was to gain a comprehensive understanding of the variables influencing customer satisfaction and retention in the adoption of technology within logistics service providers (LSPs) using the Technology-Organization-Environment (TOE) model. The findings from the structural equation modeling (SEM) analysis contribute to the existing literature on customer satisfaction in the digital age of logistics services. The findings revealed several antecedents that contribute to customer satisfaction, ultimately leading to client retention. In the organizational context, personal contact and information quality were found to have both positive and negative effects on customer satisfaction. In the environmental context, order discrepancy handling, price, and timeliness showed positive effects on customer satisfaction. Furthermore, in the digitalization era, the quality of technology applications positively influenced customer satisfaction when using LSPs. This can be shown by the moderating effect of technology context, through application quality variables, on relationships between organizational context, environmental context, and customer satisfaction. Further, customer satisfaction was identified as a significant indicator of customer loyalty, with technology contexts such as application quality moderating this relationship.

These research findings align with prior studies conducted by Gupta et al. (2022), Azemi et al. (2017), Mentzer et al. (2001), Manapul et al. (2022), Uvet (2020), and Akram et al. (2021). They suggest that the development of technology has changed consumer behavior, where factors such as personal contact quality, information quality, order discrepancy handling, price, timeliness, and application quality play crucial roles in customer satisfaction. The study also highlights the importance of the environmental context, which demonstrates a more positive effect compared to the organizational context, reflecting the way customers currently use logistics services. However, it should be noted that the findings differ from those of Callarman (2020) and Mentzer et al. (2001) as insignificant relationship was established between order accuracy and order condition with customer satisfaction.

The current literature on logistics service quality (LSQ) primarily concentrates on logistics service providers, neglecting research conducted from the customer's viewpoint. Surprisingly, despite the pivotal role of LSQ, these dimensions have not been extensively examined in various business-to-consumer settings (Lin et al., 2023; Gaudenzi et al., 2021; Uvet, 2020). Our study contributes to the literature by highlighting the significance of LSQ in fostering customer retention through satisfaction, aligning with earlier research by Micu, Aviaz, and Capatina (2013). Furthermore, our research addresses a gap in the current academic discourse by emphasizing LSQ from customers' perspectives across a broad spectrum of business-to-customer (B2C) contexts, emphasizing that the influence of LSQ dimensions on customer satisfaction should be evaluated based on the customer's position within the technology-organization-environment model.

In conclusion, these results align with previous studies by Rahayo and Patma (2021) and Prasetyo et al. (2021), Albari (2020), John & Karlay (2018), and Akram et al. (2021). They support the notion that application quality plays a moderating role in the link between customer satisfaction and retention in the given context. Additionally, the findings of this study align with research indicating that logistics service quality significantly affects customer satisfaction (Thongkruer & Wanarat, 2021).

5.2 Implications

5.2.1 Theoretical implication

The study has systematically organized a multitude of theoretical principles, establishing the basis for future investigations. By combining deep insights from previous investigations, it provides a significant amount of scientific evidence and theoretical foundation. This provides helpful instructions for conducting study on technology in the business field.

The TOE framework has been thoroughly examined in a wide range of disciplines, with a special focus on information systems. Nevertheless, the integration of technology in areas such as logistics has been somewhat slow, despite its importance in assessing the acceptance, execution, and exploitation of technology. Hence, this study contributes to the current understanding by utilizing the TOE framework in the specific areas of logistics and information management. In addition, the study incorporated the TOE model to investigate the relationship between LSQ and customer satisfaction, thereby providing a significant contribution to the theory. The research demonstrates that customer happiness is essential for retaining customers, confirming that the quality of an application has a good impact on improving the abilities of an organization.

5.2.2 Practical implication

This study possesses significance not just in terms of its theoretical worth for researchers but also in practical aspects, specifically for leaders in the logistics business. The findings will prove highly advantageous for managers and executives in a company that is navigating the learning, contemplation, and implementation of technology.

The findings of this study will be valuable for managers seeking insights into the factors impacting the implementation of new technologies within their operations, particularly focusing on the quality of their applications. Understanding these influencing factors in business processes will be vital for those aiming to effectively integrate technology, adding practical significance to operations to enhance customer satisfaction and retention.

6. Conclusion

This study aims to examine logistics service quality (LSQ) and its impact on customer satisfaction within business-to-customer (B2C) relationships in Vietnamese logistics enterprises, particularly through the lens of the technology-organization-environment (TOE) model. Utilizing a survey

method to collect data from users of logistics services, the study employed a quantitative comparative analysis to identify and evaluate the influence of eight distinct LSQ dimensions on customer satisfaction and retention. The findings reveal that the integration and strategic application of these LSQ dimensions, informed by the TOE model, significantly enhance customer satisfaction levels. This study not only fills a gap in existing academic literature by focusing on B2C relationships and the role of third-party logistics (3PL) service providers but also offers practical insights for logistics companies looking to improve their customer service quality and, consequently, customer loyalty.

There are evident limitations in this study that should be taken into account for future research and enhancement. Firstly, the study's findings were gathered in Vietnam and may not be broadly applicable to other countries. Secondly, the number of logistics companies currently utilizing technology through application quality is limited, restricting the author's capacity to gather extensive data for optimal objectivity. In the future, research could be broadened to encompass data from a broader range of enterprises, enabling the collection of more comprehensive and precise information, as well as facilitating result generalization. Lastly, this study solely focuses on quantitative research and does not incorporate qualitative research. Subsequent research papers could integrate both research methods to yield the most accurate outcomes.

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Appendix A: Research questionnaires

A. General information

1. How long have you used the external delivery service for your operations?
 - Less than 01 year
 - 01-03 years
 - 04-06 years
 - More than 06 years
2. When did you first start using service from GHTK by its app?
 - Since it is first introduced (2021)
 - 06-12 months
 - 04-06 months
 - 01-03 months
 - Less than 01 month
3. How often do you use the service of GHTK for your delivery/ shipping demands?
 - Almost every day
 - Almost every week
 - Every two weeks
 - Every month
 - Depend on demand
 - Not very often

B. Survey questionnaire

The questionnaire comprised two parts. The first was the demographic, such as educational level, age, gender, employment status. In addition, the interviewees were required to reply about the frequency with which they purchased products online and used logistics services each month. The second section focused on the constructs of logistics services, including PCQ, IQ, OA, OC, ODH, TIM, CS and RET. All measurement items of the above constructs were rearranged in accordance with previous studies. The questionnaire was developed in English and later translated into Vietnamese to inquire about adult Vietnamese customers.

Appendix B: Source of the items in research instrument

Code	Questions	Reference
<i>Personal Contact Quality (PCQ)</i>		
PCQ1	Responsiveness of tellers to order needs.	Bienstock et al. (2008)
PCQ2	Customer focus of tellers, especially personal issues	
PCQ3	Tellers' approach and behavior while meeting order requests	
PCQ4	Competency of tellers to customers' questions and order needs	
PCQ5	Handling customer feedback	
<i>Information Quality (IQ)</i>		Glenn and

IQ ₁	Availability of order-related information, including details of pick-up time, estimated arrival time, receiving information, payment records, etc..	Savitskie (2007)
IQ ₂	Shipping tracking capability	
IQ ₃	Speed and accuracy of information tracked	
IQ ₄	Complete and adequate information provided via the app for a single order and summary reports	
<i>Ordering Accuracy (OA)</i>		
OA ₁	Perfect order accuracy with a high percentage of completed orders without errors (more than 95%)	Mentzer et al. (2001)
OA ₂	Accuracy in filling orders, delivery time, billing, action on complaints	
OA ₃	Accurate tracking information	
<i>Ordering Condition (OC)</i>		
OC ₁	Product delivery without or lack of damages	Mentzer et al. (2001)
OC ₂	Safety and security of goods in delivery	
OC ₃	Delivery with the right items and quantity	
<i>Order Discrepancy Handling (ODH)</i>		
ODH ₁	Order discrepancy handling is effectively managed in orders after their arrivals	Mentzer et al. (2001)
ODH ₂	Straightforward and result-oriented handling solutions	
ODH ₃	High and active responsiveness to the order discrepancy	
ODH ₄	Employees show careful consideration of discrepancies and are willing to find solutions as soon as possible	
<i>Timeliness (TIME)</i>		
TIME ₁	Total order cycle time is short with simple steps of clicking and selecting	Mentzer et al. (2001)
TIME ₂	Transportation time is optimized for fast delivery	
TIME ₃	Timeliness of shipment pickup and delivery as estimation in the app (on-time)	
TIME ₄	Order placement accessibility and handiness	
<i>Customer Satisfaction (CS)</i>		
CSA	I am satisfied with the quality of LSP services recently.	Mentzer et al. (2001)
<i>Retention (RET)</i>		
RET ₁	How likely is it that you are to leave GHTK due to their service quality	Mentzer et al. (2001)
RET ₂	How likely is it that you are to keep using the service of GHTK for your delivery demands for a longer time	
RET ₃	How likely would you recommend GHTK service to others?	

All LSQ construct items were measured on a seven-point Likert-scale (1 = "strongly disagree"/ "strongly dissatisfied"; 7 = "strongly agree"/ "strongly satisfied").