Digitalization of Small and Medium-Sized Hotels in Vietnam: Interdependent Critical Factors

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Abstract

People responsible for managing digitalization must clarify the role of its critical factors. Many studies have already identified these factors, assuming that they are independent. These factors, however, are likely to interact since digitalization is a multi-stakeholder and multi-dimensional transformation. Ignoring their interactions is likely to cause biases in measurement and analysis. Therefore, this study explores the influential weight and interactions of the critical factors behind the digitalization of Vietnam's small and medium-sized hotels. According to the technology-organization-environment (TOE) framework, the results of a combined analytical hierarchy process (AHP) and the decision-making trial and evaluation laboratory (DEMATEL) analysis present four key findings: 1) technological context is a cause, but organizational context is an effect, while environmental context is neutral; 2) technological context has influence than others; 3) among the 12 critical factors identified, marketing benefits, financial resources, usage barriers, and cross-technology compatibility are the most important; and 4) marketing benefits, cross-technology compatibility, financial resources, organizational characteristics, and competitor pressure are causes. The findings show that contexts (factors) interact. Cause context (factor) directly and indirectly influences digitalization through other contexts (factors). In addition, there are no dominant contexts and factors. Accordingly, to be effective, digitalization needs to take all critical factors into account. Prioritizing the primary context (factors) and improving the core cause context (factors) are therefore appropriate.

Keywords: *Analytical Hierarchy Process (AHP), Decision-Making Trial and Evaluation Laboratory (DEMATEL), Factor Interactions, Small and Medium-Sized Hotel Digitalization, Technology-Organization-Environment (TOE) Framework.*

INTRODUCTION

Digitalization has transformed the socioeconomic landscape (European Commission, 2016; Ezzaouia & Bulchand-Gidumal, 2020; IDC-Cisco, 2020). It is also indispensable to an organization's sustainable development. Among the benefits of digitalization are customer relationship management, financial performance, learning and innovation, marketing benefits, and operations effectiveness (European Commission, 2016; IDC-Cisco, 2020; Lam & Law, 2019). However, market competitiveness will improve only if a firm digitalizes successfully. Identifying and prioritizing critical factors is therefore essential.

Digitalization is the use of digital technologies and data to create value for businesses (Gobble, 2018). It is inseparable from the acceptance and adoption of technology. Many studies (El-Gohary, 2012; Ezzaouia & Bulchand-Gidumal, 2020; Jia et al., 2017; Leung et al., 2015; Lin, 2017; Okumus et al., 2017; Wang et al., 2016) use theories and models of technology adoption such as the diffusion of innovation theory, technology acceptance model, or technology-organization-environment (TOE) framework to assess critical success factors. These studies treat critical factors as independent variables to ascertain whether or not the impact of these critical factors is significant. However, they should also have considered the importance of interactions among these factors to explain digitalization behaviors. Since digitalization is a multi-dimensional and multi-stakeholder transformation, critical factors most likely interact. Ignoring these interactions may introduce bias into measurement and analysis (Lin, 2021; Sara et al., 2015), resulting in unsuccessful digitalization.

Firms evolve with society, technology, and economy. Small and medium-sized businesses (SMBs) have less availability and less access to financial and technological resources than their larger counterparts. SMBs

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therefore need help with digitalization (Zaoui & Souissi, 2020). Around 400 million SMBs worldwide account for 95% of businesses and 60 to 70% of employment (National Action Plans on Business and Human Rights, 2017). They are the economic engines of most countries, especially developing economies. Although governments prioritize and support SMBs, digitalization constrains their development and growth (European Commission, 2016; IDC-Cisco, 2020).

Digital waves have transformed business operations, customer behavior, and market competition (Brunetti et al., 2020). These changes significantly affect the tourism and hospitality sectors that depend on business-consumer relationships, digital communications paths and platforms, and digital technologies (Gössling, 2020). Therefore, this study uses the TOE framework to evaluate the effects of critical success factors and their causal relationship to the digitalization of small and medium-sized hotels (SMH) in Vietnam. The results can clarify the critical role of technological, organizational, and environmental contexts and their critical factors in digitalization. Indeed, planning, organizing, leading, and controlling digitalization depends on the precise knowledge of the influence of and interaction among these factors. This knowledge is indispensable for digitalization management and research. Without clarifying the role of critical success factors, SMHs might not be able to maximize the social and economic benefits of digitalization.

LITERATURE REVIEW

The Status of Business Digitalization in Vietnam

According to IDC-Cisco (2020), 84% of SMBs in 14 Asia Pacific economies need help to digitalize their businesses. Approximately 31% of these businesses have paid little attention to digitalization. Only 16% of SMBs have overcome their challenges with digitalization. Singapore, Japan, New Zealand, and Australia lead the digital competition, followed by Mainland China, South Korea, Taiwan, Hong Kong, India, Thailand, Malaysia, Philippines, Indonesia, and Vietnam. Vietnam placed last. Its SMBs represent approximately 97% of all businesses and contribute over 50% of Vietnam's GDP (Hoa & Tuyen, 2021). So far, over 57.5% of Vietnamese SMBs struggle with digital transformation (Vietnam Investment Review, 2021). How will they respond to this challenge?

The main challenges of SMB digitalization in Vietnam are the lack of a digital mindset, roadmap, and enabling technologies (IDC-CISCO, 2020). Digital transformation is vital for Vietnam's sustainable development (Truong & Van My, 2023). The Vietnamese government thus has implemented a national digital transformation program until 2025 (Dung & Tri, 2021; IDC-Cisco, 2020; World Bank, 2022). These government initiatives are driving the digitalization of tourism. The spread of digital technology and data use has improved operations efficiency and tourist satisfaction (Phuong, 2022). For example, Agoda and Booking.com have made accommodations, flights, and other travel services easily accessible. Social media campaigns and search engine optimization have promoted tourism destinations and attracted tourists (Van Tuan et al., 2021; Vossen, 2014). Digital payment systems, such as mobile wallets and online payment gateways, have met tourists' payment needs. Indeed, the integration of digital technologies into business models, strategies, and innovation has contributed to the survival and success of tourism businesses. However, Vietnam urgently needs to invest in upgrading information technology hardware, cloud, and information security (IDC-Cisco, 2020; World Bank, 2022).

Vietnam's hospitality businesses have been positively affected by the digital wave. They have adopted mobile apps, guest feedback systems, social networks, and other digital technologies to meet customers' needs and improve operational effectiveness (Binh & Phuong, 2020). Although these instruments help to secure market share or improve market growth, compared with large hotels, SMHs need more technological and financial resources to digitalize their businesses. SMBs are most countries' economic engines, particularly in developing economies. Because of the essential contributions made by SMBs, governments worldwide prioritize their development (European Commission, 2016). However, digitalization is the main constraint on SMB growth (IDC-Cisco, 2020). The digital wave has transformed customer behavior, commercial operations, and customer-business relationships. Tourism businesses rely on customer-business relationships, digital channels,

and digital technologies (Gössling, 2020), especially hotels. This study thus evaluates the influence and interactions of critical factors behind SMH digitalization in Vietnam.

The Technology –Organization – Environmental Framework

The technology-organization-environment (TOE) framework developed by Tornatzky et al. (1990) explains technology acceptance and adoption. It has three contexts: technological (internal and external), organizational (scope, size, and managerial structure), and environmental (industry, competitors, and governments) (Molinillo & Japutra, 2017). Each context is closely associated with other technology adoption theories and models. Technological context (TC) is related to the *perceived feature of innovation* in the diffusion of innovation theory and the *perceived ease of use* and *usefulness* of the technology acceptance model. Organizational context (OC) is consistent with the *organizational attributes* of the diffusion of innovation theory, and environmental context (EC) is relevant to the *social system* in the diffusion of innovation theory and the *institutional influence* of institutional theory. The TOE framework is used to identify the critical determinants of technology adoption, including blockchain adoption in the maritime industry (Lin, 2023), hotels' adoption of mobile reservation systems (Wang et al., 2016), big data adoption (Park & Kim, 2021), and the adoption of other technologies (Chiao et al., 2018; Roth-Cohen & Lahav, 2019). This framework is appropriate for examining the internal and external organizational drivers of technology adoption. Therefore, this study uses the TOE framework to assess the influence and interactions of critical factors driving SMH digitalization.

Critical Success Factors

The critical factor is useful in evaluating the performance of information systems(Rockart, 1979). Previous studies have shown that identifying three to six critical organizational factors is essential to an organization's management and development in a competitive environment (Boynton & Zmud, 1984; Butler & Fitzgerald, 1999; Rockart, 1979). This knowledge helps managers to make optimal planning, organizing, leading, and controlling decisions (Butler & Fitzgerald, 1999). For example, Critical factor identification clarifies the benefits and obstacles in business-to-consumer e-business adoption (Dubelaar et al., 2005) and business digitalization (K. Chen & Yung, 2004; Wu & Chang, 2006).

Critical Technological Factors

According to the TOE framework, an organization's technological factors (Figure 1) comprise the characteristics of its internal and external technology (Kuan & Chau, 2001; Oliveira et al., 2014; Tornatzky et al., 1990). Previous studies have identified several technological factors that contribute to digitalization, including cross-technology compatibility, marketing benefits, operational efficiency, and usage barriers (Ezzaouia & Bulchand-Gidumal, 2020; Jia et al., 2017; Lam & Law, 2019; Leung et al., 2015). Marketing benefits are the most influential drivers of business digitalization (Rahayu & Day, 2017). Digital advertising and promoting bring significant cost savings and increase customer engagement by shortening the distance between businesses and their current and future customers (Garrido-Moreno et al., 2015). For example, social media channels such as Facebook, Instagram, and YouTube are far more effective than traditional marketing methods (Garrido-Moreno et al., 2015; Racherla & Hu, 2008).

Digital technologies can help businesses to optimize organizational resources such as capital, employees, equipment, and inventory to increase employee productivity, reduce operating costs and expenses, and improve customer relationship management (El-Gohary, 2012). Digitalization is thus capable of enabling businesses to be agile and more profitable by improving operational efficiency. Accordingly, managers can digitalize their businesses to improve operational efficiency (Ezzaouia & Bulchand-Gidumal, 2020; Garrido-Moreno et al., 2015; Rogers, 2010). However, introducing digitalization may cause usage barriers when technologies conflict with users' tools, habits, and workflow. These barriers are related to the *perceived ease of use* defined by the technology acceptance model (Davis, 1989). In addition, digitalization may create a variety of risks, including cyberattacks, data breaches, information security, technology failures, and transaction risks (Davis, 1989; El-Gohary, 2012; Khanra et al., 2021).

Cross-technology compatibility is another critical technological factor. It unifies technologies inside and outside the business (Leung et al., 2015). As unified connections are created, existing and emerging technologies will contribute to more marketing benefits and operational efficiency and improve organizational models and strategy (Wang et al., 2010). Indeed, the unified connection helps businesses to optimize their operations and management, which ensures competitive advantages in an evolving market (Wang et al., 2010). Therefore, technology compatibility is crucial in shaping the initial and ongoing digitalization process and performance (Leung et al., 2015; Racherla & Hu, 2008).

Critical Organizational Factors

The organizational context is important in enabling digitalization (Kuan & Chau, 2001). Digitalization affects a business's resource allocation, decision-making, organizational structure, operations, and management. Accordingly, this context comprises several critical organizational factors that affect digitalization, such as financial resources, organizational characteristics, digital skills and talent, and top management support. Effective digitalization depends on the availability of resources (Ezzaouia & Bulchand-Gidumal, 2020). Financial resources are essential to the deployment of hotel information technology (Okumus et al., 2017). Lower digitalization costs also increase the likelihood of hotel technology acceptance (R. Leung & Law, 2013). Similarly, the cost of digitalization is a significant barrier for SMHs (Leung et al., 2015; Racherla & Hu, 2008).

Digital skills and talent are critical in implementing customer-oriented digital transformation in enterprises (Abdullah et al., 2018; von Leipzig et al., 2017). Conflicts between hotel owners and managers and resistance to change significantly affect e-procurement adoption in Hong Kong's hotel industry (Au et al., 2014; von Leipzig et al., 2017). This evidence suggests the importance of digital skills and mindset for hotels' internal stakeholders. To reap the benefits of digitalization, firms need to strengthen their digital education and training to adopt digital technologies.

The vision and support of top management are also crucial for successful digitalization. Top management can shape organizational digitalization. Previous studies have shown that top management support is a critical factor in the success of business-to-customer electronic commerce in travel agencies (Lin, 2017), internet-based information systems (Lee & Kim, 2007; D. Leung et al., 2011), and the initial and continued adoption of ICT of hotels (Leung et al., 2011). Accordingly, top management support is indispensable in shaping an organization's digitalization strategy and prioritizing digital initiatives. In addition, organizational characteristics, such as size, scope, culture, and location, are significant in technology adaption and digitalization (Jia et al., 2017; Wang et al., 2016). For example, hotel size is significantly and positively related to the adoption of mobile hotel reservation systems in Taiwan (Wang et al., 2016) and Spanish hotel websites (Escobar-Rodríguez & Carvajal-Trujillo, 2013).
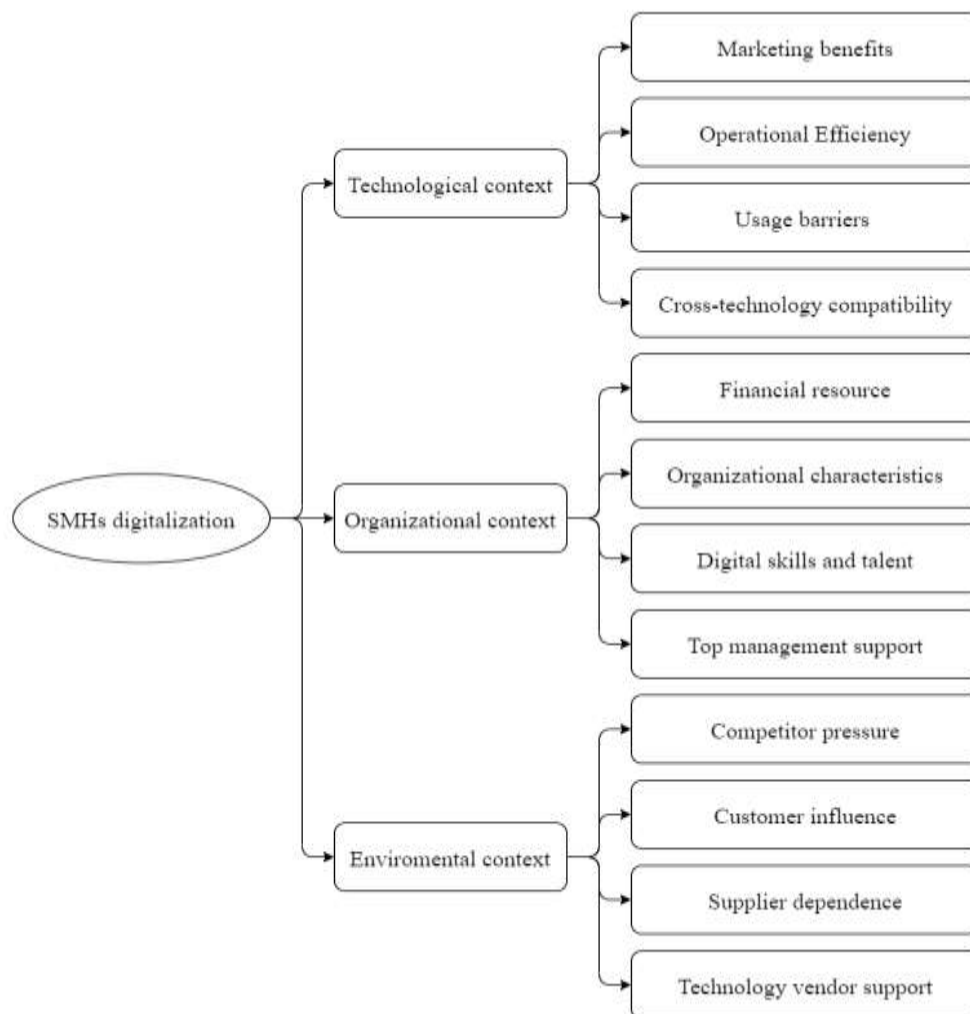
Figure 1. The conceptual framework based on TOE

Critical Environmental Factors

An organization's environment shapes its development and management. Environmental factors, such as market conditions, competitive landscape, governmental regulations and laws, and customer preferences, all influence a business's ability to innovate and thrive in the marketplace. Previous studies show the importance of environmental factors in affecting a business's digitalization decisions, strategies, and effectiveness (Bigné et al., 2008; Kuan & Chau, 2001; Lin, 2017; Oliveira et al., 2014; Tornatzky et al., 1990). Competitor pressure, customer influence, government actions and policies, supplier dependence, and technology vendor support collectively shape the environment in which hotels operate and digitalize. Competitor pressure drives business digitalization (Chen et al., 2016; Ghobakhloo et al., 2011; Wang et al., 2010). To secure market share or enhance market growth, hotels increasingly adopt technologies or digitalize their businesses to reduce costs, increase their operational efficiency, and improve marketing performance (Escobar-Rodríguez & Carvajal-Trujillo, 2013; Ezzaouia & Bulchand-Gidumal, 2020; Leung et al., 2015; Lam & Law, 2019; Wang & Qualls, 2007).

Customers exert significant influence on hotel digitalization. As customers rely on technologies to plan and book travel, tourism businesses must voluntarily or involuntarily digitalize their operations to meet customer expectations, behaviors, and needs (El-Gohary, 2012; von Leipzig et al., 2017). Likewise, supplier dependence is an essential driver of business digitalization to reduce costs and reap the benefits of supply chain management (Ezzaouia & Bulchand-Gidumal, 2020; Karadag et al., 2009; Leung et al., 2015; von Leipzig et al., 2017). In

addition, businesses need the right partners with the right technologies and expertise to help them overcome the problems caused by digitalization (Brunetti et al., 2020; Chen et al., 2016; Ghobakhloo et al., 2011; Okumus et al., 2017; Tam & Tummala, 2001). The need highlights the importance of technology vendor support, especially for SMHs with limited technological and financial resources. In short, digitalization allows businesses to form collaborative relationships with customers, governments, suppliers, and technology vendors. By doing so, businesses can navigate the evolving digital market and meet the changing needs of their stakeholders and outperform their competitors (Table 1).

Table 1. The critical factors behind effective SMH Digitalization

Context	Critical factor	Reference
Technological context (TC)	Marketing benefits (TC_1)	Ezzaouia and Bulchand-Gidumal (2020); Garrido-Moreno et al. (2015); Rahayu and Day (2017).
	Operational efficiency (TC_2)	Ezzaouia and Bulchand-Gidumal (2020); El-Gohary (2012); Khanra et al. (2021); Wang et al. (2016).
	Usage barriers (TC_3)	El-Gohary (2012); Davis (1989); Khanra et al. (2021); Leung et al. (2015); Rogers (2010).
	Cross-technology compatibility (TC_4)	Davis (1989); El-Gohary (2012); Leung et al. (2015); Molinillo and Japutra (2017); Wang et al. (2010).
Organizational context (OC)	Financial resource (OC_1)	Ezzaouia and Bulchand-Gidumal (2020); Okumus et al. (2017); Racherla and Hu (2008).
	Organizational characteristics (OC_2)	Escobar-Rodríguez and Carvajal-Trujillo (2013); Ezzaouia and Bulchand-Gidumal (2020); Jia et al. (2017).
	Digital skills and talent (OC_3)	Au et al. (2014); Molinillo and Japutra (2017); Racherla and Hu (2008); von Leipzig et al. (2017).
	Top management support (OC_4)	El-Gohary (2012); Leung et al. (2015); Lian et al. (2014); Lin (2017); Racherla and Hu (2008).
Environmental context (EC)	Competitor pressure (EC_1)	Y. Chen et al. (2016); Jia et al. (2017); Lin (2017); Wang et al. (2010); Y. Wang and Qualls (2007).
	Customer influence (EC_2)	Y. Chen et al. (2016); Ezzaouia and Bulchand-Gidumal (2020); El-Gohary (2012); Lin (2017).
	Supplier dependence (EC_3)	Ezzaouia and Bulchand-Gidumal (2020); Iacovou et al. (1995); Zhang and Dhaliwal (2009).
	Technology vendor support (EC_4)	Brunetti et al. (2020); Ghobakhloo et al., 2011; Okumus et al. (2017); Tam and Tummala (2001).

RESEARCH METHODOLOGY

Many studies (Dubelaar et al., 2005; El-Gohary, 2012; Ezzaouia & Bulchand-Gidumal, 2020; Khanra et al., 2021; Lee & Kim, 2007; Lian et al., 2014; Park & Kim, 2021; Wang et al., 2016; Zhang & Dhaliwal, 2009) have examined the critical factors driving effective technology adoption and digitalization. They typically use Likert-type questionnaires, regression, and structural equation modeling to test the relationships. These traditional measurement and analysis techniques treat the factors as independent variables. Ignoring the possible interactions may cause biased measurement and analysis. In addition, several researchers (Lee et al., 2012; Lin, 2017) have used Analytical Hierarchy Process (AHP) and Analytical Network Process (ANP) to evaluate and prioritize the influence of critical factors. However, these methods do not identify factor interdependence. Another multi-criteria decision-making method (MCDM), the Decision Making Trial and Evaluation Laboratory (DEMATEL), can help to identify critical factors' cause-effect relationships (Gabus & Fontela, 1976). This study thus uses a combined AHP and DEMATEL method to assess the influence and causal relationship of critical factors driving effective SMH digitalization.

The AHP Method

The AHP method developed by Saaty (1991) streamlines complex and unstructured decision-making problems into a concise linear hierarchical structure. It helps to identify essential criteria behind a decision and reach a group consensus. Its main steps are summarized as follows (Chang, 1992; Saaty, 1991).

Step 1. State the goal and construct the decision-making hierarchy. This study evaluates the critical factors for successful SMH digitalization. According to a literature review, expert judgments, and Delphi analysis results, critical factors are identified and used to construct the decision-making system.

Step 2. Construct the reciprocal pairwise comparison matrices. Based on Saaty's 9-point scale from 1 (equal importance) to 9 (extreme importance), group experts recruited are asked to compare the influence of each critical factor with others. Next, expert responses are used to assemble the pairwise comparison matrix G for calculating the relative importance of each factor on digitalization.

$$G = [g_{ij}]_{n \times n} = \begin{bmatrix} 1 & g_{12} & \cdots & g_{1n} \\ 1/g_{12} & 1 & \cdots & g_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/g_{1n} & 1/g_{2n} & \cdots & 1 \end{bmatrix} \tag{1}$$

where g_{ij} is a positive element of matrix G, $i, j = 1, 2, ..., n$, and n is the number of critical factors.

Step 3. Calculate the relative importance of each factor. According to the pairwise comparison matrix G, its eigenvalue (W_i) is calculated by normalizing the geometric mean of the rows to derive the relative importance of all critical factors.

$$W_i = (\prod_{j=1}^{n} g_{ij})^{\frac{1}{n}} (\sum_{i=1}^{n} (\prod_{j=1}^{n} g_{ij})^{\frac{1}{n}})^{-1} \tag{2}$$

Step 4. Check the consistency ratio (CR). A consistency test is examined to test whether the pairwise comparison matrix is consistent.

$$CI = (\lambda_{max} - n)(n - 1)^{-1} \tag{3a}$$

$$CR = CI \times (RI)^{-1} \tag{3b}$$

where CI is the consistency index, λ_{max} represents the maximum eigenvalue, and RI denotes the random consistency index. If $CR \leq 0.1$, the pairwise comparison matrix is consistent (Fontela & Gabus, 1976; Sara et al., 2015). Otherwise, the consistency ratio is not acceptable.

The DEMATEL Method

The DEMATEL method developed by Gabus & Fontela (1976) is suitable for evaluating the cause-effect relationships among criteria of complex decision problems. It helps to classify the criteria into cause-and-effect groups. Its main steps are described as follows (Fontela & Gabus, 1976; Sara et al., 2015).

Step 1: Derive the initial average matrix Y. A group of *m* experts are asked to assess the causal relationship between two factors (i.e., pairwise comparisons) of *n* factors based on a scale from 0 (*no influence*) to 4 (*very high influence*). Matrix Y is then derived by aggregating the judgment of group experts.

$$Y = \sum_{t=1}^{m} X^t / m = [y_{ij}]_{n \times n} \tag{4}$$

where X^t is the direct matrix judged by the tth ($t = 1, 2, ..., m$) respondent, y_{ij} is an element of matrix Y, and $y_{ij} \geq 0$.

Step 2. Compute the normalized direct influence matrix D. Matrix D is defined by normalizing the initial average matrix Y.

$$D = Y \times S \tag{5a}$$

$$S = (\max_{1 \le i \le n} \sum\nolimits_{j=1}^{n} y_{ij})^{-1} \tag{5b}$$

Step 3. Compute the total relation matrix T. Matrix T can be derived as:

$$T = D(I - D)^{-1} = [t_{ij}] \tag{6}$$

where I is an $n \times n$ identity matrix. This matrix reveals direct and indirect influences between each pair of factors.

Step 4: Construct the causal relationship map. Matrix T can be used to identify the cause-effect relationships of factors. The sum of rows (r) and columns (c) of matrix T can be calculated as follows.

$$r = \sum\nolimits_{j=1}^{n} t_{ij} \tag{7a}$$

$$c = \sum\nolimits_{i=1}^{n} t_{ij} \tag{7b}$$

The values of $r_i + c_i$ and $r_i - c_i$ represents the influential intensity and direction of factor i, respectively. If $r_i - c_i < 0$, factor i belongs to the effect group, otherwise factor i is a cause if $r_i - c_i > 0$. According to the $(r+c, r-c)$ values of factors, the cause-effect relationship map can be drawn. To summarize, the analysis framework is shown in Figure 2.
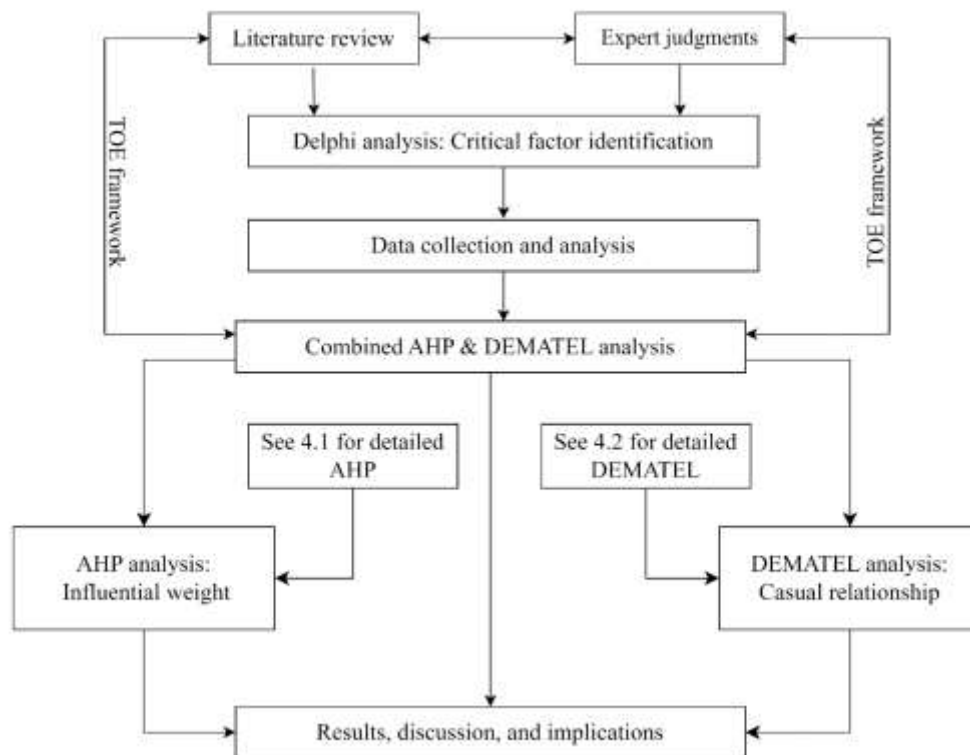

Figure 2. The analysis framework

EMPIRICAL STUDY AND RESULTS

Critical Factors and Research Data

Literature review, expert judgment, and preliminary tests are suitable instruments to arrive at a valid criteria consensus in MCDM analysis (Lee & Yang, 2018). After a literature review and expert judgment, the Delphi technique is used to identify the critical factors behind SMH digitalization. Ten experts in hotel digitalization were recruited. Through three rounds of structured communication, the group reached a consensus that identified 12 critical factors within technological, organizational, and environmental contexts (Table 1). Next, the conceptual hierarchy of critical factors (Figure 1) was constructed and used to design the questionnaire for the combined AHP and DEMATEL analyses.

A panel of more than ten experts is acceptable for MCDM analysis (Lee & Yang, 2018). As this study evaluates the influence and causal relationship of critical factors driving SMH digitalization, experts were recruited from governments, hotels, hotel suppliers, technology vendors, tourism associations, and travel agencies. After several contacts, 36 experts were recruited to participate in the survey. Their profiles are shown in Table 2.

Table 2. The profile of group experts.

Characteristics of experts		Number of experts	Percentage
Age	21- 30	1	2.78%
	31-40	4	11.11%
	41-50	20	55.56%
	51-60	7	19.44%
	Over 61	4	11.11%
	Total	36	100.00%
Gender	Female	10	27.78%
	Male	26	72.22%
	Total	36	100.00%
Education	High school	1	2.78%
	Bachelor	15	41.67%
	Master	13	36.11%
	PhD	7	19.44%
	Total	36	100.00%
Experience	1-5	1	2.78%
	6-10	2	5.56%
	11-15	8	22.22%
	16-20	15	41.67%
	Over 21	10	27.77%
	Total	36	100.00%
Stakeholder	Technology vendors	6	16.67%
	Hotels	10	27.78%
	Travel agency	5	13.89%
	Provincial governments	3	8.33%
	Academics	8	22.22%
	Hotel association	4	11.11%

	Total	36	100.00%
	General manager	10	27.78%
	Assistant general manager	5	13.89%
	Engineering manager	5	13.89%
Job title	Project manager	2	5.56%
	Scholars	8	22.22%
	Senior official	3	8.33%
	Consultant expert	3	8.33%
	Total	36	100.00%

AHP Analysis

AHP analysis helps to evaluate the importance of digitalization contexts and their critical factors. The results, presented in Table 3, show that technological context (0.385) is more important than both organizational (0.326) and environmental (0.298) contexts. Table 3 also shows that marketing benefits (0.129) have the highest influential weight, followed by financial resources (0.097), cross-technology compatibility (0.096), usage barriers (0.089), digital skills and talent (0.082), competitor pressure (0.076), customer influence (0.075), organizational characteristics (0.074), top management support (0.073), operational efficiency (0.071), supplier dependence (0.070), and technology vendor support (0.068). Moreover, this study sets a threshold point (0.083) calculated as the average influential weight of all critical factors to identify the primary factors: marketing benefits, financial resources, usage barriers, and cross-technology compatibility.

DEMATEL Analysis

DEMATEL analysis facilitates the identification of causal relationships of digitalization contexts and their critical factors. Table 4 shows that technological context is a cause as its $r - c$ value exceeds zero. Organizational context is an effect as its $r - c$ value is smaller than zero, while environmental context is neutral since its $r - c$ value is close to zero. Table 4 also reveals that marketing benefits, cross-technology compatibility, financial resource, organizational characteristics, and competitor pressure are causes among the 12 critical factors. Supplier dependence is neutral; the other six factors belong to the effect group.

DISCUSSION AND IMPLICATIONS

Discussion

This study finds that the technological context is more important than the organizational and environmental contexts. On the one hand, this finding contradicts previous evidence that environmental and organizational contexts outweigh the technological context for mobile technology adoption in Taiwan's travel agencies (Lin (2017). On the other hand, it is in line with the empirical evidence that technological-organizational influence outweighs environmental influence in explaining the innovation adaption behavior of SMEs in India (Nimawat & Gidwani, 2022). Taiwan has more technological and financial resources to fund digitalization and thus concentrates on organizational and environmental dimensions. In contrast, SMHs in developing countries like Vietnam need more technological resources than organizational and environmental support to digitize their businesses. In addition, the analysis results indicate that technological context has the highest influential weight (0.385), followed by organizational context (0.326) and environmental context (0.289). The evidence shows no dominant context, suggesting that all three contexts are necessary to digitalize SMHs in Vietnam. However, technological support is urgently needed to solve the digitalization problems of SMHs (World Bank, 2022).

Previous tourism and hospitality studies (El-Gohary, 2012; Lam & Law, 2019; Lin, 2017; von Leipzig et al., 2017) have identified the critical factors that drive digitalization. They treat these factors as independent variables. Since business digitalization is a multi-dimensional and multi-stakeholder transformation, these factors are likely to interact. Ignoring the likelihood of interactions is likely to result in biased measurements, analyses, policies, and implications. According to the results of DEMATEL analysis, digitalization contexts

(factors) interact. The causal relationship map (Figure 3) shows that technological context is a cause. Organizational context is an effect, and environmental context is neutral. Technological context influences hotel digitalization directly and indirectly through organizational and environmental contexts. Similarly, environmental context influences digitalization directly and indirectly through the other two contexts. Organizational context has no impact on other contexts. It only influences SMH digitalization. Accordingly, improving the technological context can achieve the long-term goals of SMH digitalization in Vietnam.
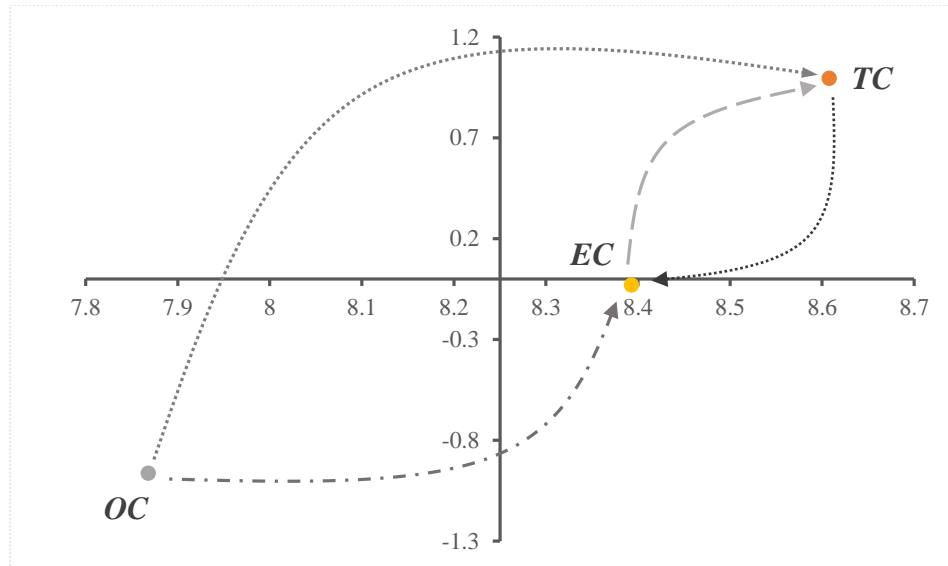

Figure 3. The cause-effect relationship of TOE contexts

Note: Technological context (TC), organizational context (OC), and environmental context (EC).

Technological context is the core cause and the most influential context. The finding indicates the essential role of technological context in hotel digitalization. Therefore, it is appropriate to prioritize the technology context to digitalize SMHs. Technological context has four influential factors: marketing benefits (0.129), cross-technology compatibility (0.097), usage barriers (0.089), and operational efficiency (0.071). They are ranked first, third, fourth, and tenth of the 12 critical factors. As shown in Figure 4a, marketing benefits are the core cause factor with the most influential factor that directly influences hotel digitalization and indirectly through other factors. These results suggest that SMH digitalization in Vietnam is driven by the desire to improve marketing competitiveness.
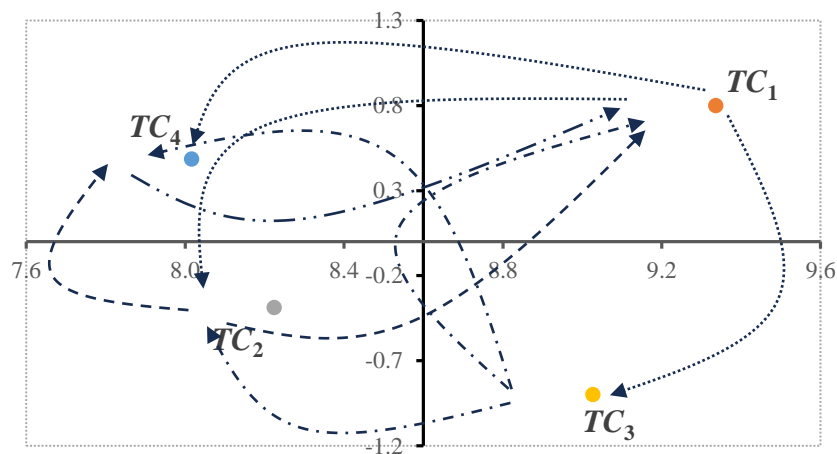

Figure 4a. The cause-effect relationship of technological factors

Organizational influences are the second important context. Its four influential factors, financial resources (0.097), digital skill and talent (0.082), organizational characteristics (0.074), and top management support (0.073), are ranked second, fifth, eighth, and ninth, respectively. As shown in Figure 4b, financial resources and organizational characteristics are causes that directly affect hotel digitalization and indirectly affect it through other factors. On the one hand, digital skills and talent and top management support belong to the effect group. On the other hand, financial resources and digital skills and talent have more influence than others. The results do not align with the empirical evidence (Lian et al., 2014; Rahayu & Day, 2017) that top management support is more influential than financial resources and organizational characteristics in shaping business digitalization. They also differ from previous findings that digital skills and talent mostly drove business digitalization of upscale and luxury-branded hotels in China, Singapore, and the Philippines (Lam & Law, 2019; Molinillo & Japutra, 2017). Since financial resources are the core cause with the highest influential weight in the organizational context, prioritizing the financial resources available to fund digitalization is the appropriate strategy to improve the effect of organizational context on SMH digitalization in Vietnam.
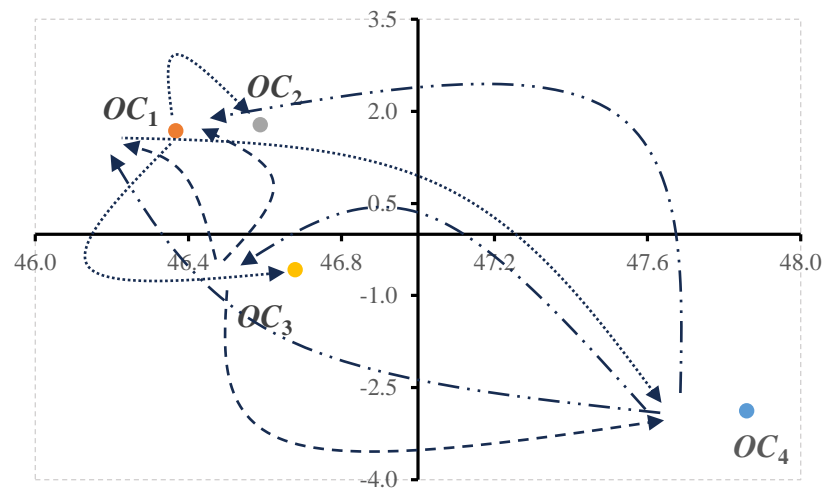

Figure 4b. The cause-effect relationship of organizational factors

Compared with technological and organizational contexts, environmental context is less influential. As shown in Table 3, competitor pressure (0.076), customer influence (0.075), supplier dependence (0.070), and technology vendor support (0.068) are ranked sixth, seventh, eleventh, and twelfth in influence weight, respectively. As shown in Figure 4c, competitor pressure is a cause. Supplier dependence is neutral, while customer influence and technology vendor support belong to the effect group. Competitor pressure is more influential than other environmental factors. These results differ from previous empirical evidence that consumer influence (Leung et al., 2015; Sima et al., 2020) or supplier dependence (Okumus et al., 2017; Yang et al., 2021) is the most influential factor in business digitalization. Market competition exerts more influence on hotel digitalization than other environmental factors. Therefore, competitor pressure is the core cause with a strong influence on business digitalization.
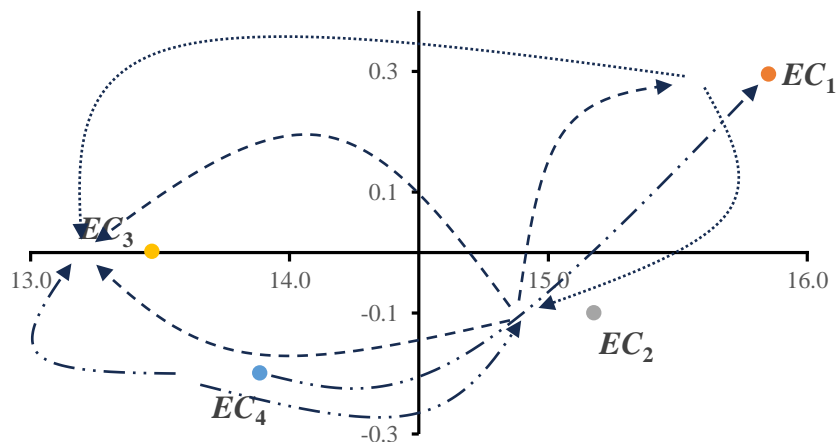
Figure 4c. The cause-effect relationship of environmental factors

Most studies identify the critical factors behind digitalization and technology adaptation to indicate whether or not these factors are significant. However, only a few researchers (Dholakia & Kshetri, 2004; Leung et al., 2015; Lin, 2017) have assessed the relative importance of these factors. Previous studies have assumed that these critical factors are independent. Since business digitalization is a multi-stakeholder and multi-dimensional transformation that affects and is affected by many influential factors, these factors interact. Considering these interactions is necessary to prevent errors in measurement and analysis. Policymakers, hoteliers, and researchers should consider the influence of and interactions among these factors in planning, organizing, leading, and controlling hotel digitalization.

Implications

After identifying the relative importance and interactions of the three contexts and their influential factors, prioritizing primary context and factors and strengthening the core causes emerge as the optimal way to enable digitalization. In this study, technological context and its critical factor, marketing benefits, are core causes with strong influence on SMH digitalization. SMHs in Vietnam hoping to digitalize their businesses should therefore adopt a technology-centric strategy that focuses on marketing benefits.

Table 3. The influential weight of contexts and critical factors

Context	Local weight	Critical Factors	Local weight	Global weight	Ranking
		Marketing benefits (TC_1)	0.336	0.129	1st
Technological context (TC)	0.385 (1st)	Operational efficiency (TC_2)	0.185	0.071	10th
		Usage barriers (TC_3)	0.230	0.089	4th
		Cross-technology compatibility (TC_4)	0.249	0.096	3rd
		Financial resource (OC_1)	0.295	0.097	2nd
Organizational context (OC)	0.326 (2nd)	Organizational characteristics (OC_2)	0.228	0.074	8th
		Digital skills and talent (OC_3)	0.253	0.082	5th
		Top management support (OC_4)	0.223	0.073	9th
	0.289 (3rd)	Competitor pressure (EC_1)	0.263	0.076	6th

Environmental context (EC)	Customer influence (EC_2)	0.259	0.075	7th
	Supplier dependence (EC_3)	0.242	0.070	11th
	Technology vendor support (EC_4)	0.236	0.068	12th

Hotel guests value the digital experience (Brochado et al., 2016). Furthermore, younger guests and business travelers consider the latest technologies essential (Brochado et al., 2016). Contemporary trends in hotel technology include artificial intelligence, big data analytics, cloud computing, flexible property management system, the Internet of Things, virtual reality and augmented reality (Cheng et al., 2023; Iranmanesh et al., 2022; Shiji Group, 2021). Compared with other trends in hotel technology, digital channels and online travel agents are suitable for SMHs to benefit more from their current marketing efforts. The reason is that digital channels and online travel agents are affordable and imperative in customers' decision-making (Roth-Cohen & Lahav, 2019; Virginia Phelan et al., 2013). Small and medium-sized businesses thus utilize them in their strategic marketing campaigns.

Hotels can also improve their marketing benefits by adopting other customer-centric technologies, such as an electronic customer relationship management system, to secure market share, expand the market, or improve customer satisfaction and loyalty (Garrido-Moreno et al., 2015; Racherla & Hu, 2008). These increased marketing benefits will motivate SMHs to accelerate their digitalization as marketing benefits are the most crucial driver of SMH digitalization. However, financial constraints are a formidable impediment to SMH digitalization. Governments can provide SMHs with financial and non-financial support. Specifically, based on business models and a targeted funding mix, digital support channels that make funding instruments easier for SMHs to find are appropriate instruments.

Marketing benefits, financial resources, cross-technology compatibility, usage barriers, and digital skills and talent are more important than other critical success factors in the current stage of SMH digitalization (Table 3). Governments can invest in digital infrastructures, education, and training through technology vendors (Hassan & Rahman, 2022). The investments will contribute to digital skills and talent, digital technology adoption, financial resources, marketing benefits, and operational efficiency by shortening the distance between hotels, customers, suppliers, governments, and technology vendors. The mutual benefits will link digitalization stakeholders and accelerate SMH digitalization.

This study also shows that SMH digitalization is significantly influenced by marketing benefits, competitor pressure, and customer influence, highlighting the central role of customers. Hotels can construct a frictionless guest-first approach to improve guest experience and satisfy their needs. Improving guest satisfaction is more important than the practicality of technology adoption (Shiji Group, 2021). Accordingly, hotels can digitalize their booking procedures, check-in/check-out, hotel information, room service, payment, and other guest services to replace touched items. Increased customer satisfaction will improve market competitiveness, sales revenue and profits, and customer-business relationships, encouraging hotels to accelerate digitalization.

CONCLUSION AND FUTURE RESEARCH

Hotel digitalization brings benefits in terms of a hotel's competitiveness, flexibility, financial performance, quality of service, resource utilization, and innovation (Iranmanesh et al., 2022). In response to the disruptive digital wave, hotels need to digitalize their business to survive and be profitable. Small and medium-sized hotels must rise to the challenges of digitalization to meet evolving guest needs and sustain business development. Identifying and prioritizing critical factors is essential for enabling digitalization It is therefore crucial to understand the influence and interactions of these factors. Based on the TOE framework, this study evaluates and prioritizes the influential intensity and direction of the three contexts and their critical factors. According to a combined AHP and DEMATEL analysis, this study identifies the primary context and factors, and core causes. Primary context and factors are valuable for solving current digitalization problems, while core causes are suitable for formulating and implementing long-term digitalization strategies.

Table 4: The total relation matrix of contexts and critical factors

Context	Sum of rows (c)	Sum of columns (r)	$r+c$	$r-c$
TC	3.807	4.802	8.608	0.995
OC	4.416	3.452	7.868	-0.964
EC	4.212	4.181	8.393	-0.031
			Threshold value = 1.382	

Part A: Technological Context (TC)

Critical Factors	$\text{Sum} = c_i$	$\text{Sum} = r_i$	$r_i + c_i$	$r_i - c_i$
TC_1	4.268	5.068	9.336	0.800
TC_2	4.306	3.918	8.224	-0.388
TC_3	4.963	4.064	9.027	-0.899
TC_4	3.765	4.252	8.016	0.487
			Threshold value = 1.081	

Part B: Organizational Context (OC)

Critical Factors	$\text{Sum} = c_i$	$\text{Sum} = r_i$	$r_i + c_i$	$r_i - c_i$
OC_1	22.344	24.024	46.367	1.680
OC_2	22.403	24.184	46.588	1.781
OC_3	23.631	23.049	46.679	-0.582
OC_4	25.369	22.490	47.859	-2.879
			Threshold value = 5.859	

Part C: Environmental Context (EC)

Critical Factors	$\text{Sum} = c_i$	$\text{Sum} = r_i$	$r_i + c_i$	$r_i - c_i$
EC_1	7.778	8.073	15.851	0.296
EC_2	7.638	7.539	15.176	-0.099
EC_3	6.733	6.735	13.468	0.002
EC_4	7.042	6.843	13.885	-0.199
			Threshold value = 1.824	

Although this research contributes new insights into the literature, it has several limitations. For instance, unlike smaller hotels, five-star hotels, hotel chains, and luxury-branded hotels have more technological and financial resources. The influential intensity and causal relationships of their critical factors are likely to differ from those of smaller hotels. Future research can apply this study's conceptual and analytical framework to large hotels. Such a comparative analysis can lead to a deeper and broader understanding of hotel digitalization. In addition, effective organizational digitalization depends on stakeholder commitment and cooperation, which determine the influence and interactions of critical factors. Therefore, it is valuable to engage in a multi-stakeholder and

multi-dimensional approach to examine the influence and interdependence of digitalization stakeholders and their critical factors.

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