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FACTORS AFFECTING DIGITAL TRANSFORMATION IN TOURISM ENTERPRISES: A CASE STUDY IN PHU THO PROVINCE

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Abstract
This study investigates the external environmental factors influencing digital transformation (DT) among tourism enterprises in Phu Tho province, Vietnam. Drawing on the Technology–Organization–Environment (TOE) framework, it examines five key variables: technological infrastructure, legal-policy environment, customer demand, competitive pressure, and economic environment. Data collected from 290 respondents across local tourism businesses were analyzed using SPSS 22.0. The findings reveal that all five factors significantly affect digital transformation performance, with technological infrastructure exerting the strongest impact. The study offers practical implications for enhancing DT readiness and provides a contextualized understanding of transformation dynamics in provincial tourism enterprises.
Keywords: *Digital transformation, TOE, Tourism enterprises, Phu Tho*

1. Introduction

Digital transformation (DT) has become a defining trend across industries, yet its significance is particularly pronounced in tourism—a sector inherently dependent on information flow, customer experience, and service quality. Unlike conventional technological adoption, DT entails a comprehensive restructuring of business processes, organizational culture, and customer interaction models. From a theoretical standpoint, the Technology – Organization - Environment (TOE) framework (Tornatzky & Fleischer, 1990) provides a robust lens for analyzing such transformation. While prior studies have largely emphasized technological readiness and organizational capability (Oliveira & Martins, 2011; Nguyen et al., 2021), there is increasing recognition that environmental factors, such as government policy, market competition, customer expectations, and socio-economic conditions, exert decisive influence over the pace and success of DT, especially in developing economies.

From a theoretical perspective, DT in tourism is not merely the digitalization of isolated services such as online booking or e-marketing. Instead, it represents a structural shift toward a digitally enabled ecosystem in which enterprises can harness data-driven insights, integrate artificial intelligence and Internet of Things (IoT) applications, and reconfigure customer journeys for

personalization and efficiency (Gretzel et al., 2015; Neuhofer et al., 2015). The TOE framework underscores that while technological and organizational determinants are critical, the environmental dimension often dictates the boundary conditions for transformation. In contexts where regulatory frameworks are inconsistent, infrastructure underdeveloped, and financial resources constrained, even technologically capable firms may encounter barriers to digital integration. Thus, advancing knowledge about how environmental forces shape DT is essential for both theoretical refinement and practical policy design.

From a practical standpoint, the urgency of DT in the Vietnamese tourism sector, and in Phu Tho province in particular, is evident. Tourism has been identified as a strategic growth sector, with Phu Tho being a culturally rich province and home to UNESCO-recognized intangible heritage such as the Hung Kings' Temple Festival and Xoan singing. In recent years, Phu Tho has witnessed a steady increase in visitor arrivals, with over **9 million tourists in 2023**, generating an estimated **7,000 billion VND in revenue (**Phu Tho Department of Culture, Sports and Tourism, 2023). The province currently hosts over **350 tourism-related enterprises and service providers,** the majority of which are small and medium-sized enterprises. These businesses contribute significantly to local employment, with the sector engaging 10 thousand workers, particularly women and young people. However, despite this potential, digital adoption remains uneven. Many firms continue to rely on traditional business models, with limited use of integrated booking systems, customer relationship management platforms, or data analytics. The COVID-19 pandemic further exposed these vulnerabilities, as enterprises with low digital readiness struggled to maintain market presence, while digitally agile firms were able to sustain operations through online platforms and virtual services.

At the provincial level, the government has introduced policies to encourage DT, aligning with Vietnam's national digital economy agenda under the "National Digital Transformation Program to 2025, orientation to 2030." Yet, challenges remain: broadband infrastructure is insufficient in some rural tourist destinations, legal frameworks for digital business practices are not consistently enforced, and SMEs often lack both financial resources and digital skills. Moreover, customer expectations are rapidly evolving. With the widespread use of smartphones and social media, tourists increasingly demand mobile-friendly platforms, real-time interaction, cashless payment, and personalized digital experiences. Failing to respond to these expectations risks eroding competitiveness, particularly as neighboring provinces (such as Hanoi or Ninh Binh) are advancing more aggressively in tourism digitalization.

In this context, examining the external environmental factors affecting DT in Phu Tho's tourism enterprises is both theoretically relevant and practically urgent. Theoretically, it contributes to refining the TOE framework by highlighting the role of contextual variables in a provincial tourism economy of a developing country. Practically, it provides evidence-based insights for local policymakers, tourism associations, and business leaders to design supportive strategies that enhance digital readiness, reduce barriers to adoption, and foster sustainable competitiveness. By analyzing how infrastructure, policy environment, customer demand, competitive pressure, and

economic conditions shape DT, this study seeks to fill a critical research gap and offer actionable recommendations tailored to the unique characteristics of tourism enterprises in Phu Tho province.

2. Literature Review

2.1. Concept of Digital Transformation

Digital transformation has emerged as a central theme in contemporary management and tourism studies, reflecting the profound restructuring of business models under the influence of digital technologies. According to Gretzel, Sigala, Xiang, and Koo (2015), DT in tourism should not be reduced to the adoption of single technological tools such as online booking platforms, social media marketing, or mobile applications. Instead, it represents a holistic and strategic shift in the way organizations create value, manage resources, and interact with stakeholders. In this sense, DT encompasses a reconfiguration of organizational culture, decision-making processes, and customer experiences toward a data-driven and digitally enabled ecosystem.

From a theoretical perspective, the TOE framework proposed by Tornatzky and Fleischer (1990) remains one of the most widely used models to examine innovation adoption. The framework suggests that DT is influenced simultaneously by technological readiness, organizational capability, and environmental conditions. While technological and organizational determinants, such as IT infrastructure, leadership commitment, and employee skills, have been extensively studied (Oliveira & Martins, 2011; Nguyen, Pham, & Tran, 2021), the environmental dimension is equally critical. Government policies, competitive pressures, customer digital literacy, and the broader socio-economic context often determine whether digital initiatives can be successfully implemented and sustained (Baker, 2012; Zhu & Kraemer, 2005).

Thus, DT should be conceptualized not as a discrete technological upgrade but as a systemic process of transformation in which technology, organizational practices, and environmental dynamics converge to reshape the tourism ecosystem. This multidimensional understanding is particularly relevant for developing countries such as Vietnam, where institutional frameworks, infrastructure, and market readiness present unique opportunities and constraints (Doan & Le, 2020).

2.2. The Role of Digital Transformation in Tourism Development

The tourism industry is one of the most information-intensive sectors of the global economy. Service delivery, customer experience, and competitiveness increasingly depend on the capacity of enterprises to integrate digital technologies into their operations. Neuhofer, Buhalis, and Ladkin (2015) highlight that DT enables tourism providers to design personalized, interactive, and immersive experiences for travelers, thereby enhancing satisfaction and loyalty. Smart technologies, such as artificial intelligence, big data analytics, and the Internet of Things, allow firms to predict customer preferences, optimize resource allocation, and improve service efficiency.

The role of DT in tourism development can be examined from multiple perspectives. First, DT fosters **value creation and competitiveness**. By adopting digital booking systems, virtual tours, and online marketing, enterprises can expand their reach, reduce transaction costs, and strengthen brand presence in an increasingly competitive marketplace (Gretzel et al., 2015).

Second, DT enhances **resilience and adaptability**. As evidenced during the COVID-19 pandemic, firms with higher levels of digital readiness were better equipped to sustain operations through online channels, remote customer engagement, and contactless services (UNWTO, 2021).

Third, DT contributes to **sustainable growth.** Digital tools facilitate better data management, real-time monitoring, and informed decision-making, which help local authorities and businesses optimize tourism flows, preserve cultural heritage, and mitigate negative environmental impacts (Bwalya & Mutula, 2016).

In summary, the literature confirms that DT is both a conceptual and practical transformation that redefines the structure of tourism enterprises and the competitiveness of destinations. It functions not only as a tool for efficiency but as a strategic enabler of innovation, resilience, and sustainability. These insights provide the theoretical grounding for examining the external environmental factors that shape DT adoption among tourism enterprises in Phu Tho province.

3. Hypotheses

Based on the works of Tornatzky and Fleischer (1990), along with contextual adaptations from Zhu and Kraemer (2005), this study identifies five key variables hypothesized to influence the level and success of digital transformation among tourism businesses. These variables include the economic environment, competitive pressure, technological infrastructure, legal and policy environment, and customer demand. The economic environment (EE) encompasses macroeconomic stability, access to financial resources, and tourism-related investments that can either facilitate or hinder DT. Competitive pressure (CP) is defined as the extent to which rival firms adopt digital innovations, creating pressure to conform for fear of being left behind. Technological infrastructure (TI), such as broadband availability and digital platform accessibility, is fundamental for enabling online services and internal digital processes (Oliveira & Martins, 2011). Equally critical is the legal-policy environment (LP), including the presence of digital strategies, incentives, and regulatory clarity. When policies support innovation, businesses are more likely to embrace digital tools. Customer demand (CD) for digital services, such as online booking, virtual experiences, and digital payment, further drives adoption. From this theoretical grounding, the study proposes the following hypotheses:

H1: The economic environment has a positive impact on digital transformation

H2: Competitive pressure has a positive impact on the digital transformation process.

H3: Technological infrastructure has a positive impact on digital transformation.

H4: The legal policy environment has a positive impact on digital transformation.

H5: Customer demand has a positive impact on digital transformation.

4. Research Methodology

To explore the impact of external environmental factors on digital transformation within tourism enterprises in Phu Tho province, the study adopts a quantitative research design with a deductive reasoning approach. The questionnaire was designed regarding prior validated scales in the literature, particularly those adapted to the Vietnamese context (Nguyen et al., 2021; Doan & Le, 2020). Each variable in the model is measured using multiple indicators, framed as statements on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). A non-

probability convenience sampling technique was employed with the owners, managers, or digital operations staff of tourism service providers in Phu Tho province.

A total of 300 questionnaires were distributed directly and via email. After eliminating incomplete and invalid responses, 290 usable responses were retained for analysis, exceeding the minimum threshold for multivariate techniques ($n \geq 5$ to 10 observations per variable) (Tabachnick and Fidell, 2007). Data analysis was conducted using SPSS 22.0 software. The analytical procedures include the following steps: Reliability Analysis, where Cronbach's Alpha was used to assess the internal consistency of the constructs. Variables with Alpha values above 0.6 and item-total correlations above 0.3 were considered reliable (Hair et al., 2010). Exploratory Factor Analysis (EFA): EFA was conducted to assess the construct validity of the measurement items. Kaiser-Meyer-Olkin (KMO) values above 0.5 and significant Bartlett's tests ($p < 0.05$) were required to proceed. Factor loadings ≥ 0.5 were retained. Multiple Linear Regression Analysis: To test the hypotheses and evaluate the influence of independent variables on DT, a multiple regression model was estimated. Multicollinearity was checked using the Variance Inflation Factor (VIF < 2) to ensure the robustness of estimates. Significance was assessed at $p < 0.05$.

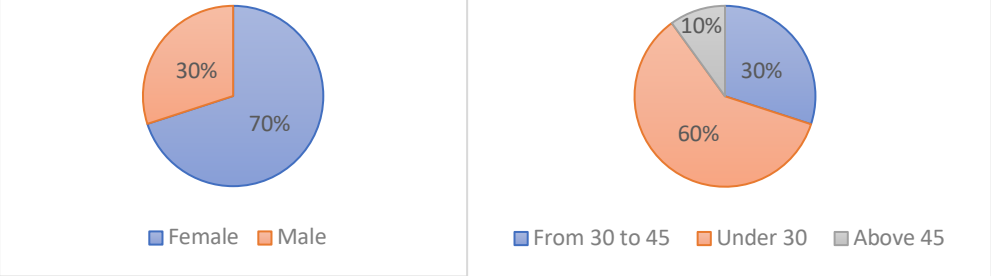
5. Research Results and Discussion

5.1. Demographic Profile of Respondents

Among the 290 valid responses, the gender distribution indicates that male respondents accounted for 30% (87 people), while females comprised 70% (203 people). In terms of age, 55% of respondents were between 30 and 45 years old (87 people), 25% were under 30 (174 people), and 20% (29 people) were over 45. This suggests that a substantial proportion of participants are in their most productive working years, aligning with the age profile of decision-makers in local tourism enterprises.

Chart 1: Gender and Age distribution

Source: The author collected, processed, and analyzed 2025



Regarding education, 50% of the respondents held a bachelor's degree, 35% had completed high school, and 15% had attained postgraduate qualifications. These figures reflect a moderate to high level of education, which is a positive indicator for the capacity to understand and apply digital transformation initiatives.

The majority of respondents were business managers, indicating a reliable source of information regarding strategic and technological decisions. Most businesses were small to medium-sized enterprises, with 25 employees and less than 10 years of operation, typical of the tourism sector in Phu Tho.

5.2. Reliability Testing

Cronbach's Alpha was employed to assess the internal consistency of each scale. All constructs achieved Alpha coefficients above the minimum threshold of 0.6, ranging from 0.785 (Economic Environment) to 0.864 (Technological Infrastructure), confirming acceptable reliability. Furthermore, all items showed corrected item-total correlations above 0.3, indicating that individual items were sufficiently correlated with their respective scales (Hair et al., 2010). As a result, no items were excluded from further analysis.

Table 1: Reliability Analysis (Cronbach's Alpha)

Construct	Cronbach's Alpha	Item-Total Correlation
Technological Infrastructure (TI)	0.864	0.631
Legal-Policy Environment (LP)	0.854	0.587
Customer Demand (CD)	0.823	0.562
Competitive Pressure (CP)	0.836	0.519
Economic Environment (EE)	0.785	0.591

Source: The author collected, processed, and analyzed 2025

5.2. Exploratory Factor Analysis (EFA)

The EFA was conducted using Principal Component Analysis with Varimax rotation. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy reached 0.832, exceeding the 0.5 threshold, and Bartlett's Test of Sphericity was statistically significant ($p < 0.05$), confirming the suitability of the data for factor analysis. The extracted solution explained 74.5% of the total variance across five components, aligning with the theoretical model.

Table 2: Exploratory Factor Analysis (EFA) Results

Factor	No. of Items	Average Factor Loading
Technological Infrastructure (TI)	5	0.778
Legal-Policy Environment (LP)	4	0.752
Customer Demand (CD)	4	0.721
Competitive Pressure (CP)	5	0.745
Economic Environment (EE)	5	0.682

Source: The author collected, processed, and analyzed 2025

All factor loadings exceeded 0.5, indicating that the observed variables strongly represent their respective latent constructs (Fabrigar & Wegener, 2011). Five factors: Technological Infrastructure (TI), Legal-Policy Environment (LP), Customer Demand (CD), Competitive Pressure (CP), and Economic Environment (EE) showed strong and coherent item groupings.

5.3. Multiple Linear Regression Analysis

To test the proposed hypotheses, a multiple regression analysis was performed with Digital Transformation as the dependent variable. The standardized beta coefficients revealed that Technological Infrastructure ($\beta = 0.342$, $p < 0.05$) exerted the strongest influence on DT, followed by Legal-Policy Environment ($\beta = 0.325$, $p < 0.05$), Customer Demand ($\beta = 0.321$, $p < 0.05$), Competitive Pressure ($\beta = 0.218$, $p < 0.05$), and Economic Environment ($\beta = 0.215$, $p < 0.05$).

Variance Inflation Factor (VIF) values ranged from 1.235 to 1.677, confirming no multicollinearity issues.

Table 3: Summary of Regression Analysis Results

Factor	Standardized Coefficient (Beta)	P-value	VIF
Technological Infrastructure (TI)	0.342	0.001	1.235
Legal-Policy Environment (LP)	0.325	0.001	1.342
Customer Demand (CD)	0.321	0.001	1.415
Competitive Pressure (CP)	0.218	0.000	1.534
Economic Environment (EE)	0.215	0.000	1.677

Source: The author collected, processed, and analyzed 2025

Based on the multiple regression analysis, the final model explaining the impact of external factors on digital transformation performance is as follows:

DT = 0.342*TI* + *0.325*LP + 0.321*CD* + *0.318*CP + 0.215EE + ε

Where: DT = Digital Transformation Performance; TI = Technological Infrastructure; LP = Legal-Policy Environment; CD = Customer Demand; CP = Competitive Pressure; EE = Economic Environment; ε = Error term

The overall model was significant at the 0.001 level ($F = 18.846$, $p < 0.001$), with an adjusted R-squared of 0.632, indicating that over 63.2% of the variance in DT can be explained by the five factors

5.4. Discussion of Results

The findings from the multiple regression analysis reveal that **technological infrastructure** is the most critical determinant of digital transformation among tourism enterprises in Phu Tho province. This result aligns with existing literature (e.g., Oliveira & Martins, 2011; Gretzel et al., 2015), which emphasizes that access to high-speed internet, digital platforms, and technical IT support are fundamental enablers of innovation and operational modernization. In the local context, broadband availability, stable telecommunications, and the integration of digital tools serve as the technological backbone for businesses to deploy online services, e-commerce platforms, and digital marketing solutions. The lack of adequate infrastructure could lead to disparities in technology adoption between firms, especially among small and medium-sized enterprises with limited resources.

Following closely, the **legal-policy environment** is identified as the second most influential factor. This finding underscores the importance of a coherent, transparent, and supportive institutional framework in driving digital innovation. Government policies, such as tax incentives for digital investment, simplified administrative procedures for business registration, and strict data privacy regulations, can reduce perceived risks and lower the barriers to digital adoption. In this sense, the role of the government is not merely that of a strategic planner but also a system designer that creates a favorable ecosystem for digital transformation.

Customer demand also exerts a substantial influence on the digitalization process, highlighting the growing expectations of tech-savvy tourists. Increasing reliance on mobile devices, online

booking, digital guides, and contactless services has made it imperative for tourism businesses to digitize the customer journey. This confirms that digital transformation is not simply a strategic decision but also a market-driven necessity in response to evolving consumer behaviors and preferences.

Competitive pressure is found to have a moderate yet statistically significant effect. This suggests that tourism businesses in Phu Tho are increasingly aware of digital trends and the competitive risks of technological lag. However, the relatively lower impact compared to other factors could indicate a cautious attitude toward adopting innovations, particularly among SMEs. These enterprises may lack the capacity, experience, or confidence to act as early adopters and instead choose to observe the outcomes of digital initiatives implemented by their peers before making investments.

Interestingly, the **economic environment** shows the weakest influence on digital transformation in this study. This may be due to the financial conservatism typical of SMEs, which often hesitate to invest heavily in uncertain or long-term digital projects despite recognizing their strategic relevance. Limited access to capital, perceived risks, and the absence of tailored financial instruments may further constrain their readiness to undertake digital initiatives.

It is also noteworthy that **socio-demographic and natural environmental variables** were excluded from the final model. This implies that these factors either do not exert a direct measurable impact in this specific context or their effects are indirectly captured through other variables such as customer behavior or technological accessibility. This finding diverges from studies conducted in disaster-prone or demographically dynamic regions, where such externalities are more pronounced. It reinforces the argument that digital transformation research must be context-sensitive, recognizing regional differences in institutional capacity, infrastructure development, and market maturity.

In summary, the results affirm the centrality of technological and institutional enablers in supporting digital transformation, while also highlighting the significant role of market demand and competitive dynamics. Conversely, financial limitations and contextual variables like demography or environment play a secondary role in this setting. These insights suggest that effective digital transformation strategies must be tailored to local conditions, balancing technological readiness with policy support and enterprise capabilities.

6. Managerial Implications

The empirical findings of this study offer important implications for policymakers, business leaders, and supporting institutions aiming to accelerate digital transformation in the tourism sector of Phu Tho province. Foremost, the prominent role of technological infrastructure underscores the need for continued investment in digital readiness. Local authorities should prioritize the development of broadband networks, expansion of public Wi-Fi in key tourist areas, and promotion of digital platforms integrated with emerging technologies such as artificial intelligence, Internet of Things, and cloud computing. These infrastructures are not only foundational for enabling online services and digital interaction but also represent a long-term strategic asset for building a competitive and resilient tourism ecosystem.

Equally important is the enhancement of the legal and institutional framework. Simplifying administrative procedures related to digital business registration, offering targeted tax incentives for digital investments, and strengthening data security and privacy regulations are critical steps to reduce perceived risks and administrative burdens for enterprises. These measures must be accompanied by practical support programs, particularly for small and medium-sized tourism enterprises, that provide training, technical assistance, and guidance in adopting and managing digital tools effectively. Such support should not be generic but tailored to the specific needs, capacities, and constraints of the tourism industry in the local context.

From a market perspective, customer expectations continue to evolve toward convenience, personalization, and real-time access to services. Tourism businesses must respond proactively by integrating digital technologies throughout the customer journey, including mobile-friendly websites, online booking platforms, virtual tour experiences, digital payment systems, and customer relationship management solutions. Meeting these expectations is no longer optional but a vital component of competitiveness in a digitally-driven service economy.

In addition, the influence of competitive pressure suggests that digital transformation must be approached not as a one-off investment, but as an ongoing process of adaptation and learning within a broader competitive landscape. Enterprises should engage in systematic benchmarking of their digital maturity relative to peers and explore cooperative mechanisms, such as digital innovation alliances or industry-wide technology hubs, that can reduce the cost and risk of transformation while enabling shared value creation. Destination management organizations, in particular, can act as intermediaries to coordinate and facilitate collective digital initiatives.

Although the economic environment was found to have a relatively modest impact, this does not diminish the need for accessible financial mechanisms. Local governments and financial institutions should consider developing dedicated funding instruments, such as preferential loans, innovation grants, or public-private partnership schemes, to support the digital upgrading of tourism enterprises, especially microenterprises that often lack collateral or financial planning capabilities.

In sum, the success of digital transformation in the tourism sector depends on the synchronized interaction of multiple factors: robust infrastructure, a supportive policy framework, responsive enterprise capabilities, and evolving customer demand. Only through a comprehensive, context-sensitive, and multi-level strategy can local tourism enterprises in Phu Tho navigate the complexities of digital transformation and leverage it for sustainable growth and competitive advantage.

7. Conclusion

This study examined the factors influencing digital transformation among tourism enterprises in Phu Tho province. Grounded in the TOE framework, five factors were found to significantly impact digital transformation performance: technological infrastructure, legal-policy environment, customer demand, competitive pressure, and economic environment. The results underscore the pivotal role of both enabling conditions (e.g., infrastructure, policy support) and external pressures (e.g., customer expectations, market competition) in driving digital change. The regression model

explained over 63.2% of the variance in transformation performance, with technological infrastructure emerging as the most influential factor.

These findings carry practical implications for policymakers and business leaders seeking to foster sustainable and inclusive digital transformation. A supportive environment, one that is technologically equipped, legally conducive, and customer-centric, is essential for tourism enterprises to thrive in the digital era.

Future studies could expand the current framework by incorporating internal organizational factors such as leadership, digital culture, and resource availability. Comparative research across different regions or tourism segments may also offer deeper insights into the dynamics of digital transformation in Vietnam and beyond.

Declaration of competing interest

The author declares that we have no known financial or non-financial competing interests in any material discussed in this paper.

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