Print ISSN: 1738-3110 / Online ISSN 2093-7717
JDS website: http://accesson.kr/jds
http://doi.org/10.15722/jds.23.07.202507.23

Developing Digital Transformation Enhances Distribution Channel Innovation and Competitive Advantage of Logistics Enterprises

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Received: April 24, 2025. Revised: May 09, 2025. Accepted: July 05, 2025.

Abstract

Purpose: This study analyzes the impact of digital transformation on distribution channel innovation and the competitive advantage of logistics enterprises in Ho Chi Minh City, Vietnam. **Research design, data and methodology:** The study utilized a mixed methods approach, incorporating both qualitative and quantitative methods to ensure the reliability of the findings. Data was gathered from a sample of 380 managers from logistics enterprises in Ho Chi Minh City. Data analysis was performed using a 5-point Likert scale and SEM was used to examine the relationships between the research variables. **Results,** digital transformation directly impacts distribution channel innovation and competitive advantage of logistics service providers in Ho Chi Minh City. At the same time, distribution channel innovation is an intermediary that impacts digital transformation on competitive advantage. In addition, the study also found that digital transformation leadership, IT infrastructure, organizational agility, competitive pressure, and government support policies have a positive impact on digital transformation. **Conclusions:** This study emphasizes the significance of digital transformation in driving distribution channel innovation and gaining a competitive advantage for logistics enterprises. The research findings serve as a foundation for logistics businesses to implement digital transformation, innovate their distribution channels, and ultimately achieve competitive edge.

Keywords : Distribution Channel Innovation, Logistics, Digital Transformation, Competitive Advantage, IT Infrastructure

JEL Classification Code: L91, M10, M21, R41

1. Introduction[1]

In the theoretical context, digital transformation is widely recognized as a strategic driver that can greatly benefit businesses by enhancing their competitive advantage. This is achieved through optimizing operational processes, increasing transparency in supply chain management, and improving the quality of customer service (Ivanov et al., 2019; Gong & Ribiere, 2023). The emergence and increasingly deep integration of technologies such as artificial intelligence (AI), big data, the Internet of Things (IoT), and automation systems have opened up many possibilities to improve logistics operations, from inventory management, transportation optimization to building smarter and more efficient distribution systems (Wei et al., 2024). Parfenov et al. (2021) emphasize that one of the

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important aspects of digital transformation in logistics is innovation in distribution channels, which determines the speed of market response, customer satisfaction, and operating costs. In the rapidly evolving logistics industry, digital transformation is having a profound impact. Digital technologies are no longer just supporting tools; they are now the driving force behind distribution channel innovation (Cichosz et al., 2020). Businesses that have implemented digital technology to restructure their distribution channels have seen improvements in operational efficiency and maintained a competitive edge. This includes transitioning from traditional distribution models to integrated network systems and from single-channel to multi-channel approaches (Nguyen & Hoang, 2022). However, a significant amount of academic research on digital transformation continues to primarily concentrate on internal operational aspects, such as cost optimization and inventory management (Leão & Da Silva, 2021; Adisaksana, 2022; Alabdali & Salam, 2022). In-depth studies on the impact of digital transformation on distribution channel innovation and business competitive advantage are still relatively limited. This research gap is particularly notable as businesses move towards flexible, digital distribution models that prioritize customer experience.

The Vietnamese logistics industry in Ho Chi Minh City is facing intense competition from both domestic and international markets. As the primary economic, commercial, and logistics hub of the country, Ho Chi Minh City is home to a significant number of logistics enterprises, seaports, warehouse centers, and infrastructure that facilitate the movement of goods. This bustling city is a crucial player in the country's economy, attracting a large number of businesses and serving as a vital link in the supply chain. According to Le and Dang (2023), logistics services in Ho Chi Minh City make up a significant portion of the regional economy and play a crucial role in the development of the national supply chain. However, logistics costs in Vietnam are still high, accounting for 16–20% of GDP, much higher than the global average (11%), a large part of which comes from inefficiencies in the distribution system, which is still manual, fragmented and has not been systematically integrated with technology (Ministry of Industry and Trade, 2024). Reality also shows that while some large enterprises in Ho Chi Minh City have begun to apply technology to stages such as warehouse management, order tracking, and automatic delivery, the majority of small and medium enterprises, which account for a high proportion of the logistics industry structure, are still facing difficulties in the digital transformation process due to lack of financial resources, technological capacity, and specialized human resources (Akbari et al., 2023). This widens the gap in competitiveness between businesses, and creates the need to comprehensively assess the role of digital transformation, not only internally but also in terms of distribution channel innovation, an important factor that directly affects service efficiency and the ability to expand market share.

In this context, it is crucial to study the effects of digital transformation on distribution channel innovation and the competitive advantage of logistics enterprises in Ho Chi Minh City. This is a pressing need in both theory and practice. This study clearly identifies the driving forces behind digital transformation, examines its impact on distribution channel innovation, and explores the competitive advantage of logistics enterprises. We expect our research results to contribute to both academic institutions and businesses, providing specific recommendations to enhance distribution channel innovation and improve competitive advantage in the age of digitalization. In today's digital landscape, implementing technologies such as smart order management systems and digital delivery platforms not only enhances operational efficiency but also drives innovation in distribution models. By integrating real-time data into distribution channels, logistics enterprises can strengthen their competitive advantage in the digital age.

2. Theoretical Basis

According to the theory of Competitive advantage (Porter, 1985), businesses can achieve superior performance through strategic positioning and improving activities in the value chain, with distribution channels playing a crucial role. According to the Resource Based View (Barney, 1991), internal resources such as technology, customer data, logistics management systems, and organizational capabilities are crucial for gaining a competitive advantage. In order for these resources to be effective, they must possess the following qualities: they must be valuable, rare, difficult to imitate, and irreplaceable. Meanwhile, Dynamic capabilities (Teece et al., 1997) offers a relevant perspective on digital transformation, stating that businesses must continuously identify new technological opportunities, integrate digital resources into the distribution process, and restructure their business models to adapt to changing markets and customer needs. In today's digital landscape, implementing technologies such as smart order management systems and digital delivery platforms not only enhances operational efficiency but also drives innovation in distribution models. By integrating real-time data into distribution channels, logistics enterprises can strengthen their competitive advantage. Furthermore, from the perspective of institutional theory, actors do not solely make decisions based on rational goals of efficiency but also by social and cultural factors and concerns about legitimacy

(Scott, 1995). Institutional theory views digital transformation as a disruptive force that affects both sectors and organizations (Hinings et al., 2018).

3. Literature Review and Research Gaps

Firstly, after reviewing previous research, we found that the majority of studies focused on two specific groups. Group one studies examined factors that impact digital transformation, such as those conducted by Luo and Yu (2022), Jović et al. (2022), Zhang et al. (2022), Laorach and Tuamsuk (2022), Zhang et al. (2023a), Verhoef et al. (2021), Zhang et al. (2023b), and AlNuaimi et al. (2022). Group two relationships between digital transformation and competitive advantage of enterprises, such as (Leão & Da Silva, 2021; Adisaksana, 2022; Alabdali & Salam, 2022; Shehadeh et al., 2023; Siu et al., 2024; Susanti et al., 2023).

Secondly, previous research has argued that digital transformation can give businesses a competitive edge (Leão & Da Silva, 2021; Adisaksana, 2022; Alabdali & Salam, 2022; Shehadeh et al., 2023; Siu et al., 2024; Susanti et al., 2023). Previous studies have examined the relationship between digital transformation and corporate competitive advantage from various perspectives. These include: the mediating role of market share expansion in explaining the impact of digital transformation on competitive advantage (Xue et al., 2022); the mediating role of supply chain purchasing activities in explaining the impact of digital transformation on competitive advantage (Alabdali & Salam, 2022); the mediating role of entrepreneurial orientation in explaining the impact of digital transformation on competitive advantage (Shehadeh et al., 2023); the mediating role of knowledge transfer ability in explaining the impact of digital transformation on competitive advantage (Guo, 2023); and the enhancement of human capital research and development to improve overall competitiveness (Siu et al., 2024).

Research gaps, the authors of previous studies have identified many concepts related to the research model. However, there are still gaps that need to be addressed in order to fully assess the impact of digital transformation on the competitive advantage of logistics enterprises in Ho Chi Minh City. Some of these gaps include:

Firstly, it is important to consider both the factors that influence digital transformation and how digital transformation impacts the competitive advantage of the enterprise. This will provide a comprehensive understanding of the enterprise's digital transformation.

Secondly, we will examine the mediating role of distribution channel innovation in order to better understand how digital transformation affects the enterprise's competitive advantage.

Thirdly, there have been numerous studies examining the effects of digital transformation on the competitive advantage of enterprises in various industries, including manufacturing (Xue et al., 2022), banking (Rashwan & Kassem, 2021), services (Shehadeh et al., 2023), and petroleum (Guo, 2023). However, this particular study focuses on logistics enterprises, specifically logistics service providers in Ho Chi Minh City, Vietnam. It is important to note that logistics enterprises play a crucial role in the supply chain and distribution channels.

4. Methodology

4.1. Hypotheses and Research Model

4.1.1. Hypotheses Development

Information technology infrastructure (ITI) plays a crucial role in the successful implementation and operation of digital systems. According to Jović et al. (2022) the availability and interoperability of information technology directly impact the digital transformation process. Osmundsen et al. (2018) state that technology infrastructure is essential for enhancing logistics management and streamlining access to information. AlNuaimi et al. (2022) emphasize technology as the foundation of digital transformation, while Zhang et al. (2023a) argue that technology plays a crucial role in the success of this process. Building on these findings, the study proposes the following hypothesis:

H1: Information technology infrastructure has a positive impact on digital transformation of logistics enterprises.

Digital Transformation Leadership (DLED) is crucial in guiding and implementing digital transformation. Vial's (2019) research shows that visionary leadership plays a crucial role in helping businesses respond flexibly to technological change. Vogelsang et al. (2019) discovered that leadership capacity has a significant influence on innovation capability. Similarly, Ardi et al. (2020) found that digital transformation leadership not only serves as a motivator, but also plays a crucial role in effectively allocating resources for successful digital transformation. Building on these findings, the study proposes the following hypothesis:

H2: Digital transformation leadership has a positive impact on digital transformation of logistics enterprises.

Organizational agility (OAGI) is a crucial factor in helping businesses adapt quickly to change, particularly in the context of digital transformation. According to AlNuaimi et al. (2022), agility plays a significant role in optimizing digitalization processes for businesses. Zhang et

al. (2023b) and Gong and Ribiere (2023) have both concluded that agile organizations are better equipped to effectively implement digital technologies. Similarly, Tijan et al. (2021) have highlighted the importance of organizational agility and efficient business processes in facilitating digital transformation within the maritime transport sector. Based on this, the study put forth the following hypothesis:

H3: Organizational agility has a positive impact on digital transformation of logistics enterprises.

Competitive pressure (COMP) refers to the external factors that push businesses to improve and adapt, in order to stay ahead of their competitors in terms of market share or profitability. According to Lertwongsatien and Wongpinunwatana (2003), competitive pressure is the primary driving force behind change in an industry. Fu and Lee (2021) found that competition drives SMEs to adopt digital transformation faster. Luo and Yu (2022) and Zhang et al. (2023a) have both highlighted the significance of market pressure in driving businesses to adopt digital technology. Based on this, the study puts forward the following hypothesis:

H4: Competitive pressure has a positive impact on digital transformation of logistics businesses.

Government policies (GPOL) play a crucial role in guiding and promoting digital transformation. Chen et al. (2021) highlight the importance of implementing measures such as digital training, technology grants, and electronic payment incentives to promote the digitalization of businesses. Luo and Yu (2022) and Zhang et al. (2023a) have both discovered that supportive policies play a crucial role in expediting digitalization across multiple industries, including logistics. These policies provide businesses with the necessary resources to enhance the effectiveness of their digital transformation. Based on this, the study puts forward the following hypothesis:

H5: Government support policies have a positive impact on digital transformation of logistics businesses.

Competitive advantage (CAD) is a crucial factor for businesses in the era of digital transformation. According to Porter (1985), companies can achieve competitive advantage through either cost reduction or differentiation from their competitors. Barney (1991) emphasized that businesses can create sustainable competitive advantages by effectively utilizing their resources. Other studies (Leão & Da Silva, 2021; Zhou et al., 2019; Verhoef et al., 2021) have also highlighted how digital transformation can improve a company's market position through optimizing processes and improving performance. Through digital transformation, logistics businesses can optimize various processes in the supply chain, such as warehouse management, freight forwarding, and transportation. Technology supports businesses to track perishable goods in real time, optimize routes, and accurately predict customer demand. By reducing operating costs and improving work efficiency, this approach minimizes the risk of errors in the operating process. Based on this, the study hypothesized the following:

H6: Digital transformation has a positive impact on the competitive advantage of logistics enterprises.

According to Ning and Yao (2023), digital transformation is crucial for streamlining business processes. For example, automating tasks such as processing orders, categorizing products, coordinating transportation, and reducing errors have been shown to increase efficiency and reduce costs for companies. According to Oubrahim et al. (2023), digital transformation facilitates the integration of supply chain data, connecting inventory information between suppliers, warehouses, carriers, and customers through digital platforms. This results in a seamless flow of information, real-time synchronization, and the ability to monitor the distribution chain. Thanks to this, businesses are able to efficiently manage the flow of goods and make timely decisions. According to Wu et al. (2006), businesses can optimize their distribution networks by utilizing digital technology to reduce costs, distance, and time. According to Kohtamäki et al. (2020), digital technology helps personalize online shopping services, make order information transparent, and create effective interaction channels. This contributes to improving customer satisfaction and loyalty by allowing customers to customize their orders and receive personalized recommendations based on their preferences. Kuswantoro et al. (2012) demonstrate that innovation in distribution channels has a significant impact on the performance and competitive advantage of businesses. Belhadi et al. (2022) have shown that digitalized supply chains can improve supply chain visibility, enable flexible adjustments in structure, organization, and capacity, enhance product quality, and improve supply chain efficiency. Shin (1999) demonstrated that digital technology can improve the coordination of economic activities and enhance firm productivity. Building on these findings, the study proposes the following hypotheses:

H7: Digital transformation positively impacts distribution channel innovation of logistics enterprises.

H8: Distribution channel innovation positively impacts the competitive advantage of logistics enterprises.

4.1.2. Research Model

The proposed research model (Figure 1) is based on the Resource Based View (RBV), Competitive advantage theory, Dynamic capability and Institutional theory. Its

purpose is to investigate the effects of digital transformation on distribution channel innovation and the competitive advantage of logistics enterprises.

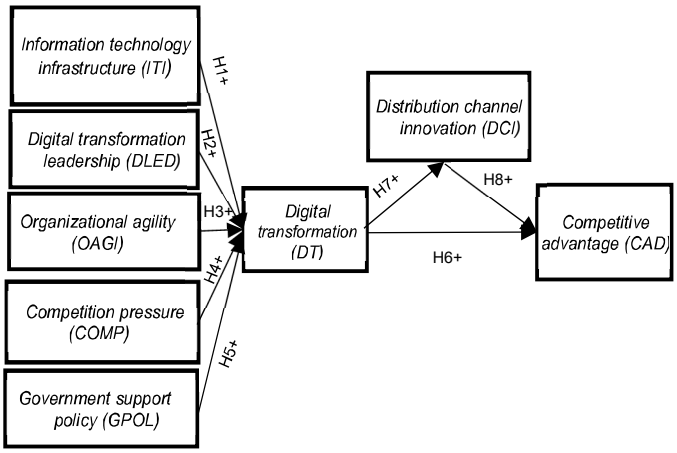

Figure 1: Propose Research Model

The model comprises of five key factors that have a direct influence on digital transformation: information technology infrastructure (ITI), digital transformation leadership (DLED), organizational agility (OAGI), competition pressure (COMP), and government support policy (GPOL). It is believed that digital transformation (DT) has a significant impact on distribution channel innovation (DCI) and ultimately leads to a competitive advantage (CAD). Furthermore, it is assumed that distribution channel innovation (DCI) plays a crucial role in enhancing the competitive advantage (CAD) of logistics enterprises.

The hypotheses in the model are tested through quantitative data analysis using structural equation modeling (SEM). This method is used to evaluate the impact of each factor on the digital transformation process and competitive advantage of logistics enterprises.

4.2. Survey Design and Measurement

The survey process involves three steps: (1). Conducting discussions with 10 experts who have at least 10 years of experience to determine the appropriate scale and observation variables for the current state of distribution, digital transformation, and competitive advantages of logistics enterprises in Ho Chi Minh City. (2). A preliminary study was conducted with a sample size of 170 participants to evaluate the internal consistency and construct validity of the questionnaire's structure. (3). Conduct main research with a sample size of 400 individuals, collecting 380 valid questionnaires. The survey was conducted from October 2024 to December 2024 and was based on a questionnaire. The target audience of the survey was logistics enterprise managers in Ho Chi Minh City. The respondents were identified through direct interviews and provided with formal questionnaires, using a non-probability sampling method. The data collected was analyzed through exploratory factor analysis (EFA), confirmed through confirmatory factor analysis (CFA), and tested against hypotheses using structural equation modeling (SEM).

Structural Equation Modeling (SEM) is a comprehensive statistical methodology that allows for the examination of complex relationships between observed and latent constructs. It integrates regression analysis, factor analysis, and analysis of variance to provide a holistic understanding of these relationships. In this study, we utilized SEM to evaluate the measurement model and structural model within the proposed theoretical framework. We performed parameter estimation using the bootstrap technique, which is an effective alternative in situations where large sample sizes are not feasible. Bootstrap is a resampling procedure that involves generating numerous random subsamples from the original dataset. It is generally recommended to use a minimum of 1,000 resamples to ensure the robustness of the estimates (Hair et al., 2019). We operationalized all observed variables using a 5-point Likert scale, ranging from “strongly disagree” to “strongly agree,” to facilitate the collection of reliable and consistent data. We conducted statistical analyses using SPSS (version 26) and AMOS (version 24).

We adapted and modified measurement scales from previous studies to ensure their suitability for use in the research context in Vietnam. The author utilized the distribution channel innovation scale developed by Kuswantoro et al. (2012) and made modifications based on interviews with logistics experts in Ho Chi Minh City. The observed variables were adapted to better fit the research context. The variables that were observed were adjusted to include the following: "DCI1: The enterprise improves the order processing process to shorten processing time and increase accuracy in distribution", "DCI2: The enterprise adopt new technologies to share data with distributors and customers", "DCI3: The enterprise apply real-time synchronized inventory and order information across channels", and "IDC4: Enterprise distribution systems enable faster and more accurate deliveries through innovation.

The concept of competitive advantage for enterprises is measured by four observed variables, adapted from the scale created by Azeem et al. (2021). These variables were further refined through expert interviews. For example, the variable " We make great efforts in building a firm brand name" was adjusted to "In the past three years, the enterprise has seen an improvement in its market share compared to its closest competitors", this change was made because market share is a good indicator of brand strength. Additionally, the market

share question was designed to be easily understood by respondents, making it easier for them to answer. Eliminate the observation variable "The company has better managerial capability than the competitors." It can be challenging to compare the management capabilities of different businesses with one another. The digital transformation scale comprises of three observed variables derived from Zhao et al.'s (2023) scale. The information technology infrastructure scale includes three observed variables adapted from Lu & Ramamurthy's (2011) scale. The digital transformation leadership scale consists of four observed variables adapted from AlNuaimi et al.'s (2022) scale. The Organizational Agility Scale is comprised of four observed variables that have been adapted from Cegarra-Navarro et al.'s (2016) scale. Similarly, the Competitive Pressure Scale is composed of four observed variables that have been adapted from Fu & Lee's (2021) scale, while the Government Support Policy Scale includes four observed variables that have been adapted from Chen et al.'s (2021) scale.

5. Results

5.1. Descriptive Statistics of the Sample Characteristics

We distributed a total of 400 survey questionnaires and received 400 completed surveys in return. After collecting data through direct surveys using survey forms and cleaning the data, 20 questionnaires were excluded due to invalid responses, responses with identical answers for all items or missing data. Results, 380 out of the 400 questionnaires were deemed valid and retained for the formal quantitative analysis, as presented in Table 1.

Table 1: Statistical Summary of the Official Research Sample (n = 380)

Classification Criteria	Sample size	%	Classification Criteria	Sample size	%
Gender			***Marital Status***		
Male	301	79	Single	141	37.1
Female	79	21	Married	239	62.9
Total	*380*	*100*	*Total*	*380*	*100*
Age			***Educational Level***		
<30 years	75	20	Vocational/ College	98	25.8
30 - 45 years	211	56	University	210	55.2
46 - 55 years	60	16	Postgraduate	44	11.6
>55 years	34	8	Other	28	7.4
Total	*380*	*100*	*Total*	*380*	*100*
Income (million VND/month)			***Experience***		
< 30	67	17.6	< 5 years	67	17.6
30-40	139	36.6	5 – <10 years	134	35.3
41-50	125	32.9	10 –< 20 years	124	32.6
> 50	49	12.9	>= 20 years	55	14.5
Total	*380*	*100*	*Total*	*380*	*100*

5.2. Scale Reliability Analysis

Scale evaluation includes: internal consistency reliability, index reliability, convergent validity, discriminant validity. Specifically, Cronbach's alpha must be greater than 0.6 and composite reliability (CR) must be greater than 0.7 (Hair et al., 2017). In addition, Average Variance Extracted (AVE) must be greater than 0.5 to ensure the convergent validity of the scale (Hair et al., 2017). This study also uses the Heterotrait-monotrait ratio; FornellLacker and Cross Loadings to analyze discriminant validity, If the SQRT(AVE) coefficient is larger than the remaining correlation coefficients, the scale ensures discrimination (Fornell and Larcker, 1981).

Table 2: Composite Reliability (CR), Convergent Validity, and Discriminant Validity of Constructs

	CR	AVE	MSV	MaxR (H)	COMP	DLED	GPOL	OAGI	ITI	DT	DCI	CAD
COMP	0.838	0.565	0.306	0.841	**0.751**							
DLED	0.843	0.573	0.327	0.844	0.273	**0.757**						
GPOL	0.833	0.554	0.307	0.834	0.378	0.311	**0.744**					
OAGI	0.816	0.527	0.148	0.822	0.124	0.225	0.301	**0.726**				
ITI	0.756	0.509	0.265	0.761	0.237	0.259	0.262	0.209	**0.713**			
DT	0.849	0.652	0.478	0.851	0.553	0.572	0.554	0.384	0.515	**0.807**		
DCI	0.824	0.544	0.294	0.844	0.321	0.289	0.267	0.177	0.320	0.519	**0.738**	
CAD	0.851	0.589	0.478	0.856	0.479	0.516	0.519	0.310	0.394	0.691	0.543	**0.767**

The results presented in Table 2 show that Cronbach alpha of all factors are higher than 0.6, composite reliability (CR) is greater than 0.7 and AVE is higher than 0.5. This means that internal consistency reliability and convergent validity of these constructs have been achieved. At the same time, the SQRT(AVE) coefficient is larger than the remaining correlation coefficients, also demonstrates that the Maximum Shared Variance (MSV) is less than the Average Variance Extracted (AVE). We conclude that the scale ensures discrimination.

5.3. Exploratory Factor Analysis

According to Hair et al. (2019), there are certain criteria that must be met when conducting exploratory factor analysis (EFA). It is crucial to adhere to these criteria in order to ensure accurate results. These include a Kaiser-Meyer-Olkin (KMO) coefficient between 0.5 and 1, suggesting that the data are suitable for EFA, and a significance level of less than 0.05 for Bartlett's test, indicating a linear correlation between the observed variables and the representative factor. Additionally, factor loadings should meet the following thresholds based on sample size: greater than 0.3 for samples over 350, greater than 0.5 for samples between 100 and 350, and greater than 0.7 for samples under 100 (Anderson & Gerbing, 1988).

Table 3: Pattern Matrix

	Component							
	1	2	3	4	5	6	7	8
COMP3	0.856							
COMP4	0.828							
COMP1	0.790							
COMP2	0.782							
DLED4		0.844						
DLED2		0.832						
DLED1		0.814						
DLED3		0.798						
GPOL3			0.834					
GPOL4			0.826					
GPOL2			0.810					
GPOL1			0.774					
OAGI2				0.825				
OAGI4				0.816				
OAGI3				0.792				
OAGI1				0.768				
ITI3					0.854			
ITI1					0.808			
ITI2					0.781			
DT2						0.899		
DT1						0.863		
DT3						0.863		
DCI3							0.855	
DCI2							0.846	
DCI1							0.812	
DCI4							0.711	
CAD3								0.859
CAD2								0.840
CAD4								0.831
CAD1								0.792
Eigen value					1.719	2.297	2.612	2.761
% of Extracted variance					67.189	76.571	65.310	69.019
KMO Measure of Sampling Adequacy					0.818	0.720	0.790	0.813
Bartlett's Test of Sphericity (sig)					0.00	0.000	0.000	0.000

To achieve a satisfactory level of explanation, total variance explained should be greater than 50% and each factor's Eigenvalue should be greater than 1 (Anderson & Gerbing, 1988).

Table 3 shows that the Kaiser-Meyer-Olkin (KMO) coefficients range from 0.72 to 0.818, satisfying the condition of 0.5 to 1. Eigenvalue ranges from 1.719 to 2.761 (greater than 1), the total extracted variance is 65.310% to 76.571% (greater than 50%) and the Sig value is 0.000 (less than 0.05). These indices show that all variables satisfy the conditions for exploratory factor testing.

5.4. Confirmatory Factor Analysis

The measurement model must demonstrate a satisfactory fit to the empirical data, as evidenced by five key fit indices: (i) the chi-square/degrees of freedom ratio (CMIN/df), (ii) the Tucker-Lewis Index (TLI), (iii) the Comparative Fit Index (CFI), (iv) the Normed Fit Index (NFI), and (v) the Root Mean Square Error of Approximation (RMSEA) (Gefen et al., 2011). The CFA results in Figure 2 demonstrate that the model meets these criteria: CMIN/df = 1.829, indicating a good fit (Bentler & Bonett, 1980; Bagozzi & Jy, 1988); TLI = 0.930, indicating excellent fit (Hu & Bentler, 1995); CFI = 0.939, indicating excellent fit (Hu & Bentler, 1995); NFI = 0.876 is accepted (Hu & Bentler, 1995); and RMSEA = 0.047, indicating an excellent fit (Browne & Cudeck, 1993). These results should be compatible with market data without the need for any modifications.

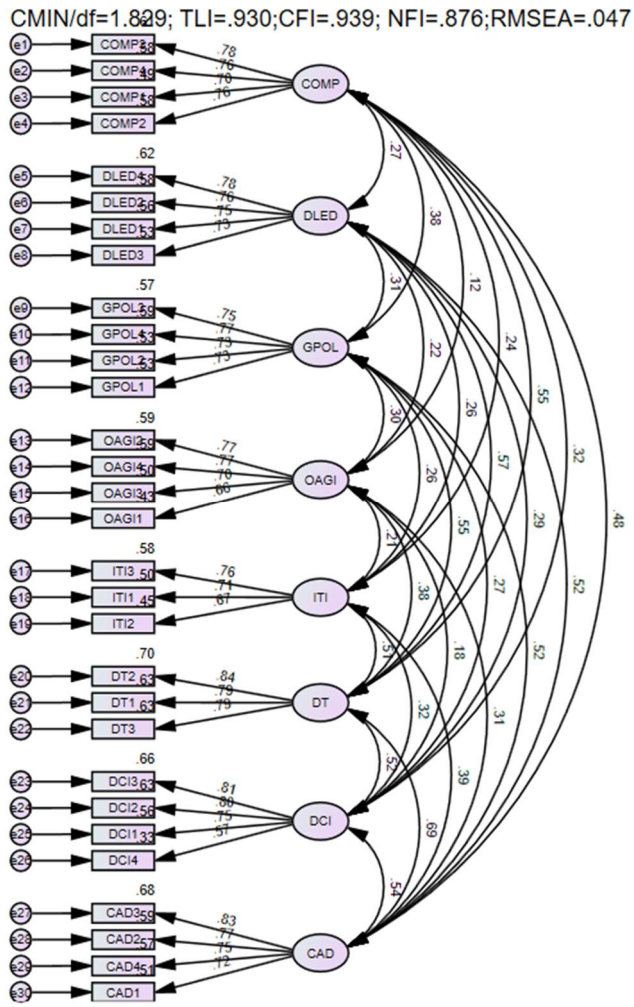

Figure 2: Confirmatory Factor Analysis Results

5.5. Structural Equation Modeling

The results of the Structural Equation Modeling (SEM) analysis indicate a good fit for the collected market data, with the following fit indices: CMIN/df = 2.159, TLI = 0.902, CFI = 0.910, NFI = 0.846, and RMSEA = 0.055. Furthermore, the estimation results in Table 4 show that all

relationships are statistically significant, with p-values less than 0.05.

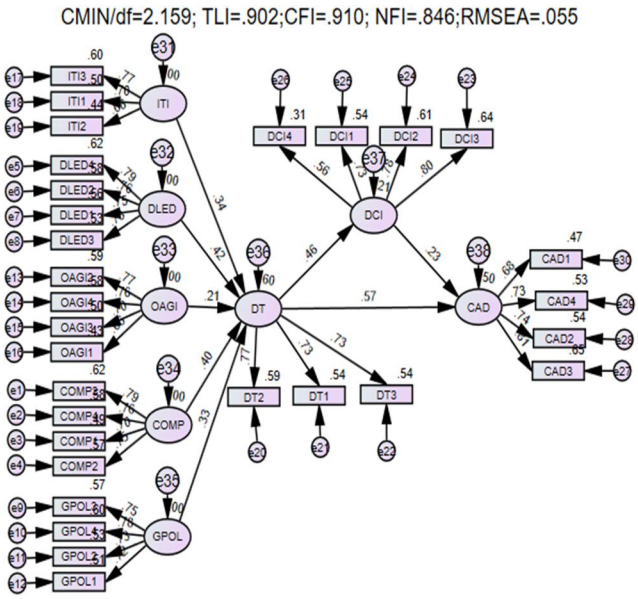

Figure 3: Results of SEM

Table 4 displays the factors that have the most significant impact on digital transformation, listed in descending order. These factors consist of competitive pressure, leadership in digital transformation, government policies that support digital transformation, IT infrastructure, and organizational agility. The implementation of digital transformation has a positive effect on the innovation of distribution channels and ultimately leads to a competitive advantage. Additionally, the innovation of distribution channels also has a positive impact on competitive advantage.

Table 4: Hypothesis Testing Results from the Structural Model

Hypo-thesis	Path	Estimate	S.E.	C.R.	P	Decision
H4	DT<--- COMP	0.409	0.055	7.445	***	Accepted
H2	DT<---DLED	0.375	0.048	7.867	***	Accepted
H5	DT<---GPOL	0.332	0.052	6.328	***	Accepted
H1	DT<---ITI	0.329	0.054	6.154	***	Accepted
H3	DT<---OAGI	0.202	0.049	4.111	***	Accepted
H6	CAD<---DT	0.591	0.070	8.489	***	Accepted
H7	DCI<---DT	0.489	0.067	7.265	***	Accepted
H8	CAD<---DCI	0.219	0.058	3.757	***	Accepted

Note: *** (Sig. = 0.000)

5.6. Testing the Estimation of the Theoretical Model Using Bootstrap

We assessed the model's robustness using the Bootstrap method with 1,000 resamples. The average estimates and biases from these 1,000 samples are presented in Table 5. According to Ho & Thuong (2023), an absolute C.R value ≤ 1.96 (with a confidence level of 95% or higher) is acceptable. Therefore, the research model is significant with a large sample size (1,000 observations), ensuring that the data analysis results are reliable and can be generalized to the population.

Table 5: Estimation Results Using Bootstrap with N=1000

Parameter			SE	SE-SE	Mean	Bias	SE-Bias	C.R
DT	<-	ITI	0.069	0.005	0.317	-0.012	0.007	-1.71
DT	<-	DLED	0.045	0.003	0.384	0.009	0.005	1.80
DT	<-	OAGI	0.051	0.004	0.197	-0.005	0.005	-1.00
DT	<-	COMP	0.06	0.004	0.408	-0.001	0.006	-0.17
DT	<-	GPOL	0.058	0.004	0.328	-0.003	0.006	-0.50
DCI	<-	DT	0.069	0.005	0.487	-0.002	0.007	-0.29
CAD	<-	DCI	0.078	0.006	0.228	0.009	0.008	1.13
CAD	<-	DT	0.075	0.005	0.592	0	0.008	0.00

*CR (Critical Ratios) = (Bias) / (SE-Bias)

6. Discussion

The finding indicate that digital transformation has a considerable influence on the competitive advantage of logistics enterprises in Ho Chi Minh City (β = 0.591, p = 0.000). This aligns with the outcomes of previous research conducted by Leão and Da Silva (2021), Zhou et al. (2019), and Verhoef et al. (2021). In fact, major companies like Sotrans and Gemadept have implemented advanced warehouse management software, utilized real-time tracking, and utilized digital platforms for transport coordination. These systems streamline costs and shorten goods processing time by automating tasks and improving communication between different departments. This not only increases internal efficiency but also boosts their position in the supply chain. Some smaller businesses, like Viettel Post Logistics, have started implementing digital technologies such as chatbots and AI routing, demonstrating their potential for competitiveness when investing in the right direction. However, many businesses are still hesitant to undergo transformation, due to a lack of proper digital infrastructure and human resources, which could result in falling behind. This highlights the fact that digital transformation is not just a technical aspect, but also a strategic factor that can enhance the adaptability of logistics businesses in Ho Chi Minh City, enabling them to better serve their customers and maintain a competitive edge in a highly competitive market.

This study has also discovered that digital transformation has a significant impact on distribution channel innovation (β = 0.489, p = 0.000). These results align with previous studies conducted by Ning and Yao

(2023), Oubrahim et al. (2023), Belhadi et al. (2022), and Shin (1999). Digital technologies, especially the Order Management System (OMS), have significant Improved and combined order processing efficiency. In order to improve efficiency and reduce errors in their delivery processes, businesses such as Grab, DHL, GHTK, GHN, and Ahamove have effectively utilized algorithms to classify orders by geography and optimize delivery routes. These improvements not only optimize costs but also boost accuracy in the delivery process.

Digital transformation is essential for creating data sharing between enterprises, distributors, and customers. The implementation of ERP systems, open APIs, and cloud data platforms has improved the exchange of real-time information related to orders, inventory, and delivery status. These systems facilitate the sharing of crucial data, allowing for more efficient and accurate communication between different departments and stakeholders. This has greatly streamlined the process of managing orders, inventory, and delivery, resulting in increased productivity and customer satisfaction. This timely information linkage not only improves distribution efficiency, but also enhances the reliability of the entire supply chain. This is particularly important in cities like Ho Chi Minh City. Rapid urbanization and unpredictable changes in consumer demand are common in such cities. The study also highlighted how digital transformation streamlines data synchronization between traditional and modern sales channels. By integrating data from various sources such as websites, physical stores, and e-commerce platforms, businesses can respond more flexibly to market fluctuations, such as changes in consumer demand or supply chain disruptions. This enables businesses to minimize local shortages or surpluses of goods, ensuring a more efficient and effective distribution of products. This demonstrates that digital transformation not only streamlines supply chain processes, but also contributes to restructuring the distribution model towards "Omni-channel," a multi-channel distribution trend that is gaining popularity in the modern business context. The implementation of digital technologies has greatly improved the quality of distribution services, resulting in faster and more accurate delivery. By utilizing technologies such as AI routing, GPS positioning systems, and big data analysis, delivery time within Ho Chi Minh City has been reduced from 2-3 days to just a few hours.

This study has revealed that distribution channel innovation has a positive impact on the competitive advantage of logistics enterprises in Ho Chi Minh City ($\beta = 0.219$, $p = 0.000$). These findings are consistent with previous research conducted by Wu et al. (2006), Kuswantoro et al. (2012) and Kohtamäki et al. (2020). These studies have emphasized the significance of distribution channel innovation in bridging the gap between digital transformation and competitive advantage. Businesses that have implemented modern distribution methods, such as integrating digital technology, developing online trading platforms, and streamlining transportation networks, have seen significant improvements in three core factors: delivery speed, customer accessibility, and partner satisfaction. The use of technology, such as transportation management systems (TMS), tracking systems, and big data analytics platforms, has greatly improved distribution accuracy and reduced the risk of service disruptions for businesses.

In Ho Chi Minh City, the country's premier logistics and trade hub, the dynamic market, high demand for delivery, and fierce competition have created immense pressure for innovation. To meet these challenges, businesses have adopted multi-channel distribution models that combine traditional channels, such as physical warehouses and internal fleets, with digital channels like online ordering and tracking platforms, and outsourcing services through applications. This approach has enabled businesses to enhance their flexibility in serving customers. Businesses can not only optimize costs and time, but also customize services for each customer segment. This includes small-scale retailers, such as local mom-and-pop shops, to large-scale e-commerce businesses, like multinational online retailers. This ability to tailor services to different customers gives businesses a competitive advantage.

Furthermore, this study found that information technology infrastructure, digital transformation leadership, and organizational agility were crucial factors in the success of digital transformation in logistics enterprises. Additionally, competitive pressure and government support policies were also found to have a positive impact on the digital transformation of these enterprises. The impact of competitive pressure (COMP) on digital transformation is significant ($\beta = 0.409$, $p = 0.000$), as shown in previous studies by Luo and Yu (2022), Fu and Lee (2021), and Zhang et al. (2023a). This is because market competition drives businesses to innovate and adopt digital technology in order to enhance operational efficiency. Digital transformation leadership strongly impacts digital transformation ($\beta = 0.375$, $p = 0.000$), highlighting the crucial role of leaders in guiding strategy and driving the process. This finding is in line with the findings of Vial (2019) and Vogelsang et al. (2019), who also highlighted the importance of leadership commitment in overcoming technological barriers for businesses. Government Support Policy (GPOL) ($\beta = 0.332$, $p = 0.000$) and Information Technology Infrastructure (ITI) ($\beta = 0.329$, $p < 0.001$) both have a positive impact on digital transformation. This is consistent with the findings of Jović et al. (2022) and Chen et al. (2021), who highlight the crucial role of technology and government support in the digitalization of businesses.

OAGI impacts digital transformation (β = 0.202, p = 0.000), as found by AlNuaimi et al. (2022) and Zhang et al. (2023b), who also reported a positive relationship between OAGI and digital transformation. This is because agility helps businesses quickly adapt to changes in technology and the business environment.

7. Conclusions

Academic Contributions: Firstly, this study offers researchers a fundamental theoretical framework on digital transformation, distribution channel innovation, and the competitive advantage of logistics enterprises. Furthermore, the study enhances our understanding of the relationship between digital transformation, distribution channel innovation, and competitive advantage, thus providing a deeper understanding of the specific strategies and processes that contribute to a competitive advantage for enterprises. Secondly, this study introduces the Dynamic Capability theory to examine the digital transformation process of logistics enterprises, thereby expanding the scope of application for this theory. According to dynamic capabilities theory, a firm's competitive advantage depends greatly on its ability to innovate its distribution channels, such as incorporating e-commerce platforms or utilizing social media marketing strategies, to suit the digital economy. Theoretical frameworks such as Dynamic Capabilities have been extensively utilized in the innovation literature during the information technology era (e.g., Teece, 2010; Cepeda & Arias-Pérez, 2019; Khalil & Belitski, 2020). However, there is still a limited understanding of digital transformation and distribution channel innovation from a Dynamic capabilities theory perspective. It is important to further explore these concepts and their relationship to dynamic capabilities theory in order to gain a deeper understanding of their impact on innovation. Thirdly, the study successfully constructed a reliable and valid one-dimensional scale for the new variable of distribution channel innovation in logistics enterprises All the scales obtained were one-dimensional and demonstrated reliability as well as convergent and discriminant validity.

In practical terms, the findings of our study provide valuable insights for logistics business managers. Specifically, our research suggests that logistics business managers should strategically invest in driving innovation within their distribution channels. This can be achieved through various means, such as implementing technological advancements in delivery methods, digitizing operations management systems, and integrating digital platforms into customer service processes. Technological innovations not only improve operational efficiency but also enhance competitive advantages for logistics businesses. For instance, implementing automated inventory management systems can streamline processes and reduce errors, leading to improved efficiency. Additionally, utilizing data analytics can provide valuable insights for optimizing supply chain operations and gaining a competitive edge in the market. By continuously adopting innovative strategies, logistics businesses can stay ahead of the competition and achieve long-term success. The study also empirically provides data for management agencies, industry associations, and policymakers to use in designing support programs for logistics enterprises in Ho Chi Minh City's digital transformation process. This includes training programs and financial support programs.

Limitations of the study, while the study has yielded significant findings on the correlation between factors driving digital transformation, distribution channel innovation, and competitive advantage in the logistics industry in Ho Chi Minh City, there are still some limitations that should be acknowledged. Firstly, the scope of the study is limited to logistics enterprises in Ho Chi Minh City. Therefore, the results may not provide a comprehensive understanding of the logistics industry in other regions of the country. Second, the study only measured competitive advantage through its outcomes, without considering specific competitive strategies such as cost leadership or differentiation strategy. In future research, it is important to also measure competitive advantage in terms of these strategies to gain a more comprehensive understanding of the factors that contribute to a company's success.

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Appendixes

Appendix 1: Measurement scale and observed variables

No.	Code	Scales and observed variables
I	**ITI**	**Information technology infrastructure**
1	ITI1	The enterprise's data infrastructure (e.g., databases, data warehouses, data availability, storage, accessibility, sharing, etc.) meets the requirements of digital transformation.
2	ITI2	The enterprise's Internet infrastructure (e.g., connectivity, reliability, availability, LAN, WAN, etc.) meets the requirements of digital transformation.
3	ITI3	The enterprise's technology infrastructure (e.g., ERP, ASP, reusable software components, emerging technologies, etc.) meets the requirements of digital transformation.
II	**DLED**	**Digital Transformation Leadership**
4	DLED1	The enterprise's leadership inspires all members with a clear vision and commitment to the organization's digital transformation plans.
5	DLED2	The enterprise's leadership articulates a clear vision for digital transformation, enabling members across the organization to execute it effectively
6	DLED3	The enterprise's leadership motivates and aligns members to collaborate toward achieving the organization's digital transformation goals.
7	DLED4	The enterprise's leadership encourages all members to contribute ideas and think proactively about digital transformation.
III	**OAGI**	**Organizational Agility**
8	OAGI1	The organization is able to promptly respond to the evolving needs of both customers and government agencies.
9	OAGI2	The organization swiftly adapts its operations and processes to accommodate changes in demand.
10	OAGI3	The organization responds swiftly to changes in the market and government regulations by making timely decisions.
11	OAGI4	The organization consistently explores opportunities to innovate or restructure in order to remain competitive and adaptive.
IV	**COMP**	**Competition pressure**
12	COMP1	Business competitors have increased their customer engagement through digital applications.
13	COMP2	Competitors are using digital technology, so businesses will use digital technology.
14	COMP3	To stay ahead in the industry, businesses need to embrace digital transformation.
15	COMP4	Industry competitors have gone digital to gain a competitive advantage.
V	**GPOL**	**Government support policy**
16	GPOL1	The law on digital transformation is suitable for the context and digital transformation activities of enterprises.
17	GPOL2	State-owned enterprise digital transformation training programs have a positive impact on businesses.
18	GPOL3	State management policies support and encourage the feasibility of digital transformation in enterprises.
19	GPOL4	The State and state management agencies work together to implement digital transformation solutions and programs with businesses.
VI	**DT**	**Digital transformation**
20	DT1	The firm is integrating digital technologies to change business processes.
21	DT2	The business operation of the firm is shifting toward the use of digital technologies.
22	DT3	The firm is operating business processes based on digital technology.
VII	**DCI**	**Distribution channel innovation**
23	DCI1	The enterprise improves the order processing process to shorten processing time and increase accuracy in distribution.
24	DCI2	Businesses adopt new technologies to share data with distributors and customers.
25	DCI3	Businesses apply real-time synchronized inventory and order information across channels.
26	DCI4	Enterprise distribution systems enable faster and more accurate deliveries through innovation.
VIII	**CAD**	**Competitive advantage**
27	CAD1	In the last three years, the quality of our organization's services has exceeded that of our closest competitor.
28	CAD2	In the past three years, the enterprise has seen an improvement in its market share compared to its closest competitors.
29	CAD3	In the past three years, the enterprise has seen a significant increase in profitability compared to its closest competitor.
30	CAD4	In the past three years, our enterprise has successfully reduced costs in comparison to our closest competitor.