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Factors impacting logistics performance

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A B S T R A C T

Logistics is an integral part of the supply chain and plays a crucial role in this industry. Therefore, improving logistics performance is the top concern of organizations. This study is conducted to determine factors affecting logistics performance in Vietnam. The authors collected data from 162 Vietnamese logistics enterprises. Applying the structural equation modeling (SEM), the research has demonstrated that logistics efficiency positively correlates with e-logistics, information technology capability, information sharing, and service staff quality. Furthermore, e-logistics have the strongest impact and play the most important role in logistics performance.

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1. Introduction

As of 2020, there are more than 3,000 domestic enterprises and 30 transnational enterprises in the logistics market, including large companies such as DHL, FedEx, Maersk Logistics, and APL Logistics (General Statistics Office, 2020). Most companies are small and medium-sized, providing from 2 to 17 different services. The services focus on forwarding, inland transportation, seaport and airport operations, cargo management, and international transportation. In particular, transportation is the essential service of the logistics system in Vietnam. Since the industrial revolution 4.0, logistics has become an indispensable tool for every company. Logistics service providers play a connecting role among supply chains. The purpose is to share resources efficiently and improve performance and service quality (Cruijssen et al., 2007). Logistics mainly aims to ensure the conformity of customers' needs and wants (Christopher, 2005). This explains why the logistics industry has the potential to thrive in a globalized economy (Hu et al., 2016; Cichosz et al., 2017).

Industrial revolution 4.0 has spurred significant growth in e-logistics services (Miraz et al., 2018; Imran et al., 2019; Miraz et al., 2020). Studies have shown that it is essential to have e-logistics in the logistics chain (Venkatesh et al., 2012; Miraz et al., 2017; Tanoos, 2017) because of its positive impacts on the chain performance (Cho et al., 2008; Green et al., 2008; MahbubulHye et al., 2020). La Londe & Masters (1994) presented that information technology (IT) facilitates logistic processes. Good IT management helps solve problems and improve logistics performance (Bhatnagar et al., 1999; MahbubulHye et al., 2020). Besides, information sharing plays an essential role in logistics (Hudnurkar et al., 2014), helping improve the performance of its elements (Kim & Chai, 2017; De Vass et al., 2018; Afshan et al., 2018; Zhang et al., 2019). Also, service quality is an important factor in improving the efficiency of logistics operations (Wang & Lalwani, 2007; Imran et al., 2019; Ul-Hameed et al., 2019). Therefore, the issue of determining affecting factors to the logistics chain is crucial. This study is carried out to demonstrate the impact of e-logistics, information technology capability, information sharing, and service quality on logistics performance in Vietnam.

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2. Theoretical framework and research hypotheses

2.1. Theoretical framework

Since the 1990s, logistics has been defined as activities that bring many goods to the right place at the required time and at the lowest cost (Cooper et al., 1997). According to Christopher (1998), logistics is the strategic management of procurement, transportation, storage of raw materials, finished goods inventory, and related information management through marketing channels. Logistics leads a central role in transporting products from producer to consumers through the supply chain (Cooper et al., 1997; Lee & Seo, 2017). According to Van (2003), logistics is optimizing the transportation and storage of goods production to the place of final consumption through a series of economic activities. A logistics chain is a tool to merge different activities of separated supply chains, while a supply chain is made up of multiple logistics chains. It involves transforming raw materials into finished goods (Collin, 2002; Colin, 2005).

Logistics performance reflects customer satisfaction with logistics services (MahbubulHye et al., 2020) and the customers' perception of the gap between service expectations and the provider's performance (Miraz et al., 2019). Logistics performance is also demonstrated in service delivery capacity, flexibility (Vickery et al., 1999, Miraz et al., 2020), close connection (Stock et al., 2000), meeting customer demands (Chen et al., 2004), and bringing superior efficiency for members (Vickery et al., 2003; Chen et al., 2004).

2.2 Research hypotheses

The relationship between e-logistics (EL) and logistics performance

E-logistics is the implementation of processes using modern information technology (Dura, 2002; Wieczerzycki, 2012). According to Fertsch (2008), e-logistics accelerates the information exchange in the whole chain. E-logistics is essential for the logistics chain (Venkatesh et al., 2012; Miraz et al., 2017; Tanoos, 2s017). E-logistics improves company productivity and logistics chain performance (Bask et al., 2012; Masmoudi et al., 2014; Ramanathan et al., 2014). E-logistics positively correlates with logistic chain performance (Cho et al., 2008; Green et al., 2008; MahbubulHye et al., 2020). Therefore, the study proposes hypothesis H1: *E-logistics positively impacts logistics chain performance in Vietnam.*

The relationship between information technology capability and logistics performance

IT capability helps companies effectively manage customers and timely capture market and technology development trends (Anyanwu et al., 2016; Basheer et al., 2018). IT capability plays a crucial role in synchronizing and coordinating complex logistics activities (La Londe & Masters, 1994; Lai et al., 2008). IT capability enhances logistics chain performance, streamlines costs, and increases productivity, flexibility, and service quality (Bhatnagar et al., 1999; Closs et al., 1997; Daugherty et al., 1995; Lunce & Smith, 2000; Suominen & Takala, 2006). High IT capacity may help solve problems quickly (Bhatnagar et al., 1999) and significantly improve logistics chain performance (Nasiri et al., 2010; Zhang & Wang, 2011; MahbubulHye et al., 2020). This study suggests the research hypothesis H2: *Information technology capability has a positive impact on logistics performance in Vietnam.*

The relationship between information sharing and logistics performance

Information sharing in logistics chains is a necessary data-sharing process to manage the duration of products, services, and information flows between suppliers - customers (Barratt & Oke, 2007). Information sharing helps companies identify emerging problems and optimise logistics processes to improve performance (De Vass et al., 2018). Information sharing is essential in improving an organization's operations, enhancing the efficiency of resource and equipment use, reducing costs, and effectively managing events in the supply chain (Kim & Chai, 2017; Zhang et al., 2019). Therefore, information sharing is an important component of logistics performance management, positively impacting chain performance (Vereecke & Muylle, 2006; Hudnurkar et al., 2014; Afshan et al., 2018). Thus, the study proposes hypothesis H3: *Information sharing positively impacts logistics performance in Vietnam.*

The relationship between service quality and logistics performance

The service quality reflects employee roles and attitudes about the communication ability to meet customer requirements (Wang & Lu, 2016; Miraz et al., 2018; Miraz et al., 2019). Furthermore, the service staff quality contributes to customer satisfaction with logistics services (Benfang & Feng, 2014; Hua & Jing, 2015), which positively affects logistics chain performance (Andries et al., 2013; Hua & Jing, 2015; Miraz et al., 2019). Therefore, service quality is a necessary factor in improving the performance of the logistics chain (Xin & Bo, 2004; Wang & Lalwani, 2007; Hameed et al., 2018; Imran et al., 2019). Therefore, the study proposes hypothesis H4: *Service quality positively affects logistics performance in Vietnam.*

Based on the literature review and the proposed research hypotheses, the study applied the participatory rural appraisal (PRA) with 2 logistics experts and 8 logistics business managers. The results help identify appropriate scales for the model.

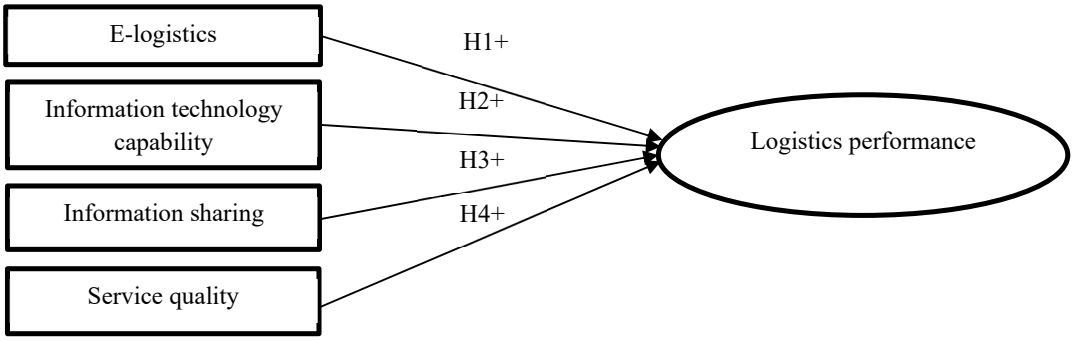

Fig. 1. Proposed research model

Table 1
Interpretation of observed changes in the research model

Factor	Observed variables	Scale	Reference resources
E- logistics	EL1: E-logistics is compatible with other technologies that the company is applying. EL2: The company has the necessary resources for e-logistics in the logistics chain. EL3: The company has enough information and knowledge to implement e-logistics. EL4: E-logistics is an important means in the logistics chain.	Likert 1-5	Venkatesh et al. (2012), Bask et al., (2012), Masmoudi et al., (2014), Ramanathan et al., (2014)
Information technology capability	IT1: It is necessary to apply technology in logistics chain management. IT2: IT facilitates logistics processes. IT3: The current technology applications of the company are suitable for the logistics chain.	Likert 1-5	La Londe & Masters (1994), Venkatesh et al. (2012)
Information sharing	IS1: The company regularly shares customer information with partners. IS2: The information shared for the company is high-quality. IS3: The information shared by partners is useful for the company. IS4: Information shared by partners is reliable.	Likert 1-5	Kim & Chai (2017), Zhang et al., (2019)
Service quality	SQ1: The service staff quality always meets the expectations of the company. SQ2: Partners and customers appreciate the service staff quality. SQ3: The service staff is effective in the logistics chain.	Likert 1-5	Dabholkar (1996), Shamdasani et al. (2008)
Logistics performance	LP1: The logistics chain meets the requirements of customers and partners. LP2: The logistics chain responds promptly to the changing needs of customers and partners. LP3: The logistics chain has a fast and flexible response time to customer requests. LP4: The logistics chain provides diverse services, meeting the needs of different choices and prices.	Likert 1-5	Vickery et al., (1999), Chen et al., (2004), Qrunfleh and Tarafdar (2014)

3. Research methodology

The study uses quantitative analysis methods in the following order: Step 1: Test the reliability of scales by Cronbach's Alpha coefficient; Step 2: Exploratory factor analysis (EFA) to evaluate the convergent and discriminant validity of variables; Step 3: Confirmatory factor analysis (CFA) to test the appropriateness of the research data; Step 4: Structural equation modeling (SEM) to test research hypotheses.

According to Tho (2011), the sample size depends on many factors, such as the analytical method and the required reliability. Hair et al. (1998) argued that in EFA, the minimum sample size should be 50, preferably 100, and try to maximize the observation/measurement ratio of 5:1, which means every 1 measurement variable needs at least 5 observations. The SEM requires a large sample size because it is based on sample distribution theory (Raykov and Widaman, 1995). To reach reliability in SEM testing, a sample size from 100 to 200 is satisfactory (Hoyle, 1995).

Quota sampling was used to collect data. The study surveyed from February 2021 to April 2021 by email. The survey respondents are the Boards of Directors of logistics companies in Vietnam. The obtained sample size is 162. Thus, the sample size meets the requirement, ensuring the reliability of tests. Several characteristics of surveyed companies include Size (6.18% of large enterprises, 33.33% of medium, and 60.49% of small ones), Years of operation (less than 10 years - 11.11%, from 10 to 20 years - 49.38%, over 20 years - 39.51%), Services (transportation, forwarding, warehouse, administrative procedures, consultancy (customs, tax, insurance), import-export, trading, etc.)

4. Research results and discussion

4.1 Evaluate scale reliability

The study uses Cronbach's Alpha coefficient to test the internal correlation between observed variables. The scale reliability test result shows that all scales have Cronbach's Alpha value greater than 0.6. Furthermore, all variables' corrected item-total correlation values are more significant than 0.3, so no variable is excluded from the model (Nunnally, 1978; Peterson, 1994; Slater, 1995). Therefore, all observations were satisfactory for the following exploratory factor analysis.

Table 2
Scale reliability test

Factor	Mean	Standard deviation	Factor-loading	Cronbach's Alpha
E- logistics				0.775
EL1	3.73	0.842	0.720	
EL2	4.05	0.794	0.665	
EL3	3.86	0.752	0.609	
EL4	3.90	0.728	0.544	
Information technology capability				0.827
IT1	4.01	0.722	0.802	
IT2	4.07	0.616	0.765	
IT3	4.20	0.667	0.737	
Information sharing				0.749
IS1	4.11	0.630	0.689	
IS2	3.97	0.717	0.678	
IS3	3.93	0.651	0.664	
IS4	4.04	0.672	0.602	
Service quality				0.748
SQ1	3.91	0.619	0.734	
SQ2	3.95	0.746	0.651	
SQ3	4.06	0.693	0.627	
Logistics performance				0.801
LP1	4.14	0.649	0.727	
LP2	3.96	0.604	0.675	
LP3	4.07	0.616	0.610	
LP4	4.04	0.593	0.503	
LP5	3.42	0.842	0.685	

Based on the EFA test result, values on the convergent and discriminant validity of scales are guaranteed: (1) Factor loading values are all higher than 0.5 (Hair et al., 2010); (2) The model's suitability KMO = 0.868 (Hair et al., 2010); (3) Bartlett's test on the correlation of variables Sig. = 0.000 (Hair et al., 2010). Cumulative variance test = 65.23%, higher than the specified level of 50% (Anderson & Gerbing, 1988). Therefore, 5 factors are created from 15 observed variables, consistent with the proposed scales.

Table 3
CFA and SEM result

Indicator	CFA result	Comparative value	Source
χ^2/df	1.141	≤ 2	Gerbing & Anderson (1988), Hair et al., (2014)
TLI	0.978	≥ 0.9	
CFI	0.982	≥ 0.9	
RMSEA	0.030	≤ 0.08	

The above table indicates that statistical indicators are guaranteed as follows: Chi-square/df = 1.141 < 2; TLI and CFI values reach 0.9 78 and 0.9 82, respectively, higher than 0.9; RMSEA = 0.0 30 < 0.08 (Gerbing & Anderson, 1988; Hair et al., 2014). This proves the model fits the market data. The standardized regression weights of the scale are greater than 0.5, and the unstandardized regression weights are statistically significant, so the model reaches the convergent value. Besides, the correlation coefficients between the factors are less than 1, and the standard deviation is less than 0.05. Therefore, the research model reaches discriminant validity (Hair et al., 2014). The composite reliability (P_c) is satisfied with the minimum value of 0.70. Although the average variance extracted from some scales is a bit low ($0.4 < P_{vc} < 0.5$), the P_c is larger than 0.6, so all scales are satisfactory (Fornell & Larcker, 1981).

Table 4
Testing scale result

Factor	Number of observed variables	Composite reliability (P_c)	Average Variance Extracted (P_{vc})	Source
E-logistics	4	0.78	0.47	Fornell & Larcker (1981)
Information technology capability	3	0.81	0.58	
Information sharing	4	0.75	0.43	
Service staff quality	3	0.70	0.50	
Logistics performance	4	0.80	0.50	

4.2 Research hypothesis test

Structural equation modeling (SEM) was used to test the research hypotheses. The analytical result is in table 5.

Table 5
Research hypothesis test

Relationship	Unstandardized Coefficients			Standardized estimated value	Significance	Hypothesis
	Estimated value	Standard deviation S.E	Critical ratio C.R			
LP ← EL	0.283	0.107	2.634	0.331	0.008	H1: accepted
LP ← IT	0.180	0.077	2.328	0.228	0.020	H2: accepted
LP ← IS	0.195	0.097	2.014	0.179	0.044	H3: accepted
LP ← SQ	0.269	0.095	2.839	0.324	0.005	H4: accepted

The study has proven that the hypotheses H1, H2, H3, and H4 are accepted with a 95% significance level. The influence level of factors on logistics performance is explained below.

Hypothesis H1: E-logistics positively affects logistics chain performance in Vietnam. Based on table 5, e-logistics and logistics chain performance have positive relationships, with a standardized estimated value of 0.331 and statistical significance p of = 0.008. If the company invests properly in e-logistics, this promotes logistics processes and speeds up the exchange of information in the logistics chain, thereby improving the efficiency of the whole chain. The research result is consistent with studies suggested by Cho et al., (2008), Green et al., (2008), Bask et al., (2012), Masmoudi et al., (2014), Ramanathan et al. (2014), MahbubulHye et al., (2020).

Hypothesis H2: Information technology capacity positively impacts logistics chain performance in Vietnam. This hypothesis is accepted at the standardized estimated value of 0.228 and the statistical significance level of p = 0.020. This finding emphasizes the importance of information technology capability in the operation process of logistics enterprises and logistics performance in Vietnam. If the enterprise has high information technology capability, it facilitates the synchronization and coordination of complex logistics chains (La Londe & Masters, 1994; Lai et al., 2008) and solves problems quickly (Bhatnagar et al., 1999). The research result is similar to studies proposed by Nasiri et al., (2010), Zhang and Wang (2011), MahbubulHye et al., (2020).

Hypothesis H3: Information sharing positively impacts logistics chain performance in Vietnam. The result in the above table shows a positive relationship between information sharing and logistics performance, with the standardized estimated coefficient reaching 0.179 and the significance p = 0.044. Enterprises increase information sharing in the logistics chain; it helps identify problems, optimizing the logistics chain process (De Vass et al., 2018). The research confirms the importance of information sharing in logistics chain performance management (Kim & Chai, 2017; Zhang et al., 2019), and logistics performance improvement (Vereecke & Muylle, 2006; Hudnurkar et al., 2014; Afshan et al., 2018).

Hypothesis H4: Service staff quality of employees positively affects logistics chain performance in Vietnam. The test result proves that the service quality of employees and logistics chain performance have a positive relationship, with a standardized estimated value of 0.324 and a significance p = 0.005. This shows that a company with high-quality human resources can achieve the satisfaction of customers and partners in the logistics chain (Benfang & Feng, 2014; Hua and Jing, 2015). Furthermore, research has confirmed that service staff quality plays a vital role in the operation of the logistics chain (Wang et al., 2016; Ul-Hameed et al., 2019). This result is similar to studies by Xin and Bo (2004), Wang and Lalwani (2007), Andries et al., (2013), Hua and Jing (2015), Imran et al., (2019), Ul-Hameed (2019), Miraz et al. (2019).

5. Conclusion

In general, the research has answered the proposed question, which is to find out factors affecting logistics chain performance in Vietnam. The study has demonstrated the positive impact of e-logistics, information technology capability, information sharing, and service quality on logistics performance. Among them, e-logistics has the most impact and plays the most crucial role in logistics chain performance in Vietnam. This is a scientific basis that helps logistics administrators develop action plans to improve operational performance, competitiveness, and the performance of the logistics chain.

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