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The Effect of Logistics Services Quality on Consumer Satisfaction in Fresh Food E-Commerce: Evidence from the South of Vietnam

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Abstract

This study aims to explore the impact of five aspects of Logistics service quality on Consumer satisfaction for the fresh food e-commerce in three provinces of the Southern Vietnam, including Ho Chi Minh City, Binh Duong, and Dong Nai. Results show that Personnel contact quality, Delivery quality, and Empathy quality have significantly positive impacts on consumer satisfaction. However, the impact of Information quality and Timeliness quality are not strong significant. Remarkable, Personnel contact quality has the strongest impact on consumer satisfaction in the logistics service quality of fresh food e-commerce. The findings provide: i) logistics firms in the field of fresh food e-commerce with important managerial implications, and ii) researchers with empirical evidence in the research context of an emerging economy.

Key words: *Logistics service quality, Personnel contact quality, Delivery quality, Information quality, Timeliness quality, Empathy quality, Fresh food, E-commerce, Consumer satisfaction.*
JEL Classification: L81; M31; Q02

1. Introduction

Logistics services have been considered as a technique to achieve a competitive edge in the market because of their role in enhancing customer satisfaction (Bowersox et al., 2008; Novack et al., 1995). Consumers increasingly want greater levels of service excellence in addition to better quality products, which is strongly tied to the idea of behavioral intents and customer happiness (Bowersox et al., 2002; Parasuraman et al., 1985). Especially, the role of e-commerce logistics has become more and more important in the era of touchless economy due to pandemics.

The COVID-19 epidemic has changed how people live and how the economy functions, which has led to a significant increase in online food shopping among customers. E-commerce is a new method of doing business, and appears in all nations, including Vietnam – an emerging economy. Also, possibilities have emerged for the top logistics industries, including e-commerce and third-party logistics providers (Mazlan, 2021). Consumers used to purchase "a bunch of veggies and fish" in the conventional market, but in order to assure their safety, they now purchase fresh food online from online retailers via smartphone apps like e-wallets and VinID or e-commerce websites like Lazada and Shopee... Fresh food supply is a major driver for e-commerce sites and supermarkets because of the rising demand for goods including vegetables, fruits, meat, seafood, and fish (Boxme, 2021). While the market for fresh foods is growing quickly, it also faces to one of the most challenging issues: its supply chain management. Food is perishable items; therefore, its logistics service quality is a challenge to satisfy customers through various stages such as storage, transportation, and final delivery.

In an emerging market like Vietnam with a strong economic growth, there is a dramatic increase in demand for fresh food. Consumers continue to purchase vegetables, fruits, milk, fish and meat from e-commerce platforms, such as Tiki, Lazada, and Shopee... They also make use of fast delivery services on these platforms. Vietnam's fresh food market is estimated to be worth $27 billion per year, continuing its expanding. Fresh food sales are expected to grow at a 4.3% annual rate. Fresh food and fast-moving consumer goods (FMCG) account for roughly one-third of Vietnamese income. Fresh food spending is three times that of FMCG, with an estimated weekly expenditure of VND 1.1 million. According to Nielsen's research, consumers are more willing to shop for fresh food online when they have a variety of purchasing options and a certain level of quality assurance. Therefore, it is a potential market for logistics firms in the fresh food e-commerce in Vietnam. Logistics firms need to know which dimensions of logistics service quality

they should focus on to better their consumer satisfaction. To meet this need, we examine the impact of five aspects of logistics service quality on consumer satisfaction for the fresh food e-commerce in three provinces of the Southern Vietnam, including Ho Chi Minh City, Binh Duong, and Dong Nai. This region has also attracted great attention from scholars in business management (Dam and Huynh, 2022; Ho and Huynh, 2022; Nguyen and Huynh, 2022).

This study contributes to the literature in two ways. Firstly, it provides an evidence on the research issue in the context of an emerging economy like Vietnam for scholars. Secondly, findings will provide logistics enterprises managerial implications for enhancing their services to satisfy their customers in the most efficient manner.

2. Literature review

2.1. Theories

2.1.1. Logistics services quality

Logistics have seen significant changes as a consequence of the usage of information and communication technologies. The use of information technology to logistics has been genuinely innovative, especially in terms of raising the caliber of clients' logistical services (Gil et al., 2008). The ordering procedure, which is made easier and faster by the Internet, has a big influence on brick-and-mortar retailers' business models as well. The e-commerce sector now has a ton of new business prospects thanks to the Internet (Chen & Chen, 2014). With the rapid growth of e-commerce, client demand for variety and punctuality increases; in fact, B2C e-commerce enterprises increase the demand for logistical services (Wang, 2015).

Parasuraman et al. (1988) introduced a comprehensive service quality evaluation system, widely acknowledged in the academic community of the service industry, based on the principles of total quality management (TQM). The system consists of five dimensions: tangibles, responsiveness, reliability, assurance, and empathy. However, while the SERVQUAL model primarily emphasizes the functional and process aspects of service quality, logistics services primarily focus on the technological and outcome-related aspects. Thus, research on the factors influencing logistics service quality continues to evolve. For example, Bienstock et al. (1996) developed and validated a 15-item scale derived from the literature on physical distribution and logistics service quality. This scale encompassed three dimensions: timeliness, availability, and

condition. Subsequently, Mentzer et al. (1999, 2001) further expanded the structure to incorporate timeliness, availability, conditions, and additional dimensions related to function/process attributes. In this study, we use the concept of logistics services quality developed by Jiang et al. (2021) with five components, comprising: Personnel contact quality, Information quality, Timeliness quality, Delivery quality, and Empathy quality.

2.1.2. Fresh food e-commerce logistics services

Companies are continually pushed to make city freight logistics economical and dependable (Dablanc, 2007), but variables such as a large number of orders and a time pressure for order fulfillment have an impact on the flow of products (Quak, 2008). As a result, last-mile logistics is one of the supply chain's most inefficient and expensive' components (Fernie, Sparks, & McKinnon, 2010). The last mile is estimated to account for 28% of total transportation costs (Arvidsson, 2013) and is expected to contribute up to 35% of total e-commerce logistics costs due to rising logistics congestions and insufficient planning resulting in longer distances to customer locations (Kin, Verlinde, & Macharis, 2017).

Digital merchants are delivering increasingly responsive last-mile delivery services to their clients in order to grow sales and gain market share from competitors, but the outcome is sometimes insufficient to offset these operating expenses. The answer to this challenge is to increase the focus on company efficiency by developing techniques that promote 'leaner' supply chains that can lower costs and support faster and more effective delivery. As a result, the emphasis should be on time and cost-effective solutions that may also enable efficient resource usage (Prajapati, et.al, 2023).

This study focuses on the last-mile distribution component of fresh food e-commerce logistics in certain southern Vietnamese regions. The procedure entails distributing packaged goods to the consumer while ensuring that the order is fulfilled in the shortest amount of time possible. Consumer satisfaction and corporate profitability are often influenced by service quality and reaction time. The e-commerce website in fresh food e-commerce dynamically refreshes the database on the details of orders to be fulfilled at any point in time. This provides them with an estimate of the inventory to be kept in their warehouse. For efficient distribution planning, the number of items to be kept at each local distribution center must be decided.

2.1.3. Satisfaction

The phrase "customer satisfaction" is widely used in the business and commerce sectors. When comparing performance to expectations, a person's sense of pleasure or discontent is called customer satisfaction (Lasserre, 2017). In order to satisfy client expectations, a company's product and service offerings are measured using this word. The company's Key Performance Indicator is another name for this (KPI). In today's cutthroat market, a key component of corporate strategy is focusing on customer happiness (Cheng, Gan, Imrie, & Mansori, 2019; Tomic & Spasojevic Brkic, 2019).

Customer satisfaction is a subject of interest to companies and many academics because consumers are the most significant factor connected with firms and because ensuring their happiness is a top goal for the creation of sustainable growth in organizations (Afework, 2013).

2.2. Previous studies and hypothesis development

Uvet (2020) conducted a study to examine the link between customer satisfaction and the quality of logistics services. The findings demonstrated that five aspects of logistics service quality, including personnel quality contact, order condition, timeliness, order discrepancy management, and operational information sharing, could be used to explain customer happiness.

Also, in a case study of the Saigon New Port Logistics Company, Tran (2019) found that elements of logistics service quality influencing satisfaction are staff quality, information quality, order quality, and timeliness. The findings demonstrated that every element included in the study model complied with the specifications. It confirmed that there was a relationship between the caliber of the logistical service and customer satisfaction

In addition, Ho et al. (2012) looked at how logistic service quality factors including punctuality, order condition/accuracy, information quality, and availability/quality of staff affected customer satisfaction in Malaysia's logistic service market. With the exception of the variable of human availability/quality, the outcomes of this study generally corroborated prior research, with three out of four aspects impacting customer satisfaction.

Most updated, Nguyen and Huynh (2023) found that the service quality factors of the e-commerce logistics that affect customer satisfaction are customer service, the quality of the order, the quality of the information, the quality of the delivery, and the price of delivery.

2.2.1 Personnel contact quality and Satisfaction

The "Personnel Contact Quality" component is characterized as staff making an effort to comprehend the issue, maintaining courteous conduct, maintaining confidentiality, being conveniently accessible, successfully handling enquiries and complaints, and having enough product knowledge and expertise. Customer satisfaction with logistics services influences the conduct and attention of logistics service providers' workforce (Gupta, et. al., 2022). In order to raise customer expectations, communication between the customer and the contact person is crucial in the service delivery process (Parasuraman et al., 1985). Customers evaluate service quality using interaction quality as one of three dimensions. Interoperability is defined as the interaction of customers, liaisons, and other customers, which is an important aspect of service quality (Lehtinen & Lehtinen, 1991). The service staff must possess the following qualities: experience, attitude, timeliness, ability to empathize with the customer's situation, desire to solve problems during the delivery process, and knowledge of how to approach the customer. approach their interactions with customers (Bitner et al., 1994; Mentzer et al., 2001). Due to the complexities of fresh produce distribution, high-quality personnel will be required. These employees will have direct contact with consumers, particularly during the last-mile delivery process, which will have a direct impact on the overall evaluation of logistics services.

H1: Personnel contact quality positively affects consumer satisfaction.

2.2.2 Delivery quality and Satisfaction

Delivery service is defined as the delivery to the customer of carefully packed goods in accordance with the order, at the agreed-upon time and location. If the customer received the correct goods and there is no damage, the trouble of contacting service personnel to return the goods is unnecessary (Hua & Jing, 2015). Transportation requirements for fresh products will be higher than for other general industrial goods. Customers must receive goods at the appropriate time and location, and product freshness must be ensured throughout the logistics process (Jiang, Lai, Chang, Yuen, & Wang, 2021). Moreover, the higher the quality of the delivery service, the happier the customer.

H2: Delivery quality has a positive impact on consumer satisfaction.

2.2.3 Information quality and Satisfaction

According to Lin and Lee (2006), the quality of information determines the output of online communities. DeLone and McLean (2014) define information quality as an e-commerce content license. The "Information Quality" component specifies that the information supplied to clients by logistics service providers must be comprehensive, timely, accurate, sufficient, and reliable. The consumer wishes to be kept up to date on each transaction involving their shipments, including their actual position and the time of delivery or delay, if any. The quality of information given, whether offline or online, aids in meeting the customer's urgent needs (Gupta, et. al., 2022). Online sellers and prospective customers need content that is individualized, comprehensive, reliable, secure, and addresses the official community (Azemi, Zaidi, & Hussin, 2017). When it comes to logistics, fresh food e-commerce companies give customers access to timely, accurate tracking information, letting them know exactly when and where their orders will be delivered. By easily laying out these details and educating guests, they also serve as a conduit for client feedback and complaints (Tam & Oliveira, 2017). Therefore, it fosters comprehensive logistics service evaluation and increases service satisfaction.

H3: Information quality positively affects consumer satisfaction.

2.2.4 Timeliness quality and Satisfaction

Timeliness is one of the three aspects of physical delivery service quality conceptualization (Bienstock et al., 1996). Hult et al. (2000) defines that the time cycle begins with placing an order and ends with delivery. This cycle time includes re-ordering time if the product does not meet expectations (Hult et al., 2000; Mentzer et al., 2001; Mentzer et al., 1999). Moreover, tt refers to a product being shipped in order for it to arrive on time. It must be completed within the time frame specified (Rahmat & Faisol, 2016). In general, the time characteristic is the most traditional and important factor of logistics service quality (Mentzer et al., 1999). To improve overall consumer reviews use, and satisfaction with logistics services, fresh food e-commerce businesses can shorten logistics service cycles, improve service speeds, and respond quickly to customer service requests.

H4: Timeliness quality positively affects consumer satisfaction.

2.2.5 Empathy quality and Satisfaction

Empathy is defined as the concern and care that each customer receives from a company's employees. Furthermore, empathy refers to the organization's offering of care and personalised attention to its clients. Approachability, a sense of security, and an effort to understand the customer's needs all contribute to empathy (Olatokun & Ojo, 2016). Empathy for customers, according to Asperen, Pieter, and Dijkmans (2018), will increase customer satisfaction. Customers will be satisfied with the service and may even return if they feel their needs are understood and met (Aryee, Walumbwa, Seidu & Otaye, 2012). Fresh food e-commerce platforms must provide careful care and advice for fresh products. In order to improve customer satisfaction, businesses must ensure food safety for fresh products, good return service, transaction safety, and customer privacy.

H5: Empathy quality has a positive impact on consumer satisfaction.

2.3. Research framework

Based on the above hypotheses and Jiang et al. (2021), we propose the research framework as follows:

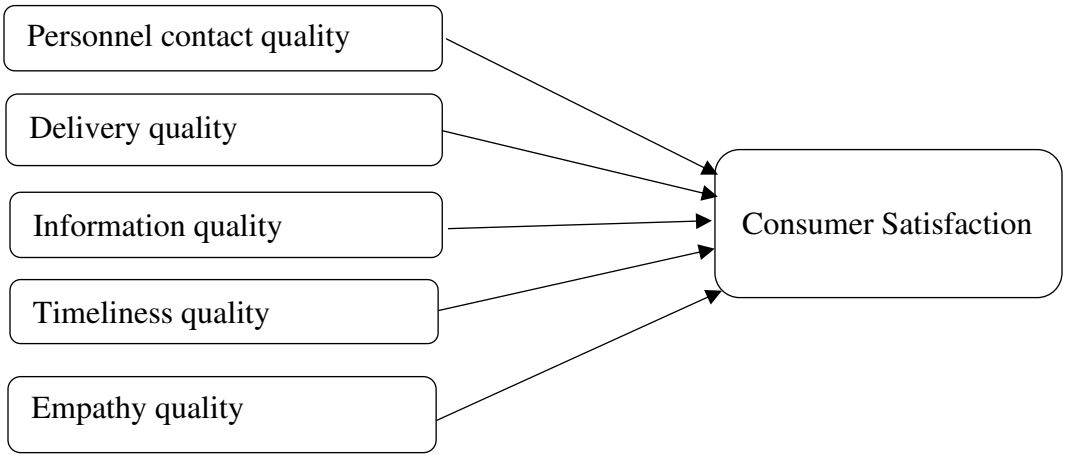

Figure 1: Research framework (Adapted from Jiang et al., 2021)

3. Data and research methodology

The quantitative method is used in this study, which is based on a questionnaire survey and then analyzes to determine the effect of various dimensions of logistics service quality factors such as

Personnel contact quality, Delivery quality, Information quality, Timeliness quality, and Empathy quality on customer satisfaction in three major provinces in the South of Vietnam, consisting of Ho Chi Minh, Dong Nai and Binh Duong.

We use the convenience sampling method due to the easy accessibility and vicinity. Furthermore, this form of sampling approach has many advantages such as being simple, inexpensive, and straightforward, and frequently available.

We collect data from 187 people from Ho Chi Minh, Binh Duong, and Dong Nai. They are customers who have utilized e-commerce sites to purchase green food. We do the survey to collect data via both online Google Forms and offline face-to-face survey.

The survey questionnaire is divided into two main parts. The first part includes four demographic questions about gender, age, marital status and education level. The second part includes 27 questions to measure dependent and independent variables. The level of agreement and disagreement is also evaluated using a five-point Likert scale, with 1 denoting strongly disagreeing and 5 denoting strongly agreeing. Tables 1, 2, and 3 show the survey questionnaire for demographic variables, dependent variable, and independent variables.

Table 1. Demographic variables

Variable	**Code**	**Items**	**Measurement scales**
Gender	GEN	Your gender	1= Male 2= Female
Age	AGE	Your age	1= Under 20 years old 2= 21 – 30 years old 3= 31 – 40 years old 4= 41 – 50 years old 5= Over 50 years old
Marital status	MS	Your marital status	1= Single 2= Married
Educational level	EDU	Your educational level	1= Elementary school or below 2= Secondary school

			3= High school 4= College/ University 5= Above University

Table 1. Dependent variable

Items	Code	Citation
Satisfaction	SA	(Thai, 2013; Kassim & Asiah Abdullah, 2010; Jiang et al., 2021)
1. How do you rate the fresh food e-commerce logistics service as a whole?	SA1	
2. What are your thoughts on the service experience of fresh food e-commerce logistics?	SA2	
3. What are your thoughts on the customer service of fresh food e-commerce logistics?	SA3	
4. What are your thoughts on fresh food e-commerce logistics' last-mile logistics service?	SA4	
5. What are your thoughts on fresh food e-commerce logistics delivery information providing service?	SA5	

Table 3 Independent variables

Items	Code	Citation
Personnel contact quality	PCQ	(Thai, 2013; Jiang et al, 2021)
1. Fresh food e-commerce logistics courier demonstrates excellent service attitude and behavior.	PCQ1	
2. Fresh food e-commerce logistics courier will respond to the customer's request calmly and graciously.	PCQ2	

3. Fresh food e-commerce logistics couriers are aware of my service requirements.	PCQ3	
4. Fresh food e-commerce logistics couriers are responsible, think about their consumers, and have strong business skills.	PCQ4	
5. Fresh food e-commerce logistics courier service attitude is not outstanding.	PCQ5	
Delivery Quality	DLQ	
1. Cold chain logistics distributes the fresh things I purchase (such as refrigerated trucks and cold chain trucks.).	DLQ1	(Hong et al., 2019; Jiang et al., 2021)
2. The fresh items I purchase will be delivered on time and correctly to the customer's selected location.	DLQ2	
3. The fresh items I purchase ensure product freshness and quality during the shipping procedure.	DLQ3	
4. The fresh things I buy arrive in their original packaging and are clean.	DLQ4	
Information Quality	IMQ	
1. I can quickly and precisely query the logistics distribution information after purchasing fresh items.	IMQ1	(Jiang et al, 2021; Huang et al., 2009; Thai, 2013; Rafiq & Jaafar, 2007)
2. I may quickly access the logistics distribution information after purchasing fresh items.	IMQ2	
3. I may obtain thorough and adequate feedback on logistics distribution details after purchasing fresh items.	IMQ3	
4. I may obtain thorough and adequate feedback on logistics distribution details after purchasing fresh items.	IMQ4	
Timeliness Quality	TLQ	

1. The logistics service provider took a short time from the shipment to the final delivery of the goods after I ordered fresh supplies.	TLQ1	(Jiang et al, 2021; Huang et al, 2009; Mentzer et al., 2001; Thai, 2013; Xing et al., 2010)
2. When I acquire new things, the logistics provider can deliver them swiftly.	TLQ2	
3. The period for pending orders at the logistics level is short after I buy fresh items.	TLQ3	
4. If fresh items are not delivered on time after I order them, the logistics service provider will swiftly arrange delivery.	TLQ4	
Empathy Quality	EPQ	
1. When I utilize new logistical services, I have a satisfying feeling of security.	EPQ1	(Jiang et al, 2021; Parasuraman et al., 1988).
2. When I had issues with the new logistics service, the logistics service providers were kind and comforting, and they offered good return service when necessary.	EPQ2	
3. When I encounter issues while utilizing the new logistics service, logistics service providers will put themselves in a position to assist me.	EPQ3	
4. They offered extra attention when I encountered issues with the new logistical service.	EPQ4	
5. When I have issues with the new logistics service, I will receive full assistance and support; they will respect the privacy of my personal information.	EPQ5	

4. Results and discussions

4.1. Descriptive statistics

Out of the total respondents (187), 43.32% (81 individuals) were males, while females accounted for 56.68% (106 individuals). The majority of the respondents, numbering 181, fell within the age range of 21 to 30 years old, representing 96.79% of the sample; only 6 individuals were under 20 years old, making up 3.21% of the respondents. Regarding marital status, 97% of the respondents were single, while 3% were married. When it comes to education, the highest proportion of respondents, 97.3% (182 individuals) had attended university or above; while college students constituted a mere 2.7% (5 individuals) of the sample. In terms of geographical distribution, 57.75% (108 individuals) of the respondents resided in Binh Duong, while 23.53% (44 individuals) lived in Dong Nai, and 18.72% (35 individuals) resided in Ho Chi Minh City.

4.2. Reliability test

To evaluate the measurement of dimensions and ensure consistency among the independent and dependent variables, a reliability test using Cronbach's alpha will be employed. The range of 0.60 to 0.95 for alpha indicates a desirable correlation between measurements and variables. Any measurement with an alpha value below 0.60 will be deemed unreliable and subsequently discarded (Tavakol & Dennick, 2011). The reliability tests for all variables are shown in Tables 4a-b, 5a-b, 6a-b, 7a-b, 8a-b, 9a-b, 10a-b, and 11a-b.

4.2.1. Satisfaction

Table 4a. Reliability Statistics for Satisfaction

Cronbach's Alpha	N of Items
.791	4

Table 4b. Item-Total Statistics for Satisfaction

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SA1	12.20	4.012	.628	.726
SA2	12.15	4.139	.714	.683
SA3	12.14	4.630	.549	.764
SA4	12.08	4.623	.522	.777

As shown in Tables 4a and 4b, Cronbach's Alpha is 0.791 which is higher than 0.6 and Corrected Item-Total Correlation of 4 items SA1, SA2, SA3, and SA4 are higher than 0.3 so all the item can be used for factor analysis.

4.2.2. Personnel contact quality

Table 5a. Reliability Statistics for Personnel contact quality

Cronbach's Alpha	N of Items
.856	5

Table 5b. Item-Total Statistics for Personnel contact quality

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted

PCQ1	16.03	9.015	.701	.818
PCQ2	16.02	9.424	.663	.828
PCQ3	15.96	9.456	.689	.821
PCQ4	16.03	8.805	.747	.805
PCQ5	16.43	10.204	.551	.854

The Cronbach's Alpha of Personnel contact quality is 0.856, higher than 0.6 and all the five items have the Corrected Item-Total Correlation bigger than 0.3. Therefore, the PCQ variables can be used in factor analysis.

4.2.3. Delivery quality

Table 6a. Reliability Statistics-Delivery quality

Cronbach's Alpha	N of Items
.784	4

Table 6b. Item-Total Statistics for Delivery quality

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
DL1	11.23	6.092	.645	.702

DL2	11.33	6.599	.589	.732
DL3	11.54	6.282	.574	.739
DL4	11.38	6.280	.556	.749

The Cronbach' Alpha of Delivery quality is 0.784, being higher than 0.6; and all the item DL1, DL2, DL3 and DL4 have the Corrected Item-Total Correlation bigger than 0.3. Therefore, the DL variables will be used in factor analysis.

4.2.4. Information quality

Table 7a. Reliability Statistics for Information quality

Cronbach's Alpha	N of Items
.728	3

Table 7b. Item-Total Statistics for Information quality

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IMQ1	7.74	3.022	.568	.618
IMQ2	7.70	3.308	.531	.663

IMQ3	7.67	3.199	.551	.639

The Cronbach's Alpha of Information quality is 0.728, being bigger than 0.6. Moreover, the Corrected Item-Total Correlation of 3 items IMQ1, IMQ2, IMQ3 all bigger than 0.3 so all the items will be analyzed in EFA analysis.

4.2.5. Timeliness quality

Table 8a. Reliability Statistics for Timeliness quality

Cronbach's Alpha	N of Items
.756	4

Table 8b: Item-Total Statistics for Timeliness quality

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
TL1	11.36	5.941	.551	.699
TL2	11.26	5.969	.534	.709
TL3	11.36	6.134	.543	.703
TL4	11.42	5.761	.581	.682

The Cronbach's Alpha of Timeliness quality is 0.756 and bigger than 0.6. As well as all the four items have bigger than 0.3, so all the items can be used in factor analysis.

4.2.6. Empathy quality

Table 9a. 2Reliability Statistics for Empathy quality

Cronbach's Alpha	N of Items
.752	5

Table 9b. Item-Total Statistics for Empathy quality

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
EPQ1	15.18	8.214	.571	.687
EPQ2	15.13	8.848	.477	.723
EPQ3	15.21	8.908	.534	.702
EPQ4	15.12	8.936	.506	.712
EPQ5	15.12	8.771	.500	.714

The Cronbach's Alpha of Empathy quality is 0.752, bigger than 0.6 and all the Empathy quality items are bigger than 0.3. Thus, all the items can be used to factor analysis.

4.3. Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) is a statistical technique to analyze the interrelationships between items across various factors to identify observed items that load heavily

on multiple factors or items that do not align properly within a factor. EFA ensures the convergence of items that measure the same variable, causing them to cluster together within a single factor. Conversely, items that measure distinct variables will be separated into different factors, promoting their segregation and distinct representation. Two key indicators are considered for determining the suitability of EFA: i) the Kaiser-Meyer-Olkin (KMO) index, ranging from 0 to 1, where a value of 0.50 or higher is deemed appropriate for factor analysis; ii) the significance of Bartlett's Test of Sphericity, with a p-value less than 0.05 indicating the suitability of factor analysis (Henson & Roberts, 2006).

4.3.1. Dependent variable (Satisfaction)

Table 3a. KMO and Bartlett's Test for the dependent variable

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	224.539
	df	6
	Sig.	.000

It is illustrated that KMO measure of Sampling Adequacy is 0.765 > 0.5. This means the sample is adequate for EFA. In addition, Sig. of Barlett's test of Sphericity is 0.000< 0.05. It means that there is a correlation between items within a factor and that data is suitable for EFA.

Table 10b4. Total Variance Explained for the dependent variable

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %

1	2.473	61.833	61.833	2.473	61.833	61.833
2	.652	16.307	78.140			
3	.529	13.223	91.363			
4	.345	8.637	100.000			

Extraction Method: Principal Component Analysis.

As given in Table 10b, the Total Variance Explained which first component has Eigenvalues higher than 1 at 2.473. Besides, The Total Variance Explained is 61.833% which is higher than the requirement (>50%) which means four components can explain 61.833% of the total variance.

Table 10c. Component Matrix[a] for the dependent variable

	Component
	1
SA2	.864
SA1	.808
SA3	.747
SA4	.718

Extraction Method: Principal Component Analysis. a. 1 components extracted.

In Table 10c, 4 items are collected into 1 component, all the observed variables have Factor Loading coefficient greater than 0.5. Therefore, all items above used for measuring satisfaction are accepted and can be used for next steps.

4.3.2. Independent variables (PCQ, DLQ, IMQ, TLQ, EPQ)

Table 11a. KMO and Bartlett's Test for Independent variables.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.872
Bartlett's Test of Sphericity	Approx. Chi-Square	1412.161
	df	210
	Sig.	.000

It can be seen in Table 11a that the KMO value of independent variables is 0.872. In addition, the Sig value of Bartlett's test of Sphericity is 0.000 which is smaller than 0.05. Therefore, this outcome of the independent variables in appropriate for conducting EFA

Table 11b. Total Variance Explained Independent variables.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.328	30.134	30.134	6.328	30.134	30.134	3.274	15.591	15.591
2	2.335	11.118	41.252	2.335	11.118	41.252	2.627	12.509	28.100
3	1.591	7.577	48.829	1.591	7.577	48.829	2.476	11.793	39.892
4	1.410	6.713	55.542	1.410	6.713	55.542	2.372	11.297	51.189

5	1.128	5.373	60.915	1.128	5.373	60.915	2.042	9.726	60.915
6	.856	4.076	64.991						
7	.739	3.518	68.509						
8	.698	3.326	71.835						
9	.682	3.249	75.084						
10	.645	3.073	78.157						
11	.571	2.719	80.877						
12	.520	2.475	83.352						
13	.488	2.326	85.678						
14	.467	2.222	87.900						
15	.459	2.186	90.086						
16	.427	2.035	92.121						
17	.397	1.888	94.009						
18	.370	1.762	95.771						
19	.330	1.569	97.340						
20	.304	1.447	98.787						
21	.255	1.213	100.000						

Extraction Method: Principal Component Analysis.

As shown in Table 11b, Component 1, 2, 3, 4, and 5 acquired their Initial Eigenvalues are 6.328, 2.335, 1.591, 1.410, and 1.128 respectively, which are higher than 1, indicating these components are substantial. Moreover, the cumulative of Extraction Sums of Squares Loading is 60.915% (> 50%), showing that five factors explain 60.915% of the data variation.

Table 11c. Rotated Component Matrix[a] for Independent variables

Items	Components				
	1	2	3	4	5
PCQ4	.837				
PCQ1	.752				
PCQ3	.736				
PCQ2	.707				
PCQ5	.706				
EPQ1		.746			
EPQ4		.688			
EPQ5		.688			

EPQ3		.633			
EPQ2		.602			
DL2			.761		
DL1			.752		
DL4			.708		
DL3			.698		
TL2				.749	
TL4				.747	
TL1				.676	
TL3				.666	
IMQ2					.748
IMQ1					.728
IMQ3					.652

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

[a.] *Rotation converged in 5 iterations.*

Table 11c shows that the loadings of all 21 items distributed across five components are greater than 0.5 (ranking from 0.652 to 0.837). PCQ4, EPQ1, DL2, TL2, and IMQ2 have the strongest contribution to PCQ, EPQ, DL, TL, and IMQ, respectively.

4.4. Regression

We estimate the impact of five independent variables (Personnel contact quality, Delivery quality, Information quality, Timeliness quality, Empathy quality) on the dependent variable (Consumer Satisfaction) by employing the Multiple linear regression. Results are presented in Tables 12, 13, and 14.

Table 12. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.790[a]	.624	.613	.41809	1.923

a. Predictors: (Constant), EPQ, DL, TL, PCQ, IMQ

b. Dependent Variable: SA

Regression model is created by five factors: personnel contact quality (PCQ), delivery quality (DL), information quality (IMQ), timeliness quality (TL), and empathy quality (EPQ). The Adjusted R Square is 0.613 meaning that there is 61.3 percent of the change of the dependent variable (customer satisfaction) is explained by the independent variables personnel contact quality (PCQ), delivery quality (DL), information quality (IMQ), timeliness quality (TL), and empathy quality (EPQ). The value of Durbin – Watson equals 1.923, in the range of 1.5 to 2.5, which means there is no auto-correlated problem in this statistical model.

Table 13. ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	52.427	5	10.485	59.985	.000[b]
	Residual	31.639	181	.175		
	Total	84.067	186			

a. Dependent Variable: SA

b. Predictors: (Constant), EPQ, DL, TL, PCQ, IMQ

In Table 13, the Sig value from the F-test indicates the sequence of independent variables significantly anticipates towards the dependent variable, in which, the Sig. must be less than 0.05 (Leech et al., 2005). As the table shown above, The ANOVA acquires an F-test value of 59.985 and is significant ($p<0.001$). The results of this outcome demonstrate that the combination of the predictors dramatically predicts customer satisfaction.

Table 14. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.457	.220		2.081	.039		
	PCQ	.430	.050	.482	8.669	.000	.674	1.484
	DL	.137	.045	.165	3.052	.003	.708	1.412
	IMQ	.112	.046	.139	2.413	.017	.624	1.603
	TL	.095	.046	.111	2.080	.039	.730	1.370

EPQ	.144	.050	.154	2.878	.004	.728	1.373

a. Dependent Variable: SA

Table 14 shows that the value of VIF of independent variables is smaller than 2 so there is no multicollinearity in the multiple linear regression model. As given in Table 14, the t value and the Sig. (p) of each independent variable indicates whether that variable is significantly contributing to the equation for predicting dependent variable from the whole set of predictors (Leech, Barrett, & Morgan, 2005). According to Field (2009), when Sig. of one predictor is equal or less than 0.05, this predictor has a significant impact on the dependent variable. There are five independent variables have Sig. values satisfying the condition of less than 0.05 including personnel contact quality (PCQ) (Sig. = .000), delivery quality (DL), (Sig. = .003), information quality (IMQ) (Sig. = .017), timeliness quality (TL) (Sig. = .039), and empathy quality (EPQ) (Sig. = .004). Therefore, these factors have significant influence on customer satisfaction (SA). However, the impacts of IMQ and TL on SA are not strongly significant as other factors.

Thus, we have the sufficient evidence to conclude that:

H1 is supported: Personnel contact quality positively affects satisfaction ($\beta = 0.482$, $t = 8.669$, $p < 0.05$)

H2 is supported: Delivery quality has a positive impact on satisfaction ($\beta = 0.165$, $t = 3.052$, $p < 0.05$)

H3 is supported: Information quality positively affects satisfaction ($\beta = 0.139$, $t = 2.413$, $p < 0.05$)

H4 is supported: Timeliness quality positively affects satisfaction ($\beta = 0.111$, $t = 2.080$, $p < 0.05$)

H5 is supported: Empathy quality has a positive impact on satisfaction ($\beta = 0.154$, $t = 2.878$, $p < 0.05$)

Additionally, personnel contact quality has the highest standardized coefficients Beta (0.482), which indicates that this predictor has the strongest impact on customer satisfaction. Next, delivery quality ranks second with $\beta = 0.165$. Following that are Empathy quality (third) and

information quality (fourth) with β = 0.154 and β = 0.139 respectively, while timeliness quality has lowest impact on customer satisfaction with β = 0.111. Details are given in Table 15.

Table 15. Summary

Hypothesis	Significant value	Hypothesis result	Standardized Coefficient β	Impact Ranking
H1: Personnel contact quality positively impacts on satisfaction.	.000	Supported	0.482	First
H2: Delivery quality has a positive impact on satisfaction.	.003	Supported	0.165	Second
H3: Information quality positively impacts on satisfaction.	.017	Supported	0.139	Fourth
H4: Timeliness quality positively impacts on satisfaction.	.039	Supported	0.111	Fifth
H5: Empathy quality has a positive impact on satisfaction.	.004	Supported	0.154	Third

4.5. Discussion

Our results provide interesting findings as follows:

Firstly, Personnel contact quality (PCQ) is the most influential dimension of logistics service quality that affects customer satisfaction. Because Sig. (0.000) is lower than 0.01 and Beta (0.482), there is a positive relationship between Personnel contact quality and customer satisfaction. This implies that higher Personnel contact quality leads to higher customer satisfaction. The result of this finding is identical to that of Bitner et al., (1994) and Mentzer et al., (2001). Consumers will be more satisfied when they feel the professionalism, attitude, ability to empathize and interact with customers.

Secondly, the second factor is Delivery quality (DL). In this study, Delivery quality is statistically significant due to Beta = 0.165; Sig. = 0.003 < 0.01. When customers receive the items they buy on time, carefully packed and preserved, customers will feel even more satisfied with the service. Hua and Jing (2015)'s and Jiang, Lai, Chang, Yuen, and Wang (2021)'s finding are comparable to this one.

Thirdly, the third logistics service quality factor is Empathy quality (EPQ). Due to Sig. (0.004) lower than 0.01 and Beta (0.154), there is a positive relationship between Empathy quality and customer satisfaction. The findings indicate that Customer satisfaction will be increased if they receive care from the company's staff. The conclusion of the research is comparable to that of Asperen, Pieter, and Dijkmans (2018).

Fourthly, the least significant impacts of logistics service quality's dimensions on consumer satisfaction are Information quality and Timeliness quality. Information quality, which also improves customer satisfaction, is another aspect of logistics service quality factors. The Pearson correlation between Information quality and customer satisfaction is 0.550; the beta coefficient is 0.139 and Sig. (0.017) < 0.05. According to the findings of this study, Information quality is one of the factors driving service satisfaction as they are given access to timely, accurate tracking information about their orders. The finding for the Information quality dimension is consistent to Tam and Oliveira (2007).

Whereas, Timeliness quality has a positive effect on customer satisfaction. Due to the Beta coefficient is of 0.111 and the significance is 0.039 < 0.05. According to the findings of this study, if customers can receive their goods quickly, as expected, or get instant feedback when they need

it, they will feel satisfied with the logistics service. The result for this Timeliness quality dimension is similar to Mentzer et al., (1999).

5. Conclusion and implication

This study aims at exploring the impact of five aspects of Logistics service quality on Consumer satisfaction for the fresh food e-commerce in three provinces of the Southern Vietnam, including Ho Chi Minh City, Binh Duong, and Dong Nai. Results show that Personnel contact quality, Delivery quality, and Empathy quality have significantly positive impacts on consumer satisfaction. However, the impact of Information quality and Timeliness quality are not strong significant. Remarkable, Personnel contact quality has the strongest impact on consumer satisfaction in the logistics service quality of fresh food e-commerce.

The findings provide significant implications for researchers and practitioners. Firstly, the findings add its academic significance to the topics of e-commerce logistics research with a better knowledge of the key elements driving client satisfaction in main provinces in the South of Vietnam – an emerging economy. Furthermore, unlike prior research that just show a correlation between consumer perceived importance and customer satisfaction, this study shows that consumer perceived importance has a strong positive causal link with consumer satisfaction. Secondly, this study provides a helpful reference for fresh food e-commerce enterprises, online retailers, and offline users of fresh food e-commerce. The findings will help fresh food e-commerce enterprises evaluate which grade of service would increase consumer happiness and maybe increase their likelihood to repurchase. Besides, fresh food e-commerce enterprises can gain a better understanding of the quality goods they should seek for in their last mile logistics. Following that, e-commerce enterprises will devise appropriate tactics to improve the quality of logistics services, allowing consumers to experience higher-quality logistics while earning more profits indirectly.

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