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Factors Influencing the Satisfaction of E-logistics Customers in Vietnam: The Mediating Role of Information Technology

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ABSTRACT

The study focused on the factors contributing to customer satisfaction in e-logistic services. The questionnaire used in this study was developed based on previous studies with proven validity. The structural equation model (SEM) was tested using SPSS and Amos 22 with a sample size of 320 respondents. Research results revealed four factors that affect customer satisfaction: payment method, shipping information, information security, and shipping time. Shipping cost and order fulfillment were found to have insignificant impacts. Information technology was proven to have a mediating role in improving customer satisfaction. The study results will be helpful for the government in developing and supporting E-commerce and E-logistics in Vietnam. In addition, it will help companies operating in this field understand their customers' needs better, thus attracting new customers, retaining current customers, and improving customer satisfaction.

Keywords: customer satisfaction, e-logistics, e-commerce, information security, shipping duration, shipping information, payment method

1. INTRODUCTION

E-logistics is a tool that connects parts of the e-commerce industry, including planning and controlling the movement of goods and services from the beginning to the end [1]. The increased number of technology users advocates the development of e-logistics services. In particular, the COVID-19 event in recent years has caused economic activities to be disrupted as social distancing has made it difficult to buy and sell directly. Customers have started relying on e-commerce as an alternative method to exchange goods, leading to various logistics services are benefited from being a transportation

service to support e-commerce activities. As a country with a young population and a high level of technology adoption, Vietnam has become one of Southeast Asia's most vibrant e-commerce and e-logistics markets. By 2025, the e-logistic market in Vietnam will reach $43 billion and grow at a rate of 25% per year in the coming years [2].

Customer satisfaction is an important factor influencing whether to continue using a product or service, and it also has a close relationship with the quality of that product or service [3,4]. The better the quality of products and services, the more satisfied customers will be, thereby maintaining the use of products and services for a long time [5]. Many studies have shown factors affecting the satisfaction of general logistics services. The most typical factors include time [6], package quality [7], order accuracy [8], and order processing [9]. However, most of the research is conducted on general logistics services. In contrast, studies on e-logistics services are limited, mainly focusing on large enterprises in developed countries using qualitative research methods [10]. The increasing number of e-commerce platforms and the fierce competition among logistics service providers are some factors that have prompted the need for research on e-logistics services to become more prevalent.

This article focuses on the factors affecting the satisfaction of customers using e-logistics services in Vietnam, along with the intermediary role of information technology in improving customer satisfaction. The study results will be helpful for the government in completing the legal corridor and building proper support for the development of e-commerce and e-logistics activities in the future. In addition, through this study, e-commerce and e-logistics businesses also have more useful information in identifying the core factors that need to be improved to increase service quality and customer satisfaction.

2. LITERATURE AND HYPOTHESES

2.1 Literature review

E-Logistics is a system that simplifies the logistics process by integrating various data elements and rules into a single platform to show how the logistics process is carried out through technology, electronic equipment, and the internet [11]. It consists of data, hardware, software, and informal rules that automate logistics processes carried out in order to manage the supply chain, including requests for quotes, transportation, warehouse, and tracking [10]. E-logistics brings many benefits to typical businesses, such as reducing operating costs, adding sources of income from advertising activities, quickly responding to customer needs and minimizing inefficiencies in the operation process [12]. E-Logistics within an e-commerce company will enable them to provide better and more accurate estimates for their logistics processes [13].

The quality of service is a guiding principle that businesses must implement to achieve high customer satisfaction [14]. The ability to attract and retain customers is a vital element of an organization's success and can be achieved by positive customer experiences, which eventually lead to satisfaction. Previous research has pointed out many factors that impact the satisfaction of E-logistics customers. Specifically, Irmman

et al. [11] research on E-logistics customers in Pakistan has shown three factors that affect the satisfaction of customers using the service, including shipping costs, shipping duration, and payment methods. Prianto et al. [15] research on food industry customers in Thailand has pointed out six critical factors that affect customers' satisfaction using E-logistics services, including Shipping duration, Payment Methods, Shipping Information, Information Security, Order Completion, and Information Technology. Research by Graham et al. [16], focusing on E-logistics and electronic supply chain, has pointed out two factors, including order completion and shipping information, that play a decisive role in the success of E-logistics services. Research by Nguyen Xuan Quyet & Tran Thi Ngoc Lan [2] with customers in Ho Chi Minh City has eight important factors of E-logistics services, including Customer Awareness, Technology and Security, Legal Infrastructure, Intellectual Property, Consumer Protection, Payment Methods, Human Resources, Organization, and Administration. An overview of previous research shows a range of factors that impact customer satisfaction when using e-logistics services, however, the research results are inconsistent. The cause may be due to differences in geography and survey subjects. Therefore, it is still necessary to continue to have various studies on the factors affecting the satisfaction of customers using e-logistics services to find new factors or add confirmation to the factors studied. Besides, due to the difference in market characteristics between countries, it will be one-sided if we technically apply the research results of one country to the actual implementation of another country.

This paper aims to analyze the factors that influence customer satisfaction with e-logistics services focused on the following factors: Delivery time, Payment method, Shipping information, information security, Order completion, and Shipping costs. Based on the research results, several managerial recommendations are proposed to support E-logistics service providers and e-commerce platforms in general and in Vietnam in particular to attract new customers, retain current customers, and improve customer satisfaction.

2.2 Hypothesis development

Shipping time

Shipping time is defined as the period from when the customer orders to when the customer receives the order. This essential factor significantly affects customers' satisfaction using E-logistics services [17]. Long or improper shipping time will cause customers to lose patience and lack of initiative in receiving goods, thereby minimizing satisfaction or increasing the rate of unsuccessful or return delivery. Xia & Tingting [18] also states that it is necessary to shorten delivery time and ensure that customers receive goods on schedule. Ali & Haseeb [19] also approve that delivery time plays a vital role in the operation of the garment supply chain in the Malaysian market. Therefore, the following hypothesis is proposed:

H1: Fast delivery time has a positive impact on the satisfaction of E-logistics customers.

Shipping cost

The shipping cost is the amount that customers have to pay for the E-logistics units. It is calculated by the distance from the warehouse to the receiving address and its time to deliver the goods. The shipping cost has a significant impact on customer satisfaction [18]. Furthermore, the high shipping cost will increase the product's final price, negatively impacting customer satisfaction [11]. Therefore, the following hypothesis is proposed:

H2: High shipping cost has a negative impact on the satisfaction of E-logistics customers.

Shipping information

Shipping information includes all data related to the transportation of the goods such as the time the goods were packed, the time the goods were released from the warehouse, the route of the order and the estimated time of receipt. Because customers rely on delivery information to track orders, inaccurate or delayed information from the shipping unit can negatively affect customers' confidence in the quality of the goods they will receive, contribute to their perceived dissatisfaction [15,20] and increase the rate of non-receiving or return of goods. Therefore, the following hypothesis is proposed:

H3: Detailed and accurate shipping information has a positive impact on the satisfaction of E-logistics customers.

Information security

The level of confidentiality of customer information and transaction information is an important issue for E-logistics [21,22,23]. Customers are increasingly interested in the security of their personal information, especially when stored over the internet. Therefore, the following hypothesis is proposed:

H4: High level of information security has a positive impact on the satisfaction of E-logistics customers.

Order fulfillment

In order to complete orders quickly, businesses need to ensure an adequate supply chain management system from receiving orders to ordering processing to logistics management and ensuring on-time delivery. Successful order fulfillment is calculated from the moment the business receives an order to when it is delivered. The fast order completion shows that the company processes and coordinates its customers' orders efficiently and effectively [24]. Therefore, the following hypothesis is proposed:

H5: Fast order fulfillment has a positive impact on the satisfaction of E-logistics customers.

Payment methods

Fatemeh, Sanaz & Reihaneh [25] pointed out that modern payment methods make money transfer between shoppers and businesses quicker and easier. Popular payment methods on e-commerce platforms include direct payment (cash on delivery - COD) and online payment through e-wallets, domestic ATM cards, and international

debit/credit cards. Due to the rapid emergence and evolution of online payment methods have become the preferred payment method for businesses. In addition, customers using online payment also have a lower rejection rate than customers paying directly in cash. Because when paying online, customers pay as soon as they place an order, while paying directly, customers pay after receiving the goods, so they have more time to consider the item. Once the customer has completed the payment, they will be more inclined to accept the order and be more satisfied with their choice as well as the e-logistics carrier. When customers have more time to consider, they are more likely to change their minds and are more sensitive to the quality of the delivery service. Therefore, the following hypothesis is proposed:

H6: Online payment methods have a positive impact on the satisfaction of E-logistics customers.

Information technology

E-commerce and E-logistics are based on cloud computing, so the information security of businesses and customers may be at risk. Therefore, IT plays an integral role in ensuring data is not lost, hacked, or corrupted. An efficient IT system ensures that data is protected from cyber and malware threats and is well encrypted and strictly protected. Trautman [26] highlights that IT acts as an intermediary between information security and customer satisfaction. The following hypothesis is proposed:

H7: IT acts as an intermediary for the relationship between information security and the satisfaction of E-logistics customers.

Online payments include electronic cash, prepaid cards, debit/credit cards, electronic checks, and other cards associated with the customer's bank account. All these methods are IT-based. Therefore, IT is a major driving factor for E-logistics customer satisfaction [22, 27, 28]. Therefore, the following hypothesis is proposed:

H8: IT acts as an intermediary for the relationship between online payment methods and the satisfaction of E-logistics customers.

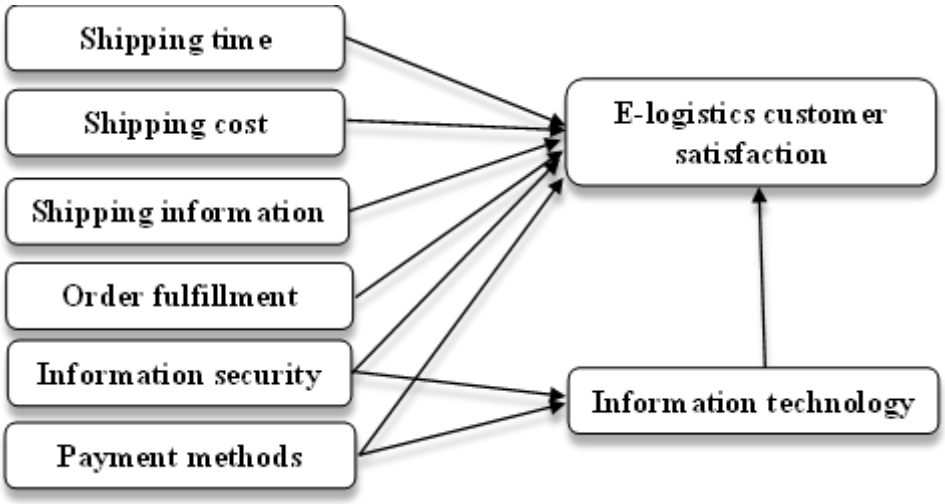

Figure 1. The proposed research model

3. RESEARCH METHOD

The questionnaires were formed based on previous research that has proven validity before adjusting to suit the Vietnamese market context. The author performed a pilot test in a small group setting to ensure that all the questions were easy to understand and understood correctly before generalizing the survey. Surveying through Google Forms for three months, the research data is collected from 24/11/2020 – 22/1/2021. The study obtained 320 valid responses. The minimum sample size for studies is consistent with the requirements of discovery factor analysis, which requires five times the number of observed variables [29]. The proposed research model has 28 variables, so the minimum sample size suitable for analysis is 28*5= 140, satisfied by 320 valid observations. The data were collected using a Likert scale from 1 (Fully Disagree) to 5 (Absolutely agreeable) to measure the attitudes and perceptions of the respondents. The majority of the respondents are female (77.8%), have an income of less than 5 million dong (87.5%), and are proficient in technology.

The study analyzed the constructs using structural equation modeling following the guideline of Anderson & Gerbing [30]. SPSS and Amos 22 software were adopted to process the data. The first step was determining the model's reliability with Cronbach's Alpha coefficient. After removing unsuitable variables, the model's reliability was significantly improved. The remaining variables were then included in the Exploratory Factor Analysis (EFA) and the Confirmatory Factor Analysis (CFA) to test the convergent validity of the various measures used for each construct. Finally, Structural equation modeling (SEM) was used to test the hypothesized model.

Table 1. Cronbach's Alpha Reliability Test

Factors	Observation variables	Items	Sources
ST (Shipping time)	Fast delivery time creates a positive impression for e-logistics businesses.	ST_1	[11, 15, 18, 19, 20]
	Delivery time is an important factor in Logistics activities	ST_2	
	Fast delivery time encourages customers to buy goods through e-logistics services.	ST_3	
	Fast delivery time ensures that goods are delivered on time and minimizes costs to customers.	ST_4	
PM (Payment method)	Easy and reliable payment methods encourage customers to make purchases online.	PM_1	[2, 11, 15, 25]
	Online payment is a core element in the business of e-commerce companies.	PM_2	
	Online payments have a significant positive impact on e-logistics customer satisfaction.	PM_3	
SI (Shipping Information)	Shipping information is an important factor in e-logistics.	SI_1	[15, 16]
	Specific and up-to-date shipping information helps customers track the shipping process of their orders.	SI_2	
	The shipping information has a significant impact on e-logistics customer satisfaction.	SI_3	
IS (Information Security)	A high level of information security plays a vital role in e-logistics.	IS_1	[2, 15, 21, 22, 23]
	The high level of information security helps increase customers' satisfaction using e-logistics services.	IS_2	
	A good level of information security makes customers more secure when paying online for e-logistics services.	IS_3	
OF (Order Fulfillment)	Fast order fulfillment has become an important part of e-logistics service.	OF_1	[15, 16]
	Completing orders quickly helps e-logistics companies attract customers.	OF_2	
	Careful and thorough order packaging increases customer satisfaction.	OF_3	
SC (Shipping cost)	Shipping cost is an important factor affecting e-logistics activities.	SC_1	[11, 19]
	Low shipping cost encourages the customer to make more purchases.	SC_2	
	Low shipping cost has a positive impact on customers' satisfaction using e-logistics services.	SC_3	

Table 1. Cronbach's Alpha Reliability Test

Factors	Observation variables	Items	Sources
CS (Customer satisfaction)	Customer satisfaction is important for the development of the e-logistics company.	CS_1	[11, 15, 16]
	e-logistic companies will plan strategies based on customer satisfaction	CS_2	
	Customer satisfaction in e-logistic operations can help companies get a competitive advantage.	CS_3	
	IT integration helps companies improve their e-logistics services.	CS_4	
	Customer satisfaction helps determine the e-logistics company's position in the market.	CS_5	
IT (Information Technology)	IT is a necessary element for online payments in E-logistics services.	IT_1	[11, 19]
	IT is a factor that promotes the satisfaction of E-logistics customers.	IT_2	
	Thanks to the efficient use of IT, E-logistics services can become safer.	IT_3	
	IT promotes the growth of E-logistics activities.	IT_4	

4. RESULTS

4.1 Reliability and Validity of measurement items

Due to its Corrected item-total and Correlation values less than the cut-off value of 0.55 [28], the item (ST_1) was removed to improve the overall reliability of all constructs with values higher than 0.7 [31].

Table 2. Exploratory Factor Analysis results

	Factors							
	1	2	3	4	5	6	7	8
CS_2	0.930							
CS_3	0.926							
CS_4	0.735							
CS_5	0.719							
CS_1	0.689							
IT_4		0.865						
IT_3		0.860						
IT_2		0.824						
IT_1		0.802						
IS_1			0.833					
IS_2			0.827					
IS_3			0.762					
ST_3				0.863				
ST_2				0.850				
ST_4				0.839				
SI_2					0.844			
SI_3					0.771			
SI_1					0.736			
OF_1						0.843		
OF_2						0.838		
OF_3						0.824		
SC_2							0.869	
SC_1							0.844	
SC_3							0.803	
PM_2								0.856
PM_3								0.815
PM_1								0.581
Total variance explained	29.92	38.60	46.88	54.77	60.37	65.48	69.53	73.16
KMO							0.880	
Barlett's test					Approx Chi-S		4372.110	
					Df		351	
					Sig.		.000	

The convergent validity of the measurement was verified using the Principal Axis Factoring extraction method. The coefficient of KMO was used to determine the factor analysis requirement ($0.5 \leq KMO \leq 1$). Bartlett's test result shows that there are significant correlations among researched variables. Total variance explained equals 73.16%, indicating that the factors explain 73.16% of the deviation of customer satisfaction. The average variance extracted (AVE) is above 0.5, confirming the achievement of convergent validity for the measurement model [31].

Table 3. Confirmatory Factor Analysis results (N=320)

Constructs	Cronbach's alpha	CR	AVE	ASV
CS	0.882	0.914	0.680	0.825
IT	0.901	0931	0.772	0.879
IS	0.868	0.919	0.791	0.889
ST	0.811	0.870	0.772	0.879
SI	0.799	0.851	0.656	0.810
OF	0.792	0.874	0.699	0.836
SC	0.792	0.857	0.672	0.820
PM	0.742	0.883	0.716	0.846

ASV is the root square of AVE greater than the inter-construct correlations of latent variables, confirming the achievement of discriminant validity, and indicating that each construct is statistically different from the other [32].

Table 4. Inter-construct correlations

	IS	IT	SC	CS	OF	PM	ST	SI
IS	0.889							
IT	0.535	0.879						
SC	0.109	0.030	0.820					
CS	0.592	0.623	0.055	0.825				
OF	0.027	0.025	0.051	0.060	0.836			
PM	0.504	0.402	0.038	0.495	0.195	0.846		
ST	0.050	0.005	0.037	0.026	0.026	0.039	0.879	
SI	0.447	0.397	0.078	0.565	0.055	0.449	0.002	0.810

4.2 Hypotheses testing

Table 5. Results of hypotheses testing with direct effect

Hypotheses	Casual Path	β-value	S.E	T-Statistics	P-Values	Hypothesis
H1	ST -> CS	0.033	0.044	0.740	0.000	**Accept**
H2	SC -> CS	-0.006	0.004	0.128	0.898	**Reject**
H3	SI -> CS	0.275	0.047	5.805	0.000	**Accept**
H4	IS -> CS	0.227	0.055	4.142	0.000	**Accept**
H5	OF -> CS	0.026	0.045	0.587	0.557	**Reject**
H6	PM -> CS	0.111	0.043	2.593	0.010	**Accept**

Model fit indicators [33]: Chi-square = 368.177 (p = 0.000); Chi-square/df = 1.359<3; TLI = 0.971; CFI = 0.976; RMSEA = 0.034 <0.08

Notes: Significance levels *p<0.1; **p<0.01; ***p<0.001

The results of the study show that four factors affect the satisfaction of customers using E-logistics services, including Shipping time (H1: β = 0.033, SE=0.044), Shipping information (H3: β=0.275, SE=0.047), Information security (H4: β=0.227, SE=0.055) and Payment method (H6: β=0.111, SE=0.043)**.** On the other hand, the shipping cost and order fulfillment have no impact on satisfaction (H2 &H5).

Table 6. Results of hypotheses testing with an indirect effect

Hypothesis	Paths	β-value	Se	T-Statistics	P-Values	Hypothesis
H7	IS-> IT -> CS	0.155	0.036	4.334	0.000	**Accept**
H8	PM -> IT -> CS	0.062	0.024	2.625	0.009	**Accept**

The study results show that information security and payment methods indirectly impact satisfaction through IT (H7&H8). In other words, payment methods and security indirectly impact satisfaction through IT and some other variables that have not been examined in this study. Therefore, we can conclude that IT has a partial mediation role in affecting payment methods and information security on customer satisfaction.

5. DISCUSSION

The empirical results reveal four factors affecting E-logistics customer satisfaction: Shipping Time, Shipping Information, Payment Method, and Information Security. Moreover, the study results show that IT is a mediator between payment methods, information security, and E-logistics customer satisfaction.

Information security has the most substantial impact on E-logistics customer satisfaction (H4: β=0.227, SE=0.055). The explanation for this is that security issues are commonly believed to occur due to the complexity of e-commerce transactions and the amount of personal information required to be collected when making purchases. To improve the security of e-commerce transactions, businesses need to implement policies and procedures that can prevent anomalous transactions. There are various steps companies can take to help their customers protect their data on e-commerce websites. These include implementing strong passwords and protecting sensitive data.

The second most substantial impact on E-logistics customer satisfaction is shipping information (H3: β= 0.275, SE=0.047). Providing complete details on the order, including its shipping status, will allow customers to feel more secure and ready to receive their goods.

The third most potent factor for E-logistics customer satisfaction is the payment method (H6: β =0.111, SE=0.043). Due to many online payment methods, it is incredibly beneficial for consumers to transact with them easily. Therefore, e-commerce and e-logistics companies should work together to develop and implement payment methods that are convenient and secure for customers.

The fourth factor that affects customer satisfaction is the shipping time (H1: β =0.033, SE=0.044). Due to the psychology of consumers, they always want to receive their goods as quickly as possible, therefore, businesses must improve their transportation system to attract and retain customers.

IT has an intermediary role in the relationship between information security and payment methods to customer satisfaction (H7&H8). Due to the rapid development of technology, the internet has become more prevalent and widely used. This has led to the need for businesses to develop practical algorithms and IT infrastructure to ensure the operative payment system and the security of customers' data. It is also beneficial for businesses, enabling them to provide better services and customer experience.

The shipping cost has no impact on the satisfaction of E-logistics customers. The reason is the compromised relationship between the cost and the speed of the shipment that they have to determine right when they choose the provider. Most of the time, the customer will be satisfied with the service provided once they know the exact cost and the time of the shipment. Likewise, order fulfillment has no impact on E-logistics customer satisfaction. This is because the completion of the order is the obligation of the seller, not the E-logistic firm.

6. CONCLUSION

The study focuses on determining the factors affecting customer satisfaction using E-logistics services. Based on the investigation of primary data of 320 respondents who have experience using E-logistics services in Vietnam and the results of data processing using SPSS 22.0 and AMOS 20.0 software, the research has shown that four factors take an impact on customer satisfaction includes: Payment method, Shipping information, Information security level, and delivery time. The research findings also reveal that the intermediary role of IT can play a vital part in improving customer satisfaction with E-logistics services. Various recommendations have been made to help e-logistics services improve their customer satisfaction. Although the study has certain limitations, it still serves as a foundational study that can be used to develop complex studies with better scales and models.

7. LIMITATIONS

Certain limitations are inevitable while conducting research setting the basis for future studies. First, this study uses a convenient sampling method, which may limit the representative of the population; however, this limitation is known beforehand and accepted as part of the study. Second, the study only focuses on the intermediary role of IT, while the research results show that other factors have not been mentioned in the model. Further studies should be conducted to expand the research scope and improve the statistical representation of the sample. This can be done by sampling in diverse regions and sample sizes and using a probabilistic method. Studying various demographic groups can also help identify new factors affecting customer satisfaction.

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