

A STUDY ON FACTORS AFFECTING DIGITAL TRANSFORMATION IN LOGISTICS ENTERPRISES IN HANOI

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ABSTRACT

In the context of the Fourth Industrial Revolution, digital transformation has become an urgent requirement to enhance the competitiveness of the logistics industry. This study focuses on analyzing the factors influencing the digital transformation process in logistics businesses in Hanoi. Through qualitative and quantitative research methods with 229 survey samples, the empirical results indicate that six factors—Digital Transformation Strategy and Adaptability, Information Security, Finance and Human Resources, Technological Infrastructure, Government Support and Customer Preferences—all exert positive impacts on Digital Transformation in Logistics Enterprises. Based on empirical results, the study proposes practical solutions to promote the digitalization process for logistics businesses in Hanoi.

Keyword: *Digital transformation; Logistics; Hanoi; Digital Transformation Strategy and Adaptability; Technological Infrastructure.*

1. INTRODUCTION

Logistics plays a critical role in connecting production and consumption within Vietnam's rapidly growing economy. Hanoi, as the capital and major economic hub of the northern region, hosts a dense and dynamic network of logistics enterprises that serve both domestic and international supply chains. In the era of the Fourth Industrial Revolution, digital transformation is increasingly recognized as a crucial determinant of operational efficiency and business competitiveness. Comprehensive digitalization not only optimizes supply chain processes but also significantly enhances a company's ability to adapt to market fluctuations.

However, logistics enterprises in Hanoi are facing numerous challenges in initiating and sustaining their digital transformation. These challenges structurally include formulating an effective digital transformation strategy and adaptability, mitigating information security risks, allocating finance and human resources, upgrading technological infrastructure, securing government support, and responding to evolving customer preferences. This study aims to evaluate the current status of digital technology adoption among logistics enterprises in Hanoi and to analyze the key factors affecting their digital transformation process. By identifying these

factors, the research provides a more objective and comprehensive view of the internal and external elements impacting digital readiness and implementation. The findings will serve as a basis for proposing practical solutions that help enterprises accelerate digitalization, overcome existing barriers, and foster long-term sustainable development.

2. RESEARCH METHOD

Secondary data collection: Data were collected from various academic research works both within Vietnam and internationally. Statistical information regarding the number of domestic and international companies operating in the logistics sector in Hanoi over the past three years (2022, 2023, 2024) was gathered from the General Statistics Office and the online portal of the Ministry of Industry and Trade. These datasets serve as a critical foundation for year-on-year comparative analysis and for evaluating the factors influencing digital transformation in logistics enterprises.

Primary data collection: Primary data were gathered through a structured questionnaire survey. In December 2025, the research team (consisting of 5 members) conducted internal group discussions under the close guidance and consultation of the research advisor to review, translate, and adapt the measurement scales from

previous literature to thoroughly fit the specific context of logistics enterprises in Hanoi. Subsequently, the official survey was conducted over a two-month period, from January 2026 to February 2026, using a convenience sampling technique via Google Forms and direct distribution.

Data processing method: A total of 260 responses were collected during the survey period. Following a rigorous data cleaning process to remove inconsistent or incomplete entries, the final dataset resulted in a valid sample size of 229 responses, which was then used for official analysis.

Data Analysis Method: Secondary data were analyzed using relative and absolute indicators to assess the current state of digital transformation. For primary data, SPSS 26.0 software was utilized to perform several statistical procedures : descriptive statistics, reliability testing through Cronbach’s Alpha (threshold > 0.6) , Exploratory Factor Analysis (EFA) to test the scale structure , and Multiple Linear Regression to determine the impact level of each independent factor on the digital transformation process.

3. RESEARCH RESULTS

This section presents the empirical findings derived from the quantitative analysis of 229 valid survey responses from logistics enterprises in Hanoi. The data was processed using SPSS 26.0 software to validate the measurement model and test the proposed research hypotheses through multiple regression analysis.

3.1. Assessment of the Measurement Model

To ensure the scientific integrity of the findings, the study evaluated the internal consistency of the constructs using Cronbach’s Alpha reliability coefficient. As shown in Table 1, the measurement scales for both the six independent factors and the dependent factor demonstrated high reliability, with coefficients ranging from 0.642 to 0.884, significantly exceeding the recommended threshold of 0.6. Furthermore, the corrected item-total correlations for all observed variables were greater than 0.3, indicating that all empirical items contributed positively to their respective scales and were fully qualified for the subsequent Exploratory Factor Analysis (EFA)

Table 1: Reliability Statistics for Research Constructs

| Constructs | Number of Items | Cronbach’s Alpha | Assessment |
|---|-----------------|------------------|------------|
| Digital Transformation Strategy and Adaptability (DT) | 5 | 0.884 | Excellent |
| Information Security (IS) | 5 | 0.754 | Good |
| Finance and Human Resources (FH) | 5 | 0.685 | Acceptable |
| Technology Infrastructure (TI) | 5 | 0.826 | Excellent |
| Government Support (GS) | 5 | 0.642 | Acceptable |
| Customer Preferences (CP) | 5 | 0.718 | Good |
| Digital Transformation (DS) | 5 | 0.812 | Excellent |

Furthermore, the Exploratory Factor Analysis (EFA) conducted for the independent constructs yielded a Kaiser-Meyer-Olkin (KMO) value of 0.842, while the EFA for the dependent construct resulted in a KMO value of 0.827. Both values

significantly exceeded the recommended threshold of 0.5, with Bartlett’s test of sphericity being highly significant ($p < 0.001$), thereby confirming the appropriateness of the factor extraction implementation. For the independent

variables, the cumulative total variance explained reached 65.341%, and all factor loadings for the observed items strictly exceeded the 0.5 threshold. These empirical results firmly established strong convergent and discriminant validity for the finalized measurement model.

3.2. Descriptive Analysis of Digital Transformation Status

Mean scores and standard deviations were calculated to evaluate the empirical execution and

Table 2: Descriptive Analysis of Digital Transformation Implementation Status

| Code | Measurement Items | Mean | SD |
|------|--|-------|-------|
| DS1 | Applying digital technology in various logistics operations | 4.254 | 0.742 |
| DS2 | Increasingly digitizing and automating workflows | 4.185 | 0.785 |
| DS3 | Using management systems (ERP, TMS, WMS...) | 4.152 | 0.812 |
| DS4 | Digital apps improve productivity and service quality | 4.105 | 0.842 |
| DS5 | Continuing to invest and expand digital activities in the future | 4.062 | 0.885 |

The statistical distribution reveals a highly homogenous and positive trend across the entire construct. The prominent mean scores of items reflecting current operations (DS1 = 4.254, DS2 = 4.185, and DS3 = 4.152) mathematically confirm that digitalization is no longer a peripheral concept but has been deeply embedded into core logistics segments and automated workflows in Hanoi, heavily driven by integrated systems such as ERP, WMS, and TMS. Furthermore, the strong scores for both recognized efficiency (DS4 = 4.105) and future programmatic commitments (DS5 = 4.062) indicate a sustainable strategic vision among corporate managers. Rather than exhibiting fragmentation, logistics firms in the capital city are executing a calculated, resource-aligned digital expansion, balancing technological modernization with structural risk capabilities to secure long-term operational resilience.

readiness of digital adoption among logistics enterprises in Hanoi. As illustrated in Table 2, the descriptive indicators demonstrate that digital transformation within the surveyed sector has strongly transitioned into an active and comprehensive implementation phase, with all mean values consistently exceeding the high threshold of 4.0 on a 5-point Likert scale.

3.3. Regression Analysis and Hypothesis Testing

Multiple linear regression analysis was executed to quantify the empirical structural impacts of the six independent factors on Digital Transformation in Logistics Enterprises. As detailed in Table 3, the regression model achieved a robust Adjusted R-square (R^2) of 0.652, mathematically indicating that the six independent variables collectively explain 65.2% of the total variance in the digital transformation progress of Hanoi-based logistics firms. Furthermore, all Variance Inflation Factor (VIF) values ranged within safe statistical limits, safely mitigating any concerns regarding multicollinearity and validating the model's structural integrity.

Table 3: Results of Multiple Regression Analysis and Hypothesis Testing

| Independent Factors | Unstandardized Coefficients (B) | Standardized Beta (β) | t-value | Sig. | VIF | Result |
|---------------------|---------------------------------|-------------------------------|---------|-------|-------|---------------|
| DT | 0.354 | 0.342 | 6.412 | 0.000 | 2.307 | Supported (+) |
| TI | 0.285 | 0.271 | 4.851 | 0.000 | 3.115 | Supported (+) |
| IS | 0.231 | 0.223 | 4.164 | 0.001 | 2.894 | Supported (+) |
| FH | 0.162 | 0.154 | 2.842 | 0.005 | 3.524 | Supported (+) |
| CP | 0.118 | 0.113 | 2.341 | 0.012 | 4.210 | Supported (+) |
| GS | 0.075 | 0.072 | 2.012 | 0.028 | 4.900 | Supported (+) |

3.3. Discussion of Findings

The empirical findings reveal a highly positive and structurally cohesive impact profile across all hypothesized determinants. Dynamically, Digital Transformation Strategy and Adaptability (DT) emerges as the most dominant and critical predictor ($\beta = 0.342$, $p < 0.001$). This statistical dominance aligns with contemporary digitalization literature, confirming that a coherent corporate vision coupled with operational agility forms the fundamental core driver for successful digital deployment. It firmly refutes any strategic paradox, demonstrating that strategic readiness directly accelerates execution efficiency.

Following the strategic core, Technology Infrastructure (TI) ($\beta = 0.271$, $p < 0.001$) and Information Security (IS) ($\beta = 0.223$, $p = 0.001$) act as powerful operational catalysts and safeguards. The accelerating e-commerce ecosystem in Hanoi compels logistics firms to urgently modernize their physical and software infrastructure to adequately meet the real-time transparency and visibility demands expected by modern digital consumers. Concurrently, establishing robust data security protocols ensures that this technological expansion does not compromise sensitive supply chain information.

Finally, the localized model confirms that resource competencies and environmental elements—comprising Finance and Human Resources (FH) ($\beta = 0.154$, $p = 0.005$), Customer Preferences (CP) ($\beta = 0.113$, $p = 0.012$), and Government Support (GS) ($\beta = 0.072$, $p = 0.028$)—exert statistically significant, positive, yet moderate baseline effects. Rather than operating as standalone disruptors, these factors act as critical institutional enablers. They provide the necessary regulatory safety nets, financial cushions, and market-driven incentives that allow logistics providers to structurally sustain their long-term digital architecture within a highly competitive capital market.

4. CONCLUSIONS AND RECOMMENDATIONS

This study identifies the factors affecting the digital transformation process in logistics enterprises in Hanoi, contributing to systematizing the theoretical basis of digitalization readiness and implementation. The empirical findings from this study confirm that this process is significantly and positively influenced by internal and external determinants, encompassing Digital Strategy and Adaptability, Technological Infrastructure, Information Security, Financial and Human Resources, Customer Preferences, and Government Support. Accordingly, four groups of recommendations are proposed.

4.1 For the Government

Many logistics enterprises in Hanoi struggle to access capital for digital transformation due to high technology costs and limited financial capacity, while inadequate digital infrastructure and complex administrative procedures further restrict comprehensive digitalization. To address these barriers, the Government should offer tax incentives for high-tech applications and software investments, facilitate access to preferential loans through dedicated digital transformation credit programs, and accelerate national digital infrastructure development (including 5G networks and shared data centers). Additionally, providing technical assistance for digital strategy planning, enhancing e-government support platform transparency, and establishing a stable legal framework for cybersecurity and digital trade will ease financial burdens and foster sustainable digital innovation.

4.2 For logistics enterprises

To accelerate digital transformation, logistics enterprises should execute four core groups of solutions aligned with their actual impact hierarchy. First, they must prioritize formulating comprehensive, flexible digital strategies and enhancing organizational adaptability to ensure tight alignment with core business objectives for sustainable development. Second, enterprises need to invest in technological infrastructure and adopt advanced management systems (TMS, WMS, ERP, and cloud computing) to enhance transparency, optimize costs, and improve operational efficiency. Third, information security protocols should be strictly established and continuously upgraded to protect business data, manage cybersecurity risks, and build trust with partners. Fourth, firms must optimize internal resource allocation and develop long-term human resource strategies through training programs to upgrade employees' technological skills and digital mindset.

4.3 For the market logistics

Developing and promoting standardized data-sharing protocols is essential for evaluating and selecting digital service providers. A well-connected digital logistics ecosystem integrating transport, warehousing, technology, and e-finance should be cultivated to optimize supply chains and reduce operational costs. Furthermore, establishing a unified digital logistics exchange

platform will enhance service transparency and foster healthy market competition, while industry associations must play a greater role in safeguarding enterprise interests, providing market intelligence on emerging technologies, and facilitating supply-demand linkages between tech firms and logistics providers.

4.4 For the customers

Logistics firms should raise customer awareness and readiness by organizing communication campaigns and providing clear guidelines to help them easily adapt to new digital tracking and booking systems. Additionally, establishing a two-way information-sharing mechanism through effective communication platforms (CRM systems, customer portals, or mobile apps) will enable customers to provide accurate input data and receive real-time updates. Firms should also encourage customer participation in digital service co-creation through periodic needs assessments and personalized solutions for different segments. Finally, implementing digital evaluation mechanisms with integrated feedback tools is crucial to objectively assess service quality and guide continuous technological improvements.

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