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Why do clients switch? An empirical study on third-party logistics service providers' loyalty in Vietnam

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Abstract:

The logistics industry significantly contributes to global supply chain and e-commerce growth. This study investigates the overall service quality (OSQ), leading to customer satisfaction (CS) and switching intention (SW) within Vietnam's logistics industry. Additionally, it examines the role of digital transformation (DT) as a moderating factor in the relationship between OSQ and CS. Employing partial least square structural equation modelling (PLS-SEM), we analysed factors impacting overall logistics service quality, satisfaction, and loyalty among 229 companies within Vietnam's economy. Our findings suggest that reliability, responsiveness, empathy, and order discrepancy handling positively influence OSQ. Customers with higher satisfaction and perceived service quality are less likely to switch logistics service providers. Contrarily, DT does not significantly moderate the relationship between OSQ and CS within the surveyed data. Therefore, logistics service providers should enhance aspects such as reliability and responsiveness to improve service quality. This study contributes to understanding the links among OSQ, CS (moderated by DT), and SW in the Vietnam logistics industry, providing practical implications for operational excellence.

Keywords: **intention to switch, loyalty, service quality, third-party logistics provider, Vietnam.**

Classification numbers: **2.1, 2.2**

1. Introduction

In recent decades, the logistics industry has played a crucial role in the global supply chain and e-commerce, enabling the transportation of goods and commodities across nations and creating value for the global economy. Indeed, the World Bank reported that the logistics industry accounted for 13% of the global economy, valued at $5.2 trillion, and employed a workforce of over 60 million people worldwide in 2018 [1]. This industry has sustained growth over the past decade, with a compound annual growth rate of 3.9% between 2010 and 2018 [1]. However, the global supply chain faced disruptions due to the COVID-19 pandemic, leading to signs of a global economic slowdown. The global supply chain has gradually become more resilient and rebounded in the years following the COVID-19 outbreak [2].

Vietnam, as an emerging economy, has proactively participated in international business activities with over 30 years of radical economic reform (the Doi Moi movement). Notably, Vietnam's accession to the World Trade Organization in 2007 marked a turning point for its participation in the global economy, underscored by significant agreements such as The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the EU-Vietnam Free Trade Agreement (EVFTA) [3]. Along with external opportunities, Vietnam's favourable

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geographic position has established it as a regional hub for transshipment and production in Southeast Asia. Over the last decades, Vietnam has become an attractive destination for international investors and manufacturers (e.g., Intel, Samsung…), leading to rapid evolution in the Vietnam logistics industry. As a result, Vietnam performed outstandingly in the logistics performance index among emerging economies and was ranked 39th out of 160 countries in 2018 [1]. Moreover, Vietnam was ranked 10th in the 2023 agility emerging markets logistics index, based on domestic and international logistics opportunities, business fundamentals, and digital readiness among the world's 50 emerging countries [4].

To achieve these performances, Vietnam leveraged its geographic advantages and made substantial internal efforts to fortify the national logistics system [5]. Vietnam's border stretches more than 3,260 km along the coastline with deep seaport systems from the North to the South. Seaports play a pivotal role in multi-modal transportation, where maritime transport, railroads, inland waterways, and air transportation converge. Additionally, public and private investments in infrastructure development accounted for 5.7% of GDP in recent years, ranking second after China (6.8% of GDP) among Asian countries [6]. These investments have supported the maintenance and expansion of 34 seaports, 22 airports, 19,000 km of inland waterways, 3,143 km of railroads, and 1,822 km of highways from the North to the South. Vietnam has a master plan to improve its infrastructure by 2030 [6].

Furthermore, Vietnam has enacted an institutional framework to drive the logistics industry. The promulgation of Decree No. 96/2022/ND-CP illustrates the state management of logistics services under The Ministry of Industry and Trade (MoIT). Additionally, Resolution No. 163/2022/NQ-CP promotes the fulfilment of business activities to gain competitiveness and develop logistics services in Vietnam. Among other initiatives, several decrees, circulars, and guidelines in roads, airways, inland waterways, railroads, maritime routes, and logistics have been promoted to support the Vietnam logistics industry. Approximately 3,000 enterprises function as 3PL providers in Vietnam, of which 95% are small and medium enterprises [7]. Given the fierce competition in providing 3PL services, enhancing the quality of logistics services to satisfy customers is a main focus for providers to retain ongoing customers and attract new clients within the competitive Vietnam logistics industry. Otherwise, customers may seek alternatives. Therefore, a study on logistics service quality and satisfaction is critically necessary among 3PL providers in Vietnam.

Several studies have discussed the quality of logistics services in the literature. Early research on transportation service quality in the U.S. context was found in empirical studies by S.A. Hopkins, et al. (1993) [8] and E.A. Morash, et al. (1994) [9]. Additionally, C.C. Bienstock, et al. (1997) [10] assessed physical distribution service quality (PDSQ) measurement. Others have studied port service quality dimensions from passenger perceptions [11] and their empirical association with customer satisfaction in Singapore [12], Korea [13], and Vietnam [14, 15]. Significantly, J.T. Mentzer, et al. (2001) [16] developed the logistics service quality (LSQ) scale concerning processes across customer segments. Some researchers extended this scale in specific cases, such as Danang city [17] and Haiphong city [18] in Vietnam. To the best of our knowledge, a study on 3PL service quality in Vietnam is still scant.

Most studies on service quality are grounded on the SERVQUAL model [19], and some use the LSQ model [16]. However, few empirical studies combine these two models. Moreover, alongside the rapid technological advancements of the Industry 4.0 era, logistics has embraced DT to boost the productivity and efficiency of operational business activities across logistics functions. However, numerous barriers to DT still exist in the Vietnam logistics industry. More than

90% of 3PL providers are still at the initial stage of digitalisation, though they are aware of the critical importance of DT in the logistics business [6].

Accordingly, this study explores factors of logistics service quality of 3PL providers associated with CS and loyalty in the context of the Vietnam logistics industry. This study contributes to the literature in the theoretical framework by combining the SERVQUAL model and LSQ in studying OSQ and the role of DT in the association between OSQ and CS. We examined this study in four main gateways of import-export businesses in Vietnam, including Hanoi and Haiphong city in the North, Danang city in the Central, and Ho Chi Minh city in the South. By doing so, we addressed three research questions:

1. Which factors significantly influence CS with 3PL providers in Vietnam?

2. How does digital transformation moderate the relationship between OSQ and CS regarding the context of 3PL in the Vietnam market?

3. How can 3PL providers in Vietnam reduce customers' switching intentions to others?

2. Literature review

2.1. The service quality and logistics service quality model

The service quality (SERVQUAL) model, introduced by A. Parasuraman, et al. (1988) [19], is an initial and widely used tool for assessing service quality. SERVQUAL identifies the gap between customers' expectations of a service provided and their perceptions of the actual service delivered [19]. Addressing this gap is crucial for enhancing service quality. SERVQUAL has been applied across various sectors, including hospitality, retail, healthcare, education, and telecommunication. In the logistics sector, for example, S.A. Hopkins, et al. (1993) [8] adapted SERVQUAL to the U.S. transportation industry to measure the service gap between shippers and carriers, and C.C. Bienstock, et al. (1997) [10] explored physical distribution and formulated PDSQ dimensions.

J.T. Mentzer, et al. (1999) [20] conducted a comprehensive revision and validation of the PDSQ model, proposing a multidimensional model with an integrated logistics focus, termed LSQ. This model was further supported by J.T. Mentzer, et al. (2001) [16], confirming its robustness. LSQ comprises two complementary elements: marketing customer service and physical distribution service, which result in nine related logistics service quality components [16]. These include personnel contact quality, order release quantities, information quality, ordering procedures, order accuracy, order condition, order quality, order discrepancy handling, and timeliness as a process. By examining the SERVQUAL and LSQ models, we proposed five dimensions reflecting the OSQ of Vietnam's logistics services, predicting CS and behavioural intentions [21].

2.2. Customer satisfaction

Customer satisfaction has become a prominent topic within the service industry. Satisfaction is the emotional response experienced by an individual when a product's performance matches or exceeds their expectations. R.A. Westbrook, et al. (1991) [22] characterised satisfaction as the positive feelings experienced after consuming a product or service. In e-commerce logistics, S. Akil, et al. (2022) [23] described CS as an indicator of customers' happiness with a company's offerings, while G.T. Yeo, et al. (2015) [13] demonstrated consumers' positive feelings about service quality outcomes. Studies suggest that satisfied customers contribute to profitability by attracting new customers through referrals and fostering repeat business [24], making CS essential for competitive business strategies.

2.3. Digital transformation

In the digital era, the advancement of new technologies has radically changed competitive strategies, particularly in the logistics service industry. Providers must harness technologies such as artificial intelligence (AI), the Internet of Things (IoT), blockchain, and cloud computing to gain competitive edges. M. Cichosz, et al. (2020) [25] noted that smart logistics utilising AI, IoT, and blockchain provide competitive advantages by automating processes, optimising routes, and facilitating real-time tracking. G. Schuh, et al. (2017) [26] outlined 6 stages of DT in Industry 4.0: computerisation, connectivity, visibility, transparency, predictive capacity, and adaptability. Among other functional areas such as development, production, services, marketing, and sales, logistics can achieve competitive advantages through digital transformation.

In Vietnam, DT could enable 3PL providers to enhance customer experience (CX) by improving traceability and transparency. Additionally, DT can enhance productivity, boost business performance, increase connectivity among functional departments (thereby avoiding the silo phenomenon), and reduce carbon emissions through the optimisation of routes using AI, thereby supporting sustainable development [6, 25].

2.4. Switching intention

Customer switching intention is defined as "the customer's self-reported likelihood of terminating a current service relationship" [27]. Originally, the concept of customer switching was grounded in the brand switching model, which introduced the term "potential switcher" to describe customers who are not loyal within a specific market [28]. These customers can be influenced by various factors that may prompt them to switch. S.M. Keaveney (1995) [29] identified eight factors driving switching behaviour in the service industry: pricing, inconvenience, core service failure, service encounter failure, responses to service failure, competition, ethical problems, and involuntary switching. Empirical studies have consistently identified dissatisfaction as a primary factor driving customers to churn [27-30].

2.5. Hypothesis development

Tangibles refer to the appearance of facilities, equipment, staff uniforms, items, and materials used for performing services [19]. For service delivery firms, tangibles significantly strengthen positive customer relationships and create a moment in CX by utilising firms' unique assets [16, 31]. Some studies, such as [14, 32, 33], have indicated that the tangible dimension significantly impacts overall service quality (OSQ). Hence, we raise the hypothesis:

H1: Tangibles are positively associated with overall service quality.

Reliability delineates the ability to deliver timely and consistent services [19]. In the logistics context, reliability refers to the ability of service providers to consistently deliver services as promised, meet customer expectations, and provide reliable transportation and delivery of goods. It means that reliable providers perform the promised service accurately [32]. Reliability is critical to OSQ [14, 31-33]. Thus, we assume that:

H2: Reliability is positively associated with overall service quality.

Responsiveness refers to the eagerness to help customers and quickly resolve problems in errors or unexpected cases [19]. This dimension is particularly relevant to the logistics industry, where timely and efficient responses are crucial in meeting customer expectations and maintaining logistics operational excellence [14, 32, 33]. C. Ugboma, et al. (2004) [33] found that a higher level of responsiveness was associated with increased customer satisfaction and trust, suggesting that the quicker logistics service providers respond, the higher the overall quality of logistics service is. Hence, we propose the hypothesis:

H3: Responsiveness is positively associated with overall service quality.

Empathy expresses employees' service style through attention, care, and the capability to understand customer needs and provide a sense of security and safety [19]. Staff can stand in the customers' perspectives and provide personalised services properly and safely. The significance of empathy in driving positive business outcomes is widely recognised [14, 32-34]. Therefore, empathy could be an essential component of service quality across various businesses:

H4: Empathy is positively associated with overall service quality.

Order discrepancy handling refers to how logistics firms address differences in orders after receiving customers' orders [19]. Logistics errors such as wrong items and poor quality harm customers' perception of service quality. When customers notify a logistics provider about incorrect or defective products, providers must address these complaints effectively. Although these activities are time-consuming and costly, service providers must resolve these issues [16, 23]. Therefore, order discrepancy handling becomes a predominant component of service quality:

H5: Order discrepancy handling is positively associated with overall service quality.

Overall service quality and customer satisfaction. CS is commonly understood as a result of service quality. It implies that the level of CS increases in tandem with the perceived quality of the product or service. Generally, several empirical studies have found a positive association between service quality and CS [21, 29, 31]. Specifically in the logistics industry, the same association was observed in M.S. Farooq, et al. (2018) [24], D.N. Le, et al. (2020) [14], N.A.A. Roslan, et al. (2015) [32], S. Huma, et al. (2019) [35], and M.F. Sorkun, et al. (2020) [36]. In this study, we propose:

H6: Overall service quality is positively associated with customer satisfaction.

The moderating role of digital transformation. By virtue of DT, the logistics industry can enhance operational efficiency, optimise supply chain processes, and improve CX [25]. The logistics industry is highly reliant on providing efficient and reliable services. By fostering DT initiatives, service providers can track real-time shipments, manage inventory efficiently, and process orders faster than ever. Advanced technologies such as AI, IoT, and blockchain in smart devices can facilitate the track and traceability of goods and products among supply chain partners in logistics 4.0 [37, 38]; for example, agri-food products in Vietnam have applied blockchain technology [39]. We assume that the more DT is integrated into service provision, the stronger the association between OSQ and CS is. Thus, we suggest:

H7: Digital transformation moderates the relationship between overall service quality and customer satisfaction.

Overall service quality and switching intention. Despite extensive research on service quality and its impact on various customer-related outcomes, the relationship between OSQ and switching behaviour still needs exploration, particularly in logistics. While the negative relationship between service quality and customer switching behaviour is statistically significant in the mobile phone service sector [40], it does not find significance in the telecommunication industry [29]. J.S.C. Hsu (2014) [41] found that perceived switching value and benefits generate switching intention. Increasing service quality could retain customers and mitigate the risk of customers churning among service providers:

H8: Overall service quality is negatively associated with switching intention.

Customer satisfaction and switching intention. The link between CS and the intention to switch providers

is critical for customer retention. Customers are likely to switch to others if they perceive less satisfaction with 3PL service providers. In other words, satisfied customers tend to stay loyal to their current service providers [23, 35]. By juxtaposing switching benefits and costs, customers decide whether to continue or maintain their current service providers [41]. Some argue that satisfied customers are unlikely to change to other service providers [27, 29]. Therefore, we propose:

H9: Customer satisfaction is negatively associated with switching intention.

The mediating role of CS between OSQ and switch intention. Research consistently shows that logistics service quality positively influences customer satisfaction and behavioural intentions in the 3PL industry [14, 23, 32, 35]. Multiple studies have identified the OSQ with various SERVQUAL dimensions impacting CS, which in turn mediates the relationship between OSQ and customer loyalty [14, 23]. Particularly, customer behaviour in our study is the switch intention of clients. The relationship of SERVQUAL-satisfaction-loyalty is quite common in the corpus of literature. However, we highlight the mediating role of satisfaction between SERVQUAL and loyalty by posing the following hypothesis:

H10: Customer satisfaction mediates the relationship between overall service quality and switching intention.

3. Research methods

3.1. Sample and data collection

We tested the research model using data collected from customers utilising 3PL services of a leading trading and delivery goods company headquartered in Ho Chi Minh city, with branches in Hanoi, Haiphong city, and Danang city - the four main cities in Vietnam. This company is a significant player in the Vietnamese freight forwarding market, providing inland transportation, air freight, and sea freight services in both domestic and international markets. The structured questionnaire comprised two sections: the first collected general information about the customers surveyed, such as business type and size, location, experience, transportation mode, frequency of service usage, and primary type of shipment; the second section contained questions about service quality, customer satisfaction, digital transformation, and switching choices. Before disseminating the survey, we asked four experts - two academic researchers and two industry practitioners - to review and validate the content of the study. Following some amendments, the final version of the survey was rendered more transparent and valid. For data collection, we employed a non-probability convenience sampling method. The survey was conducted in August 2023.

The final questionnaire was distributed directly to 270 participants using the company's logistics services via an online platform. A total of 229 respondents returned completed questionnaires, resulting in a response rate of 84.8%. These 229 samples were then available for further analysis.

3.2. Measurement scale

This study utilised variable measures grounded in the literature, employing a five-point Likert scale ranging from 1 to 5, where 1 represents 'strongly disagree' and 5 represents 'strongly agree'. For service quality, the variables of tangibles (TAN), reliability (REL), and responsiveness (RES) comprised four items each and were adopted from A. Parasuraman, et al. (1988) [19] and D.N. Le, et al. (2020) [14]. Empathy (EMP) also includes four items adopted from the same sources [14, 19]. Order discrepancy handling (ODH) with three items was adopted from J.T. Mentzer, et al. (2001) [16], while OSQ was measured by three items from D.N. Le, et al. (2020) [14]. DT included four items suggested by J.K. Nwankpa, et al. (2016) [42]. Three items measuring CS were taken from G.T. Yeo, et al. (2015) [13]. Finally, SW uses binary choices (0 not to switch and 1 to switch) as detailed in Table 1.

Table 1. Measurement items for constructs.

Items	Mean	S.D.	Outer loading	VIF
Tangible *(Cronbach's alpha=0.750; C.R.=0.842, AVE=0.573)*				
TAN1. The working offices of my 3PL provider are spacious.	4.288	.927	0.718	1.407
TAN2. The staff members of my 3PL provider are well-dressed and wear neat uniforms.	4.231	.991	0.816	1.754
TAN3. My 3PL provider has enough modern facilities and equipment to ensure customer service needs.	4.205	1.018	0.793	1.722
TAN4. My 3PL provider has appropriate and effective equipment for protecting goods and avoiding damage during transport.	4.148	.932	0.695	1.300
Reliability *(Cronbach's alpha=0.814; C.R.=0.878, AVE=0.643)*				
REL1. My 3PL provider delivers services on time as committed.	4.279	.976	0.826	2.742
REL2. My 3PL provider always performs the right committed services (cargo clearance, loading and unloading containers, etc.).	4.131	.949	0.733	1.665
REL3. My 3PL provider accurately issues an invoice (delivery order), a receipt, and a purchase order document.	4.105	.938	0.794	1.808
REL4. My 3PL provider can deliver goods without flaws or damage while providing services.	4.236	.928	0.850	2.848
Responsiveness *(Cronbach's alpha=0.825; C.R.=0.883, AVE=0.654)*				
RES1. My 3PL provider can quickly respond to any unexpected or urgent order.	4.153	1.109	0.877	2.133
RES2. The staff members of my 3PL provider are always willing to help customers with logistics services.	4.148	.987	0.825	1.870
RES3. The staff members of my 3PL provider are always available at my request when cargoes face trouble at port.	4.057	1.033	0.740	1.644
RES4. My 3PL provider is fully supportive in addressing emergency problems and situations encountered.	4.135	1.083	0.787	1.759
Empathy *(Cronbach's alpha=0.828; C.R.=0.879, AVE=0.593)*				
EMP1. My 3PL provider understands my company's unique needs related to the transportation of cargo (warehousing, storage, handling fee, etc.).	4.118	1.032	0.808	2.133
EMP2. My 3PL provider pays attention to the issues my company is most concerned about (cut-off time, clearance time, container position, etc.).	4.201	.968	0.771	1.870
EMP3. My 3PL provider demonstrates understanding of customer interests.	4.205	1.039	0.832	1.644
EMP4. When my company uses services from my 3PL provider, we gain a gratifying sense of security.	4.157	1.087	0.748	1.759
EMP5. My 3PL provider will put themselves in a position to solve problems for my company when addressing problems.	4.183	1.007	0.680	2.133
Order discrepancy handling *(Cronbach's alpha=0.638; C.R.=0.801, AVE=0.578)*				
ODH1. Correction of delivered quality discrepancies is satisfactory.	4.245	1.012	0.821	1.302
ODH 2. The process of reporting discrepancy process is adequate.	4.140	1.010	0.608	1.174
ODH 3. The response to order discrepancies is satisfactory.	4.048	1.095	0.830	1.398
Digital transformation *(Cronbach's alpha=0.757; C.R.=0.860, AVE=0.672)*				
DT1. My 3PL provider is driving new business processes built on technologies.	4.162	1.064	0.820	1.493
DT2. My 3PL provider is integrating digital technologies.	4.057	.921	0.815	1.601
DT3. My 3PL provider is shifting toward use of digital technologies.	4.057	1.029	0.824	1.496
Overall service quality *(Cronbach's alpha=0.785; C.R.=0.874, AVE=0.699)*				
OSQ1. Overall, the quality of logistics services provided by my 3PL provider is superior to those of other logistics providers.	4.249	.964	0.843	1.789
OSQ2. Overall, the quality of logistics services provided by my 3PL provider is of high standards in the logistics industry.	4.144	.972	0.837	1.673
OSQ3. Overall, the quality of logistics services provided by my 3PL provider meets my company's expectations of service quality.	4.162	.978	0.827	1.524
Customer satisfaction *(Cronbach's alpha=0.807; C.R.=0.886, AVE=0.722)*				
CS1. My company is satisfied with the services provided by my 3PL provider.	4.109	1.086	0.846	1.747
CS2. My company will continue to use services offered by this 3PL provider.	3.917	1.056	0.850	1.754
CS3. My company is willing to recommend this 3PL provider to our business partners.	4.052	1.056	0.853	1.750
Switching intention *(Cronbach's alpha=1.00; C.R.=1.00)*				
SW. Up to now, does your company intend to switch to another logistics provider?	28 (Yes)	201 (No)		1.000

3.3. Data analysis

This study employed second-generation statistical methods for multivariate analysis, specifically PLS-SEM, using the SmartPLS 4.0 software package. According to J.F. Hair, et al. (2022) [43], PLS-SEM is predominantly used to develop theories in exploratory research. Our research model, which links variables among OSQ, CS, and SW, is underexplored in existing literature. Therefore, the PLS-SEM algorithm is particularly well-suited for our study.

4. Results and discussion

4.1. Descriptive statistics

The clients, serving as business partners in the surveyed sample, are primarily large trading enterprises (46.7%), manufacturing plants (33.2%), transportation service providers (14%), and other types of businesses (6.1%) (Table 2). This distribution underscores the significant role that freight forwarders play in moving goods and commodities across trading partners. The business size distribution among micro, small, medium, and large categories is 8.3, 23.1, 45.0, and 23.6%, respectively, indicating that one-fourth of the enterprises are large, while nearly 80% are micro, small, and medium-sized companies. The geographical dispersion of businesses across the northern (24.0%), central (34.5%), and southern (41.5%) regions demonstrates that this company maintains a customer network on a national scale, enabling it to establish a resilient and interconnected logistics network. This network utilises competitive advantages due to its scale, reducing transportation times, optimising routes, and enhancing overall operational efficiency. The demographic data in Table 2 also details the years of establishment and the number of years of partnership of the business partners. The prevalence of sea freight (48%) and air freight (38.4%) over other modes like trucking as the primary modes of transportation among surveyed businesses highlights a focus on international rather than domestic services.

The frequency of service usage reflects the operational dynamics and inherent demands of the customers. Those using services less than twice per month account for 22.7%, while those using services more than four times per month represent 20.5%. Notably, a significant proportion of businesses (56.8%) use logistics services between three and four times monthly. Regarding the main types of shipment, full-container load (FCL) shipments (46.3%) cater to businesses with consistent cargo volumes, while less-than-container load (LCL) shipments (33.6%) serve the needs of companies with smaller consignments. The combination of both FCL and LCL shipments (20.1%) highlights the importance of versatile and customisable logistics options to meet the unique requirements of each business.

Table 2. Demographic characteristics of respondents (n=229).

Characteristics	Categories	Frequency	Valid percent
Type of business	Transport service enterprise	32	14.0%
	Trading enterprise	107	46.7%
	Manufacturing enterprise	76	33.2%
	Others	14	6.1%
Size of business	Micro-sized business (x≤50 people)	19	8.3%
	Small-sized business (50<x≤150 people)	53	23.1%
	Medium-sized business (150<x≤ 300 people)	103	45.0%
	Large-sized business (x>300 people)	54	23.6%
Location of business	Northern region	55	24.0%
	Central region	79	34.5%
	Southern region	95	41.5%
Company establishment	Under 5 years	17	7.4%
	5 years - under 10 years	61	26.6%
	10 years - under 20 years	120	52.4%
	Over 20 years	31	13.5%
Number of years of partnership	Under 5 years	44	19.2%
	5 years - under 10 years	162	70.7%
	10 years - under 20 years	23	10%
Main mode of transportation	Sea freight	110	48%
	Air freight	88	38.4%
	Others	31	13.5%
Frequency of service usage	Less than 2 times/month	52	22.7%
	From 2 to 4 times/month	130	56.8%
	More than 4 times/month	47	20.5%
Main types of shipment	Full-container load	106	46.3%
	Less-than-container load	77	33.6%
	Both full-container load and less-than-container load	46	20.1%

4.2. Measurement model

To ensure the reliability or internal consistency of the measurement scales, J.F. Hair, et al. (2022) [43] recommended using Cronbach's alpha and Composite Reliability (CR) indices. Cronbach's alpha requires a minimum acceptance value of 0.6 and is preferably over 0.7 [44]. In Table 1, the reliability of the studied variables ranged from 0.638 to 0.828, exceeding the minimum threshold of 0.6, indicating that the latent variables are internally consistent. Furthermore, CR values from 0.801 to 0.886 meet the acceptable threshold of 0.7 to 0.9, as suggested by J.C. Nunnally, et al. (1994) [45]. Table 1 also presents the outer loading for all reflective measurements in our research model. Items with outer loading below 0.7, including TAN4 and EMP5, were eliminated to maintain the explanatory power of indicators towards endogenous constructs.

For the convergent validity of the measurement scale, the average variance extracted (AVE) index assesses the correlations among items and their underlying construct. A measurement scale achieves convergence when AVE reaches 0.5 or higher, indicating that the latent construct explains at least 50% of the variance in each observed variable [39]. In our study, the AVE ranged from 0.573 to 0.722, exceeding the suggested minimum (Table 1). Therefore, the reliability and validity of this measurement model are considered satisfactory according to the criteria suggested by [39, 41].

For discriminant validity - a construct should be empirically distinct from other constructs - we utilised the C. Fornell, et al. (1981) [46] criterion and the Heterotrait-Monotrait (HTMT) ratios for assessment. According to C. Fornell, et al. (1981) [46], discriminant validity is achieved when the square root of the AVE is greater than its inner construct correlation coefficients. Table 3 shows that the square roots of each AVE value are greater than the off-diagonal elements, indicating satisfactory discriminant validity among variables. Furthermore, J.F. Hair, et al. (2022) [43] suggested an HTMT threshold value of 0.90 for conceptually similar constructs and 0.85 for conceptually different constructs. Table 3 reveals that all components in this study have HTMT values below the necessary threshold of 0.85, except for the components of EMP and DTxOSQ, which are acceptable at a value of 0.900. Thus, the discriminant validity of this study has been achieved. Additionally, this study evaluated all variance inflation factor (VIF) values below the cut-off value of 5. Our analysis shows that the VIF values are less than 3, indicating no critical levels of collinearity.

Table 3. C. Fornell, et al.'s criterion and Heterotrait-Monotrait ratio [46].

	CS	DT	EMP	ODH	OSQ	REL	RES	SW	TAN
CS	0.849								
DT	0.580	0.820							
EMP	0.564	0.725	0.770						
ODH	0.460	0.571	0.627	0.760					
OSQ	0.517	0.631	0.679	0.606	0.836				
REL	0.511	0.602	0.665	0.587	0.706	0.802			
RES	0.574	0.565	0.634	0.520	0.617	0.576	0.809		
SW	-0.722	-0.667	-0.676	-0.548	-0.685	-0.639	-0.611	1.000	
TAN	0.320	0.542	0.637	0.558	0.548	0.603	0.478	-0.446	0.757
Heterotrait-Monotrait ratio (HTMT)									
CS									
DT	0.738								
EMP	0.689	0.900							
ODH	0.626	0.799	0.829						
OSQ	0.647	0.811	0.823	0.826					
REL	0.631	0.763	0.795	0.814	0.877				
RES	0.697	0.704	0.753	0.676	0.743	0.688			
SW	0.804	0.766	0.729	0.667	0.769	0.706	0.665		
TAN	0.407	0.716	0.781	0.784	0.707	0.771	0.610	0.510	
DTxOSQ	0.435	0.705	0.724	0.706	0.900	0.782	0.563	0.653	0.692

CS - customer satisfaction; DT - digital transformation; EMP - empathy; ODH - order discrepancy handling; OSQ - overall service quality; REL - reliability; RES - responsiveness; SW - switching intention; TAN - Tangible.

Finally, the research model should be subject to a goodness-of-fit test after evaluating the constructs' reliability and validity. The standardised root mean square residual (SRMR) delineates the discrepancy between the correlations explained by the research model and those observed in the data. J.F. Hair, et al. (2022) [43] suggest that an SRMR should be lower than 0.080. Our empirical findings show that the SRMR in this study is 0.071, which is beneath the threshold. Consequently, the measurement model meets the criteria for satisfactory reliability, validity, and goodness-of-fit, enabling further data analysis in the structural equation model.

4.3. Structural equation modelling

The fitness of the structural model is evaluated through the coefficient of determination R^2 and effect size (f^2). The R^2 values, as shown in Fig. 1, for OSQ (0.615) and SW (0.654) can be considered moderate, whereas the R^2 value for CS (0.388) is relatively weak, according to the rules of thumb by J.F. Hair, et al. (2022) [43]. These results indicate that our research model provides acceptable explanations of the variances in the inner model for OSQ, SW, and CS, respectively. Regarding the f^2 effect size, this metric illuminates the effectiveness of the impact of each independent variable on the dependent variable. The cut-off values of f^2 at 0.02, 0.015 and 0.035 interpret small, medium, and large effects, respectively. For example, our empirical evidence shows that the effect size for CS→SI (f^2 = 0.534) and OSQ→SI (f^2=0.382) are significant, while TAN→OSQ (f^2=0.001) shows a small effect. Overall, these effect size values express the varying degrees of influence that different exogenous variables exert on the endogenous variables.

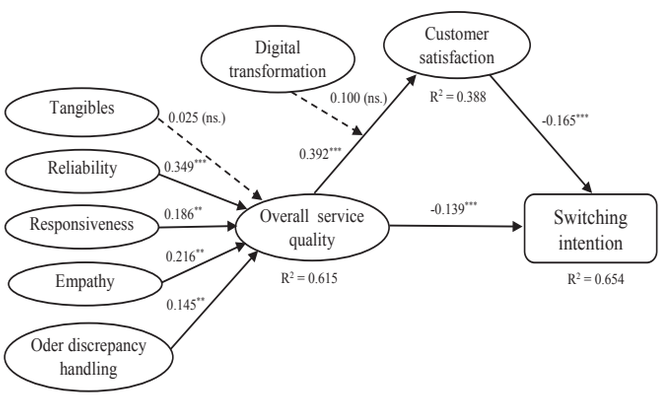

Fig. 1. Results of inner structural model. Note: *,**,*** significant level at 0.10, 0.05, and 0.01, respectively; ns. - not significance.

For the structural model (Fig. 1), seven out of the ten associations proposed in this study were statistically significant (Table 4). Among the SERVQUAL dimensions, no statistically significant relationship was found between Tangibles and OSQ (H1 is not supported). In contrast, the associations between RES, EMP and ODH with OSQ are statistically significant at the 0.05 level, with coefficients of 0.186, 0.216, and 0.154, respectively (H3, H4, and H5 are supported). Among these dimensions, REL has the most substantial statistical impact on OSQ at the 0.01 level with a coefficient of 0.349 (H2 is supported). Furthermore, OSQ was found to have a positive relationship with CS (β=0.392, p<0.05), supporting H6, indicating that higher overall service quality correlates with increased customer satisfaction.

Table 4. Results of hypothesis testing.

Hypothesis		Path coefficient	t-value	p-value	Significance at 0.05
H1	Tangibles→OSQ	0.025	0.309	0.757	No
H2	Reliability→OSQ	0.349	3.816	0.000	Yes
H3	Responsiveness→OSQ	0.186	2.329	0.020	Yes
H4	Empathy→OSQ	0.216	2.394	0.017	Yes
H5	ODH→OSQ	0.154	2.021	0.043	Yes
H6	OSQ→CS	0.392	3.229	0.001	Yes
H7	DTxOSQ→CS	0.100	1.162	0.245	No
H8	OSQ→SW	-0.139	4.365	0.000	Yes
H9	CS→SW	-0.165	5.387	0.000	Yes
H10	OSQ→CS→SW	-0.203	2.826	0.005	Yes

OSQ - overall service quality; ODH - order discrepancy handling; CS - customer satisfaction; SW - switching intention.

The relationship between OSQ and SW was negatively significant (β=-0.139, p<0.01) (H8 is supported), suggesting that customers perceiving high service quality tend to remain loyal and are less likely to switch to other service providers. Furthermore, H9 demonstrates a negative association between CS and SW (β=-0.165, p<0.01), indicating that higher customer satisfaction reduces the intention to switch. This result confirms that the relationships among OSQ, CS, and SW function as complementary partial mediation with the total effect of SW at a correlation coefficient of -0.203 (H10 is supported). However, the moderating effect of DT does not strengthen or attenuate the relationship between OSQ and CS (H7 is not supported), suggesting that efforts in DT in the logistics business have been ineffective. Control variables (Table 2) such as the scope of business partners, the age of the business partners (dating back to the initial establishment), the period partnering with 3PL service providers, and the frequency of service use do not influence the exogenous variables in our study.

The dependent variables dictate a single dichotomous (switching and not switching) indicator. We conducted a logistic regression analysis (Table 5) to assess the impact of OSQ and CS on SW. The logistic regression model, consisting of OSQ and CS as predictors, is presented in Table 6. We found that both OSQ (β=-2.090, p<0.001) and CS (β=-2.887, p<0.001) were negatively associated with switching intention. The R^2 for the intention construct was 0.789, reflecting that the model provides robust explanations of the variance in switching intention. In summary, the results strongly suggest that when customers have a higher level of CS and service quality, they are inclined to remain loyal to their current 3PL providers (Table 6 and Fig. 2).

Table 5. Summary of logistic regression results.

SWITCHING	OSQ mean	OSQ S.D.	CS mean	CS S.D.	N
Not_switch (0)	4.391	0.476	4.270	0.596	201
Switch (1)	2.702	1.121	2.273	0.811	28

OSQ - overall service quality; CS - customer satisfaction.

Table 6. Results of logistic regression analysis.

	Chi-square	*d.f.*	Sig.	
Model	134.34	2	.000	
-2Log Likelihood (L)				-17.888
Variable	B	S.E	Sig.	R^2
OSQ	-2.090	0.500	0.000	0.789
CS	-2.887	0.631	0.000	
Constant term	15.201	3.18	0.000	

OSQ - overall service quality; CS - customer satisfaction.

4.4. Digital transformation intervention

This study further tested the moderating effect of DT on the relationship between OSQ and CS. Table 7 shows no statistically significant moderation (p=0.245>0.05), suggesting that DT does not play a moderated role in this association (H9 was not accepted). However, DT significantly impacts CS (β=0.459, p<0.001), proposing that DT activities satisfy customers more.

Table 7. Path coefficients for moderating effects.

Hypothesis	Path coefficient	t-value	p-value
DT→CS	0.459	5.190	0.000
OSQ→CS	0.392	3.229	0.001
DTxCS→SW	0.100	1.162	0.245

CS - customer satisfaction; DT - digital transformation; OSQ - overall service quality; SW - switching intention.

5. Conclusions and implications

This study explores the associations among OSQ, CS, and SW within Vietnam's logistics industry. Despite initial assumptions, DT does not moderate the relationship between OSQ and CS. However, CS effectively mediates the relationship between OSQ and itself. Our findings demonstrate that reliability, responsiveness, empathy, and order discrepancy handling positively influence OSQ, aligning with prior studies [14, 23, 32, 33]. These factors significantly enhance customer satisfaction and reduce switching

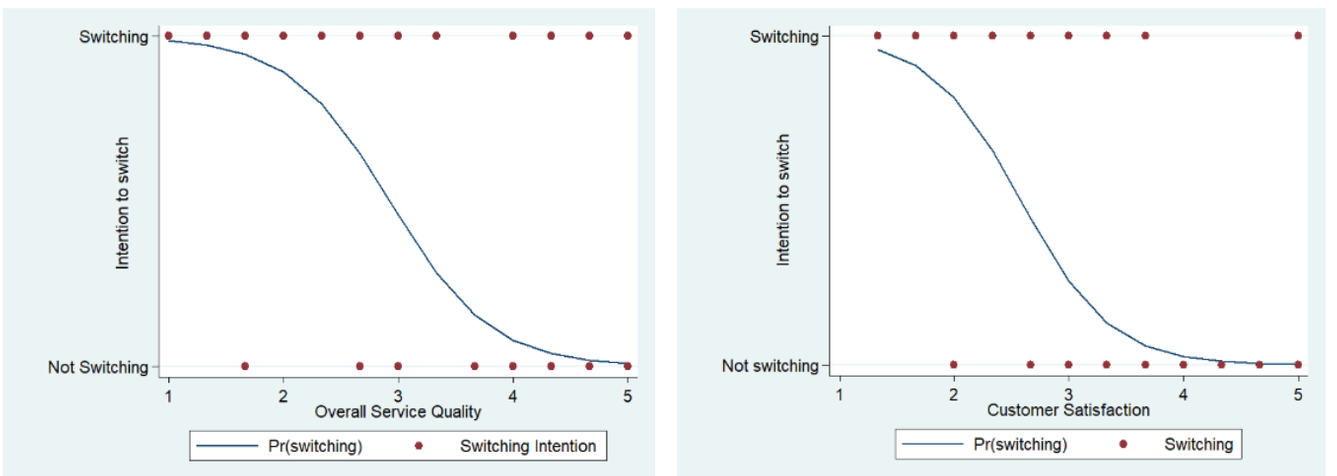

Fig. 2. Logistic regression results on overall service quality and customer satisfaction.

intention [23, 35, 36, 41]. Despite the influence of these factors, DT does not significantly impact the interaction between OSQ and CS. This study contributes notably to the literature by highlighting several key points:

5.1. Theoretical implications

This study enhances the existing conceptual framework by detailing the impacts of SERVQUAL dimensions on OSQ and examining the interconnections among OSQ, CS, and SW within Vietnam's logistics sector. Firstly, we proposed the role of DT as a moderator in the mediating relationship among OSQ, CS, and SW. This aspect is notably underrepresented in the logistics service industry literature. The empirical findings from our study reveal a strong positive association between OSQ and CS, suggesting that customers perceiving high-quality logistics services are likely to experience increased satisfaction. This result aligns with the findings of S. Huma, et al. (2019) [35] and M.F. Sorkun, et al. (2020) [36], thus advocating for 3PL providers to significantly enhance their logistics services. Secondly, we introduced the construct of order discrepancy handling into the SERVQUAL model, which is commonly explored within sectors such as hospitality, retailing, healthcare, education, and telecommunications. We recommend that future researchers consider the role of order discrepancy handling in their studies. Our findings underscore that 3PL providers should focus on improving reliability, responsiveness, empathy, and order discrepancy handling within their service offerings. Among these factors, reliability is identified as being the most influential. Finally, the study finds that customers who perceive a higher level of service quality and are satisfied with the service provided are less likely to switch to other competitors. The third theoretical contribution is an intention to switch to other competitors as devised in our research model. This introduces a new dimension to the traditional discussions around customer loyalty, often elaborated on by other scholars [23, 35], by incorporating the use of logistic regression models to assess switching intentions.

5.2. Practical implications

In the fiercely competitive market of Vietnam, the retention of current clients is of paramount importance for any 3PL provider. To achieve this, providers should strive to enhance reliability by building stronger customer trust through consistent on-time delivery, accurately fulfilled orders, and minimising service flaws and damages [35]. Additionally, 3PL providers need to optimise logistics processes to minimise delays and maintain the dependability of their operations [16]. They should also consider expanding their partnerships with a wider array of shipping lines to offer customers more flexibility and choice. Responsiveness is crucial as it reflects the provider's ability to quickly and effectively assist customers with inquiries, concerns, and unexpected situations [13, 14]. Establishing clear communication channels and protocols for swiftly addressing customer issues ensures that customers perceive value in the services provided. Moreover, 3PL providers should encourage their staff to deliver personalised attention and empathetic support to enhance the customer experience. Given the international scope of logistics, particular emphasis should be placed on improving the foreign language skills of employees [6]. Furthermore, 3PL providers should devise a reasonable reward system aligning with staff performance. Fourth, to handle order discrepancies effectively, providers should invest in comprehensive training and develop robust processes that enable prompt resolution of issues, thus enhancing overall customer satisfaction [25]. A well-managed approach to handling order discrepancies can transform potential challenges into positive customer experiences [16, 23, 25]. 3PL providers can demonstrate their commitment to customer-centric service by addressing discrepancies promptly and professionally.

Our findings indicate that DT does not moderate the relationship between OSQ and CS. This observation aligns with the current digitalisation levels in Vietnam, where more than 90% of logistics companies operate primarily at basic digitalisation levels - level 1 (computerisation) at 73.5% and level 2 (connectivity)

at 17.0%. Remarkably, 97.8% of logistics companies utilise software like Microsoft Excel and Google Sheets for daily operations, and 94.8% employ electronic custom services, specifically VNACCS [6]. However, the application of digital technologies in other activities, such as freight forwarding, customer relationships, transportation management, warehouse management, order management, and terminal operating systems, remains limited. This suggests that logistics providers need to intensify their efforts to embark on more comprehensive DT initiatives by utilising advanced technologies such as AI, IoT, and blockchain to track and trace goods and commodities in real-time, especially in the e-commerce market [37]. The necessity for digital transformation with intelligently connected tracking and tracing devices is particularly crucial in Logistics 4.0 [38]. For instance, blockchain technology, such as Agridential, has been implemented in some agricultural food sectors in Vietnam in recent years [39].

It is imperative that logistics providers standardise operational processes, strengthen leadership commitment to DT, and continuously develop feasible technological solutions [25, 37, 38]. Additionally, they should formulate a compatible roadmap for DT that aligns with their company's vision and mission, considering the constraints of human and financial resources. This study also reasserts the mediating role of customer satisfaction between service quality and behavioural intention, as previously explored [14, 23]. Ultimately, enhancing customer satisfaction and overall service quality can significantly reduce the churn rate among customers.

5.3. Limitations and future research

This study has limitations due to its focus on a leading 3PL service provider, which may not generalise to all logistics companies in Vietnam. We recommend future research that replicates this study across various companies in Vietnam and internationally. Additionally, while this study selected five process-related logistics service quality factors as antecedents of OSQ, further research might explore alternative sets of factors and delve deeper into examining their interrelationships. Moreover, by expanding the scope to include a business-to-business framework and comparing various industries, future studies could reaffirm unique logistics service factors from multiple perspectives.

CRediT author statement

Co Huynh Thi My: Conceptualisation, Methodology, Literature review, Data analysis; Thang Luong Minh: Data analysis; Uyen Phan Nguyen Thuy: Conceptualisation, Methodology, Literature review; Thien-Vu Tran: Reviewing and Editing.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

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