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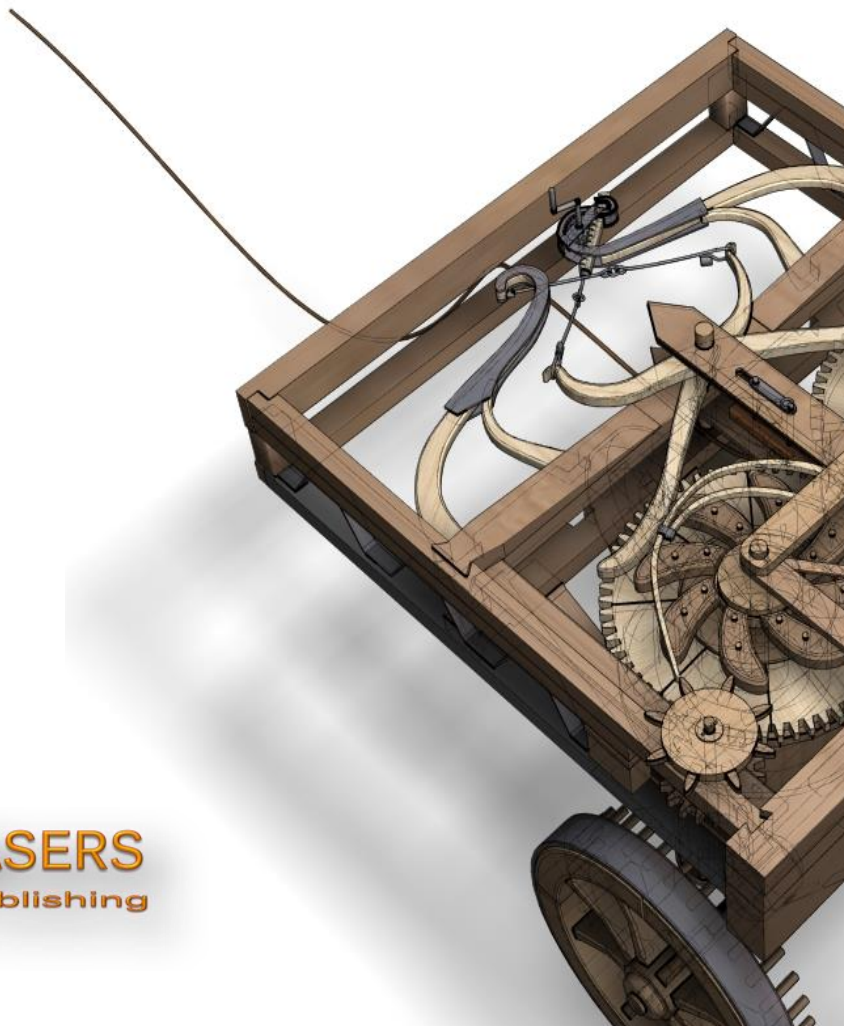

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Assess the Barrier of Small and Medium-Sized Hotel Digitalization: A Combination of AHP and DEMATEL Analysis

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Abstract: This study investigates the barriers to digitalization in small and medium-sized hotels through a combined Analytic Hierarchy Process (AHP) and Decision-Making Trial and Evaluation Laboratory (DEMATEL) analysis. It aims to identify and rank the barriers to technology adoption and understand their interrelationships. The findings emphasize that the most significant barriers are technological context and organizational context, precisely data security, IT infrastructure, competition, skilled digital workforce, and financial resources are challenges for this process. Besides, the technological context and organizational context belong to the cause group, which directly and indirectly influences the environmental context. The study provides a comprehensive framework for understanding the multifaceted barriers to digitalization in the hotel industry, suggesting that managers focus on overcoming these critical barriers to improve performance through digital adoption. This research solves a gap in the literature by focusing on independent hotels' challenges in technology adoption. It offers practical insights for hotel managers and technology developers aiming to support digitalization in this industry.

Keywords: analytic hierarchy process in tourism; barrier factors; decision-making trial and evaluation laboratory; technology adoption; technology-organization-environmental framework.

JEL Classification: L83; M15; O33.

Introduction

Technology is creating a massive revolution for manufacturing and service companies regarding management, organization, and operations. Integrating multiple technologies and enhancing processes is anticipated to lead to significant change in the workplace, requiring employees to acquire new skills for future production systems (Horváth and Szabó, 2019). For more than many years, the adoption of information technology (IT) systems has significantly transformed business operations within the hospitality industry (Buhalis and Leung, 2018), enabling direct engagement with customers (Leung *et al.* 2013), boosting competitiveness (Inversini and Masiero, 2014), and enhancing overall organizational performance (Melián-González and Bulchand-Gidumal, 2016).

Adopting information and communication technology (ICT), the Internet, and mobile applications has become exciting for researchers, policymakers, and managers. Primarily, that interest has recently increased in the hospitality and tourism industries (Berne *et al.* 2012; El-Gohary, 2012; Lin, 2017). As an inevitable consequence, researchers have developed and utilized the accepted theoretical frameworks to examine the adoption and diffusion of IT and Internet applications in business (El-Gohary, 2012). Competition in the open business environment will become fiercer and fiercer. Maintaining and surviving in that dynamic business environment requires travel companies and hotels to constantly change their strategies and approaches to get the best customer experience through products and services (Berne *et al.* 2012; Lin, 2017). With the growth of wireless devices and the explosion of mobile devices, mobile technology applications have played an essential role in changing the landscape of many organizations (D. Wang *et al.* 2012). Technology adoption, as well as digitalizing functions and tasks, not only helps to simplify but also helps improve organizational performance. It is considered a strategic weapon to help small and medium-sized hotels compete fairly with chains or large hotel systems in a challenging business environment (DiPietro and Wang, 2010).

Almost all hospitality or organizations operating in the tourism industry must respect the role of digitalization as a public service to survive in the competitive market (Krizaj *et al.* 2014; Spencer *et al.* 2012). Small and medium-sized enterprises (SMEs) make up an overwhelming number of the travel and hospitality industries worldwide today (Alison Morrison, 1998; Alison Morrison and Thomas, 1999). Digitalization has emerged as a tool to bring exciting experiences to customers looking for new experiences with tourism products without touching the actual products (WTO, 2001). Lin (2017) points out that it is currently possible to plan all stages of a trip online; that is, one can buy airline tickets, book accommodation services, purchase attraction tickets, view maps, rent cars, and seek tips and reviews of tours and restaurants. Therefore, digitalization changed the way contracts for tourism services were handled. The modern traveler has become the consumer of a new market, known as the online market, or electronic commerce, and user reviews are a new source of information in the hospitality and tourism industries (Ricaurte, 2012). Digitalization and technology allow small and medium-sized hotels to build their vision and image on a large scale and reach out to customers worldwide. Low operating costs, infrastructure associated with development, creating a completely new product distribution channel, and extensive connectivity are among the essential criteria determining access to the internet and technology for SMEs (Poon and Swatman, 1999).

Previous studies have often focused on determining the effectiveness of digitalization and technology adoption so that companies can devise a specific strategy related to innovation. Experts are aware of the great potential of digitalization for the tourism industry. However, the utilization of digitalization always needs to be addressed by organizations, managers, or internal resources. These barriers often negatively impact digitalization (Cooper and Zmud, 1990). Besides, more research is needed to address the barriers or challenges of the digitalization process for organizations. Besides, the tourism industry is a traditional industry that needs more connection to innovation and the application of technology. In other words, a research gap exists regarding the barriers of digitalization to the hospitality industry. Okumus *et al.* (2010) revealed that approximately 70% of solutions to strategic innovation in organizations fail. Organizational changes such as digitalization or technology adoption are often considered risks. The limited adoption of ICT innovation among SMEs creates significant concerns about their ability and willingness to use ICT and the Internet as a tool of Business. Digitalization has radically changed business methods, customer behavior, and fierce competition in the market (Brunetti *et al.* 2020). These changes significantly affect the tourism and hospitality industries, which depend on business-consumer relationships, digital communication platforms and conduits, and digital technologies (Gössling, 2020). This study aims to focus on small and medium-sized hotels (SMHs) or independent hotels that are not part of a large hotel chain or system. This study uses the Technological - Organizational - environmental (TOE) context framework to evaluate the impact of essential barriers and their cause-and-effect relationships on 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 essential barriers in digitalization. The study uses a combination of two multi-criteria decision analysis methods, AHP and DEMATEL, to identify the most significant barriers to technology adoption as well as the interrelationships between these barriers. The contribution of this research will help small and medium-sized hotels focus their resources on addressing the most significant barriers to improving efficiency through digitalization or technology adoption. This knowledge is indispensable for digitalization management and research. Without clarifying the role of critical success factors, SMH may be unable to maximize digitalization's economic and social benefits.

1. Literature Review

1.1 Small and Medium - Sized Hotels

There is no exactly accepted precise definition for the term "small and medium-sized enterprises" in the hospitality and tourism industry (Thomas and Thomas, 2005). One solution is for academics to determine the hotel size by the number of rooms and full-time employees. Moutinho (2013) revealed that small-sized hotels will have fewer than 50 rooms, employ less than ten people, and operate in areas that are not major tourist hubs. Ingram *et al.* (2000) have given a precise definition of small businesses operating in the hotel sector as hotels with less than 50 rooms, a medium-sized hotel has about 51-100 rooms, and accommodation from 100 rooms or more will be large hotels, similar to the above but in terms of personnel. Page *et al.* (1999) defined that hotel with large Small scale hotels will have less than nine people will participate in their activities, while medium hotels will have about 10 - 99 people. Therefore, at this stage, it is challenging to have a specific definition of the size of enterprises in the tourism industry compared to other sectors. Atkins and Lowe (1997) indicated that there are at least 40 different definitions of firm size used in the study. Still, there needs to be more consistency in evaluating the criteria for determining firm size. The requirements are many, such as the number of employees, annual sales revenue, value of fixed assets/plant and machinery, and the management structure.

1.2 Innovation Diffusion Theory in an Investigation of Technology Adoption

In recent years, many different types of technologies have been applied, such as the Internet and business administration systems, and many new technology concepts, such as e-commerce, digital transformation, or business. Previous studies have also seen the digitalization of an organization's functions as part of technology adoption. Among the previous studies, several theoretical models are used to identify, predict, and explain the behavior in adopting technology in organizations. Examples of these models include the Theory of Reasoned Action (TRA), the Theory of Planned Behavior, the Technology Acceptance Model (TAM), as well as the Unified Theory of Acceptance and Use of Technology (UTAUT). Despite the critical significance of this model for studying the process and acceptance of technology, the above models are only suitable for research on individual levels (El-Gohary, 2012; Oliveira and Martins, 2011). TAM theory has shown that adoption behavior is influenced by an individual's tendency to use technology, which is determined by the perception and ability to use similar technology. The study of IT adoption models at the organizational level (Oliveira and Martins, 2011) showed that Diffusion Theory (IDT) (Rogers *et al.* 2014) and TOE framework (Tornatzky *et al.* 1990) are two models whose dominant pattern in explaining the use of technology in the organization.

Innovation Diffusion Theory suggests that a firm's adoption and use of innovation are influenced by five innovation characteristics (relative advantage, compatibility, complexity, trialability, and observability) and six organizational characteristics (centralization, complexity, formalization, interconnectedness, slack, and size). However, IDT theory includes the influence of technological and managerial characteristics on technology adoption. However, the TOE framework is more comprehensive and practical because it applies more environmental factors. The TOE framework provides a different perspective when considering technology adoption based on characteristics that can impact the organization (Chau and Tam, 1997). The TOE framework is a perfect fit because it is more powerful and comprehensive than other models. TOE has also been applied in many studies, such as Electronic Data Interchange systems (EDI) (Kuan and Chau, 2001), Enterprise applications (Ramdani *et al.* 2013), radio frequency identification technology (RFID) (DiPietro and Wang, 2010). Based on empirical studies, the TOE framework will continue to be applied in applying technology to research in the hospitality industry.

1.3 Factor Affecting Technology Adoption and Decision Based on TOE Framework

The Technology-Organization-Environment (TOE) framework consists of 3 contexts that influence the process by which a particular organization takes place through technology adoption (Tornatzky *et al.* 1990). The TOE includes the Technological context, Organizational context, and Environmental context. Recently, TOE has also been used as a foundational theory to examine the factors affecting the use of mobile applications for hotel reservations (Y. S. Wang *et al.* 2016). Therefore, the TOE framework explains the adoption of innovation, and many empirical studies have focused on various IS domains by applying it. Research on technology adoption of organizations through the TOE framework is quite popular, but identifying and analyzing challenges or obstacles of technology adoption behavior based on the TOE framework will be a trend for the future. Therefore, as shown in Figure 1, an integrated and multi-faceted framework is suitable for the present study. The barrier factors influencing the adoption of mobile technologies are discussed below.

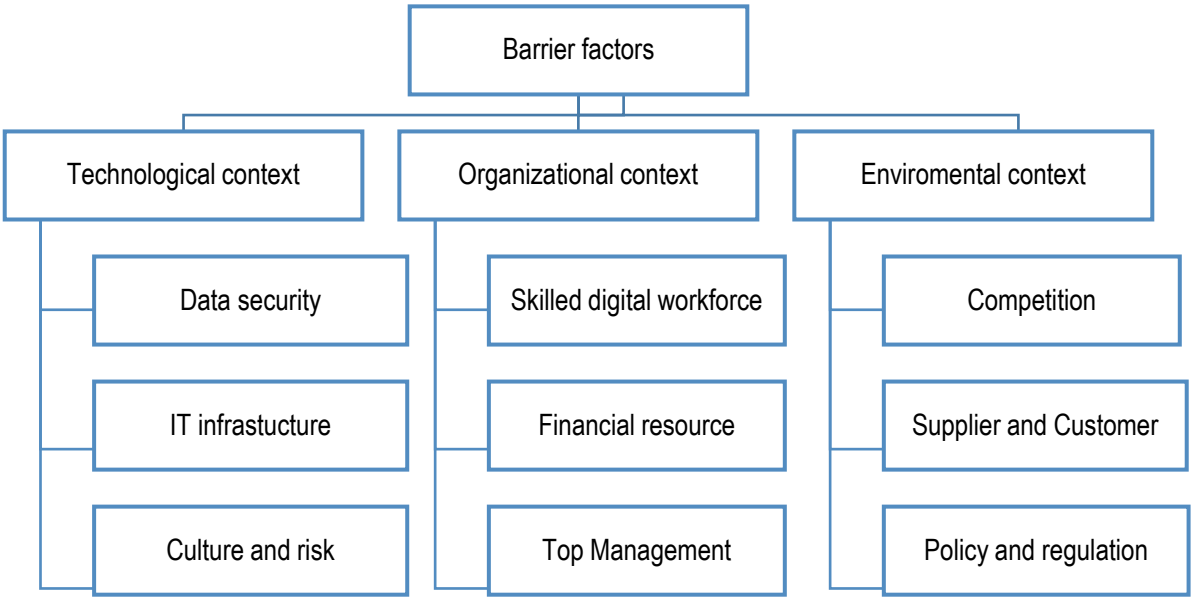
1.4 Technological Context

Technology context includes the internal and external technology characteristics relevant to the organization, including Data security, IT infrastructure, Culture, and risk (Kuan and Chau, 2001; Oliveira *et al.* 2014; Tornatzky *et al.* 1990). Therefore, the characteristics of the danger in the security of customer information, financial information, personnel information and many other information factors are always present alongside technological innovation (Abdullah *et al.* 2018; Al-Weshah and Al-Zubi, 2012; Horváth and Szabó, 2019; Peillon and Dubruc, 2019; Schwertner, 2017; Yadegaridehkordi *et al.* 2020).

Tornatzky and Klein (1982) showed that the organization will get a much higher benefit if it integrates new technologies into existing infrastructure. This is consistent with the view that organizations that need to adapt to technology do so because their IT infrastructure needs to be more robust to accommodate modern technologies (Cooper and Zmud, 1990). Currently, hotel companies, including the Property Management System (PMS), Computer Reservation System (CRS), customer databases, and various systems, are often interrelated; if technologies and applications separate from each other, it will significantly impact operational efficiency. However, for independent hotels or mainly small and medium-sized hotels, resources to innovate or accept technology are always a big challenge. Technology will be the most significant barrier related to cost, labor, and vision of leaders that we will talk about in the Organization context (Abdullah *et al.* 2018; Stockdale and Standing, 2004; Vogelsang *et al.* 2019).

The hospitality industry is often criticized as traditional, and technology is frequently adopted late and quite slowly. Primarily, Small and medium-sized hotels are usually owned by a single person; they are always afraid to change; they want to operate the hotel traditionally, from booking guests, using cash instead of payment methods via bank or mobile or managing and arranging employees face-to-face instead of using specialized management software. They always believe that even the slightest change will lead to customers feeling uncomfortable and will not use more of the hotel's services (Abdullah *et al.* 2018; Stankovska *et al.* 2016; Taylor and Murphy, 2004; Verevka, 2019; Vogelsang *et al.* 2019). Technical barriers have continuously been determining whether small and medium-sized hotels can decide whether to adopt technology or digitalize hotel functions.

Figure 1. Barrier factors of the digitalization process



1.5 Organizational Context

The technology context directly relates to organizational characteristics and decision-making about technology adoption (Kuan and Chau, 2001; Oliveira *et al.* 2014). In today's explosive business environment and fierce competition, the application of technology in the organization will be linked to the leadership and decision-making of the organization. A hotel that can reach customers or enhance the customer experience will depend on the acceptance of innovation within the organization. That's why the hotel's internal and human resource-related characteristics are the most critical factors affecting technology adaptation. Barriers to the adoption of technology within organizations also appear. Based on the above perception in the organizational context, three main barriers will affect technology adoption: Skilled Digital workforces, financial resources, and Top Management.

In addition to the organization's innovation readiness factors, information technology resources, and support from the top management of the organization, here is the small and medium-sized hotel is a factor but also a barrier to technology adoption (DiPietro and Wang, 2010; Racherla and Hu, 2008). Thong (1999) points out that the best leaders can drive change through communication, value enhancement, and a clear vision for the organization. With the same consensus, Lee and Kim (2007) argue that the commitment and vision of the manager will always be an essential barrier to technology adaptation. Previous studies also reveal that small and medium-sized businesses need help implementing innovations to optimize their operations. Besides, shortages of finances are always significant barriers to applying technology for hotels, especially small and medium-sized hotels (Horváth and Szabó, 2019; Vogelsang *et al.* 2019; Yadegaridehkordi *et al.* 2020).

It is clear that in the current context, the need for more personnel who can use IT proficiently to support the hotel in adapting technology and improving customer experience and performance remains a considerable challenge. For the innovation process (Abdullah *et al.* 2018; Al-Weshah and Al-Zubi, 2012; Verevka, 2019; Vogelsang *et al.* 2019), besides that the decisive role of an organization will be very much related to the vision and perception of senior management regarding technology adaptation (Schwertner, 2017).

1.6 Environmental Context

Environmental context represents the field in which the organization operates and does business. These external factors can potentially impact or create challenges for technology adoption (Oliveira *et al.* 2014; Tornatzky *et al.* 1990). Today, when humanity enters a 4.0 revolution, globalization, and competitive pressure from many aspects have made many travel companies and hotels promote innovation in organizations and apply technology to improve and enhance competitiveness. Many studies have shown that environmental factors are a direct barrier affecting decision-making regarding the adoption of technology in an organization (Rothwell, 1994). Therefore, in this environmental context, barriers that can affect a hotel's technological adaptation process include competitors, suppliers and customers, policies and regulation.

In this dynamic business environment, overcoming the competition or building an information technology system that is more efficient than the competition but, at the same time, more economical is always a great challenge for technology adoption. Furthermore, a high degree of competition will promote the adoption of different technological approaches (Li and Ye, 1999). Therefore, competitive pressure in this study is considered a barrier to pressure and perception of competitor technology. Competitive pressure has long formed a difficult barrier for hotels to access technological innovation as they always have to find newer technology to maintain the same competitive pressure on their competitors in the same industry (Ezzaouia and Bulchand-Gidumal, 2020; Horváth and Szabó, 2019; Stankovska *et al.* 2016; Taylor and Murphy, 2004).

Hotel suppliers and sometimes customer needs themselves become barriers to technology adoption. It is very difficult to convince suppliers to disclose the origin and quality of the service provided to the restaurant simply because the supplier's awareness of technology is insufficient. Customers sometimes accept to use a traditional method, and they are afraid to change; for example, paying for services via the Internet or mobile banking will be much more convenient than cash (Abdullah *et al.* 2018; Ezzaouia and Bulchand-Gidumal, 2020; Peillon and Dubruc, 2019; Stockdale and Standing, 2004). Technology adoption is always a strategy, and innovation to be sustainable must always have a clear legal framework to ensure the interests of the hotel or its customers. However, sometimes, technology needs to be faster, leaving the government behind. Government leads to supportive or regulatory frameworks that randomly become a terrible barrier for change-afraid organizations (Abdullah *et al.* 2018; Al-Weshah and Al-Zubi, 2012; Ezzaouia and Bulchand-Gidumal, 2020; Stockdale and Standing, 2004; Vogelsang *et al.* 2019).

2. Research Methodology

According to previous studies, the MCDM methods are appropriate for solving human subjective judgments using multiple decisions (Ghamgosar *et al.* 2011; Lin and Fu, 2012). To enhance the accuracy of the expert's choice evaluation among multiple alternatives, the study is based on the TOE framework and the combination of a qualitative phase of the MCDM method, including the Analytical hierarchy process (AHP) and the Decision-making trial and evaluation laboratory (DEMTEL) method. In addition, the experts selected for the interview in the study include managers with more than five years of experience in operating hotels and engineers with expertise in digitalization functions.

Table 1. A hierarchical framework for technology adoption

Context	Barriers	Literature source
Technological context (TC)	Data Security (TC1)	Horváth and Szabó (2019), Yadegaridehkordi *et al.* (2020), Schwertner (2017), Vogelsang *et al.* (2019), Abdullah *et al.* (2018), Peillon and Dubruc (2019), Taylor and Murphy (2004), Al-Weshah and Al-Zubi (2012)
	IT infrastructure (TC2)	Stockdale and Standing (2004), Schwertner (2017), Vogelsang *et al.* (2019), Jones *et al.* (2003), Abdullah *et al.* (2018), Peillon and Dubruc (2019)
	Culture and Risk (TC3)	Stockdale and Standing (2004), Vogelsang *et al.* (2019), Verevka (2019), Abdullah *et al.* (2018), Stankovska *et al.* (2016), Taylor and Murphy (2004)
Organizational context (OC)	Skilled Digital workforces (OC1)	Horváth and Szabó (2019), Vogelsang *et al.* (2019), Jones *et al.* (2003); Verevka (2019), Abdullah *et al.* (2018), Taylor and Murphy (2004), Al-Weshah and Al-Zubi (2012)

Context	Barriers	Literature source
	Financial resource (OC2)	Horváth and Szabó (2019), Yadegaridehkordi *et al.* (2020), Ezzaouia and Bulchand-Gidumal (2020), Vogelsang *et al.* (2019), Alrawadieh *et al.* (2021), Jones *et al.* (2003), Verevka (2019), Abdullah *et al.* (2018), Stankovska *et al.* (2016), Taylor and Murphy (2004), Abid *et al.* (2011)
	Top Management (OC3)	Schwertner (2017), Vogelsang *et al.* (2019), Jones *et al.* (2003), Verevka (2019), Abdullah *et al.* (2018), Stankovska *et al.* (2016), Abid *et al.* (2011)
Environmental context (EC)	Competition (EC1)	Horváth and Szabó (2019), Ezzaouia and Bulchand-Gidumal (2020), Stankovska *et al.* (2016), Taylor and Murphy (2004)
	Suppliers and Customers (EC2)	Ezzaouia and Bulchand-Gidumal (2020), Stockdale and Standing (2004), Abdullah *et al.* (2018), Peillon and Dubruc (2019)
	Policy and regulation (EC3)	Ezzaouia and Bulchand-Gidumal (2020), Stockdale and Standing (2004), Vogelsang *et al.* (2019), Abdullah *et al.* (2018), Taylor and Murphy (2004), Al-Weshah and Al-Zubi (2012)

2.1 Analytical Hierarchy Process (AHP)

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.

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

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.

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

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

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

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

where CI is the consistency index, $\lambda_{\max}$ represents the maximum eigenvalue, and RI denotes the random consistency index. If $CR \leq 0.1$, the pairwise comparison matrix is consistent (Saaty, 1991). Otherwise, the consistency ratio is not acceptable.

2.2 The DEMATEL Method

The DEMATEL method developed by Fontela and Gabus (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 and 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.

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

where X^t is the direct matrix judged by the t^{th} ($t = 1, 2, \ldots, m$) 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.

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

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

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.

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

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

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.

3. Empirical Study and Result

This section includes data collection, identifying essential barriers, and mutual interaction in applying technology using AHP and DEMATEL methods.

3.1 Data Collection

In MCDM methods, the selection of the number of experts and the size of the panel of experts is subjective. There needs to be a theoretical basis or empirical studies on whether the analytical results are much better with panel size (Lee and Yang, 2018). Therefore, the size of the expert panel in MCDM studies is usually not limited. The explanatory power of MCDM methods is based on the experience and knowledge of experts and previous studies. In particular, in analyzing AHP methods, the expertise and knowledge of the expert who can interpret and evaluate the relevant criteria plays the most critical role. Accordingly, a group of 5 to 7 experts would be the best fit to produce the overall results for the group (Yetton and Bottger, 1983). Hwang and Lin (2012) revealed that a group of 10 to 15 experts would be suitable for decision-making in the MCDM analysis method. In practice, the size of the panel of experts will usually be more than ten experts (Lee and Yang, 2018). Therefore, in this study, we will focus on researching small and medium-sized hotels in the hotel list of the Vietnam Tourism Association and experts in the Technology and hospitality sectors. Through the author's relationship via email and phone, 10 experts in technology and hospitality agreed to answer the questionnaire; these experts cover two main areas: technology and hotels. Technology experts with seniority in building information technology systems and digitalizing equipment in hotels. Moreover, experts in the hotel industry are those with experience in administration, control, and management, or professors working and doing research at universities. The experts' expertise will be listed in detail in Table 2. An expert questionnaire is constructed for data collection. It is kept as simple as possible to depict the concise structure of motives that drive the technology adoption process. Lastly, after several rounds of questionnaire surveys, the qualified anonymous responses of the group experts were then used in the combined AHP and DEMATEL analysis. In AHP analysis, the criteria selection was based on two primary sources: (1) a literature review and expert

judgment and (2) a pre-survey. Both approaches can provide valid criteria, but careful consideration of the requirements and wrong selection will completely change the analysis results.

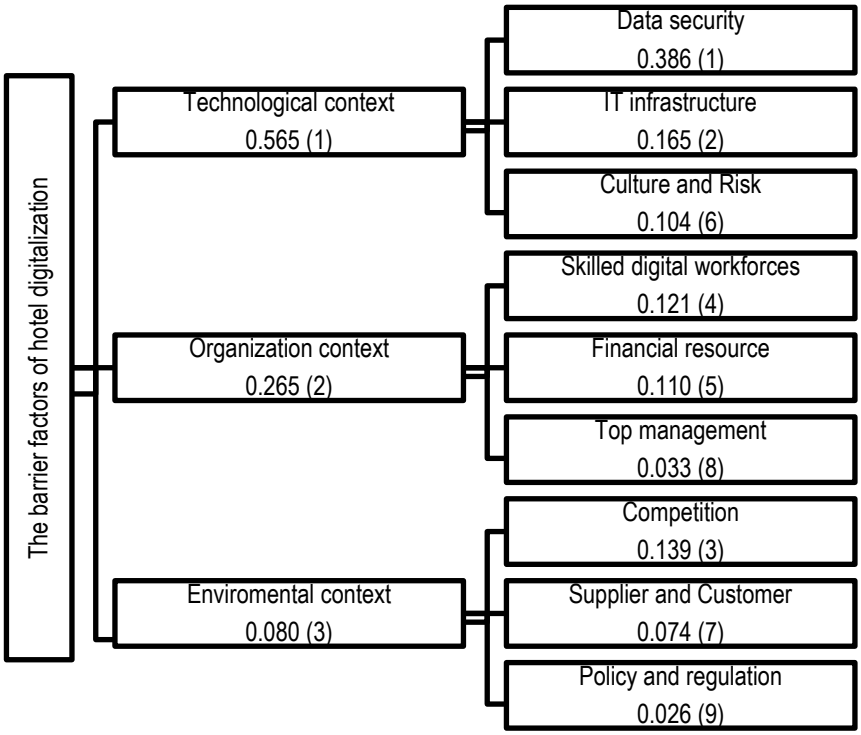
3.2 Evaluate the Relative Important of Barrier Factors: AHP Analysis

AHP analysis identifies the context and factors causing the biggest obstacles to the digitalization process of small and medium-sized hotels in Vietnam. The results are shown in Figure 2, indicating that the Technological Context (0.561) is a more significant barrier than the two Organizational Contexts (0.265) and Environmental contexts (0.080). Figure 2 also reveals that Data security (0.386) has the highest influence weight and is an obstacle to the digitalization process, followed by IT Infrastructure (0.165), Competition (0.139), Skilled digital workforce (0.121), Financial resources (0.110), Culture and risk (0.104), Supplier and customer (0.074), Top management (0.033), Policy and regulation (0.026). In addition, this study sets a threshold (0.11) calculated as an average influence weight to identify obstacles that can impact the digitalization process, which includes: Data security, IT Infrastructure, Skilled digital workforces, Financial resource, Competition.

Table 2. Demographic profile of respondents

The technology experts (*N*=5)					The hotel experts (*N*=5)				
No	Gender	Age	Position	Seniority	No	Gender	Age	Position	Seniority
1	Female	31-40	Engineer	15	1	Male	31-50	Manager	20
2	Female	31-40	Engineer	15	2	Male	31-50	Manager	18
3	Male	41-50	Academic professor	20	3	Female	51-60	General manager	25
4	Male	31-40	Engineer	11	4	Male	51-60	General manager	28
5	Female	31-40	Engineer	13	5	Female	41-50	General manager	21

Figure 2. The influential weight of context and barriers



3.3 Asses the Interaction among Barrier Factors: DEMATEL Analysis

DEMATEL analysis reveals the cause-effect relationship as well as the interaction of barrier factors to the digitalization process. Accordingly, table 3 shows that technological context and organizational context are the causes group because their r-c value is greater than 0. Environmental context belongs to the Effect group because its values in the analysis are less than 0. The results of the DEMATEL analysis method also show up to 5 barrier

factors: the causes group and three factors that belong to the Effect group. These factors all interact with each other.

4. Discussion and Implication

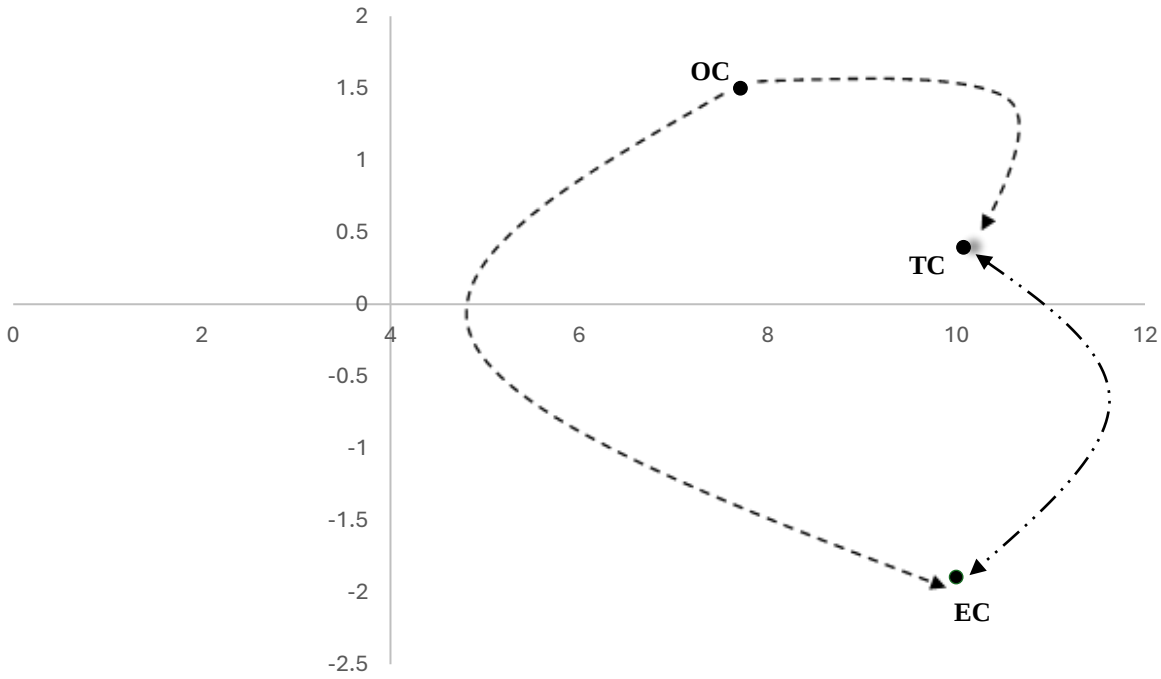
4.1 Discussion

Table 3. Total relation and influence matrix for Context

Context	TC	OC	EC	Sum=r_i	r+c	r-c
TC	1.61	1.26	2.37	5.24	10.08	0.39
OC	1.66	0.89	2.05	4.61	7.71	1.50
EC	1.58	0.95	1.53	4.05	10.00	-1.89
Sum=c	4.84	3.11	5.95	Threshold value = 1.54		

This study shows that the technological context is a much more strategic barrier than the organizational context and environmental context. The results of this study are similar to research showing that the technological context is always a problematic factor when applying mobile technology to tourism companies in Taiwan (Lin, 2017). However, this result contradicts the result that the environmental context is the leading cause of barriers to innovation through technology in small and medium-sized enterprises in India (Nimawat and Gidwani, 2022). The reason for this is that Taiwan is a developed country with abundant financial and technological resources; the government is always interested, so the number of personnel to carry out innovation is always ready, thus becoming the most significant obstacle that makes Taiwanese businesses afraid of the digitalization process comes from environmental and market factors as well as the growing elderly population here. In contrast, in developing countries, factors related to technology and organization are always significant barriers hindering the operating process based on digitalization. In addition, the results of this study also imply that the Technological context is the most important barrier (0.565), followed by barriers coming from the organizational context (0.265) and, finally, the environment context (0.080). Based on the result, managers understand that support from technology and within the organization is necessary to handle this digitalization process.

Figure 3. Cause – effect diagram for criteria



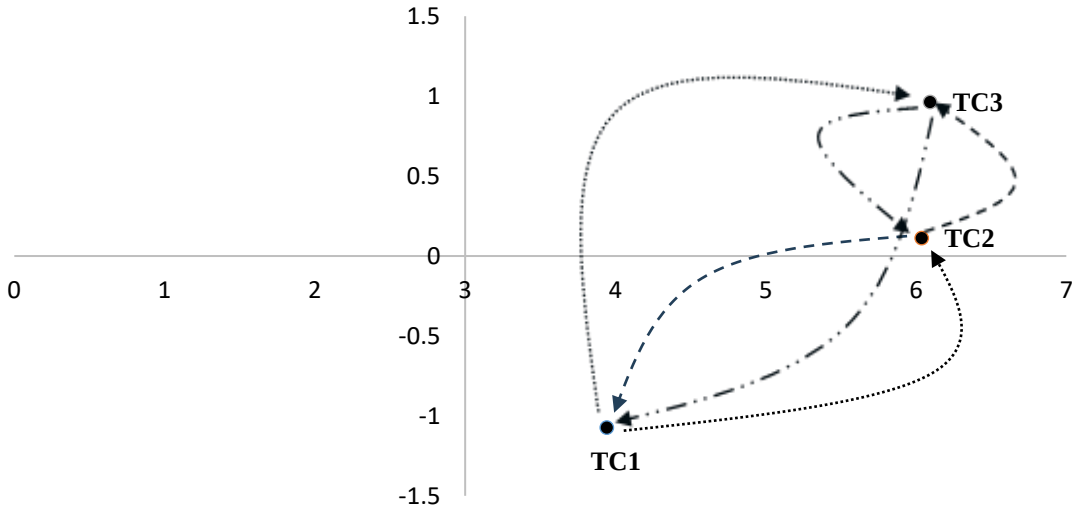
Previous studies have aimed to identify essential factors capable of promoting the digitalization process in the tourism industry (El-Gohary, 2012; Lin, 2017) (34). These studies revealed that the variables in this study are independent. However, the digitalization process in businesses is a multi-dimensional transformation process and requires the support of many stakeholders. Ignoring the interaction between these variables can lead to bias or insufficient precision in the study. As the results of the DEMATEL analysis imply that the contexts of the digitalization

process are interrelationships and impact each other, Figure 3 shows that the technological context and the environmental context are in the group of causes that both have an impact on the environmental context. Meanwhile, the environmental context belongs to the effects group and directly impacts the technological context. According to the results of this study, the digitalization process will have significant barriers coming from the technological context and the organizational context. When these issues are resolved, they will positively affect the environmental context.

Table 6. Total relation and influence matrix for Technology context

Technology context	TC1	TC2	TC3	Sum=r_i	$r+c$	$r-c$
TC1	1.20	1.40	1.60	4.20	8.20	0.20
TC2	1.20	0.90	1.10	3.20	7.20	-0.80
TC3	1.60	1.70	1.30	4.60	8.60	-0.60
Sum=c	4.00	4.00	4.00	Threshold value = 0.89		

Figure 4. Cause – effect diagram for sub-criteria (Technology context)

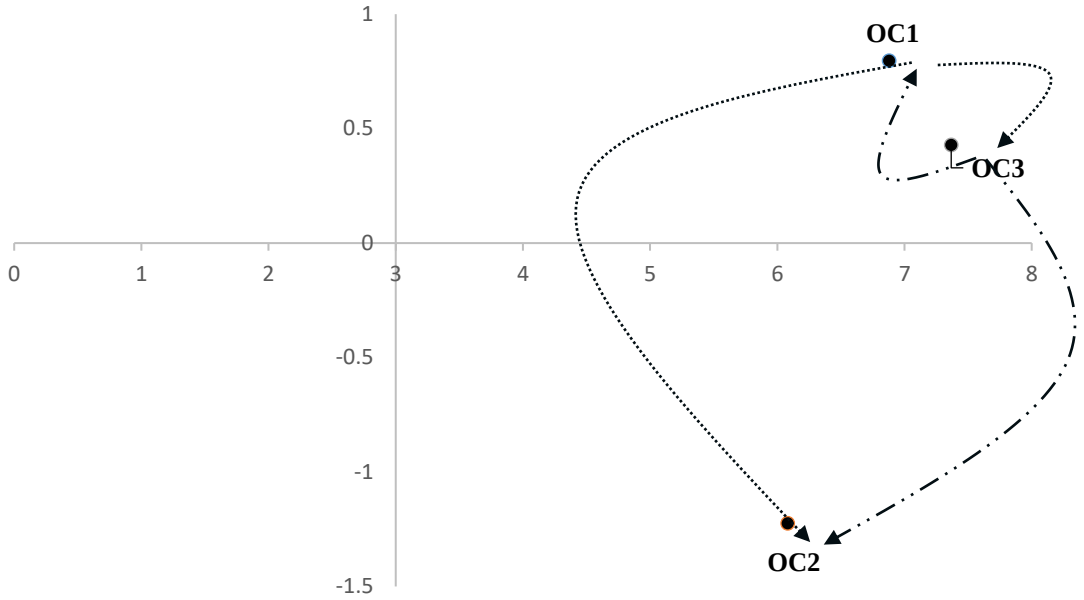


The technology context is considered one of the biggest barriers affecting the digitalization process in small and medium-sized hotels in Vietnam. This result implies that innovation that occurs when organizations overcome barriers from the technological context is an appropriate strategy. The technological context includes Data security (0.386), IT Infrastructure (0.165), Cuture and Risk (0.104). According to the AHP analysis, they are ranked first, second, and sixth out of 9 factors that are barriers to digitalization. Figure 4 also reveals that Data security belongs to the cause group and directly and indirectly impacts the factors in the Effect group, namely IT Infrastructure and Culture and risk. This result shows that the biggest barrier to digitalization is ensuring information security for customers and small and medium-sized hotels in Vietnam. Besides, Technology infrastructure and innovation culture are factors that influence interrelationships.

Table 7. Total relation and influence matrix for Organizational Context

Organizational context	OC1	OC2	OC3	Sum=r_i	$r+c$	$r-c$
OC1	0.22	0.40	0.59	1.20	2.14	0.25
OC2	0.32	0.15	0.27	0.74	1.89	-0.41
OC3	0.41	0.60	0.25	1.26	2.37	0.16
Sum=c	0.95	1.15	1.10	Threshold value = 0.36		

Figure 5. Cause – effect diagram for sub-criteria (Organization context)

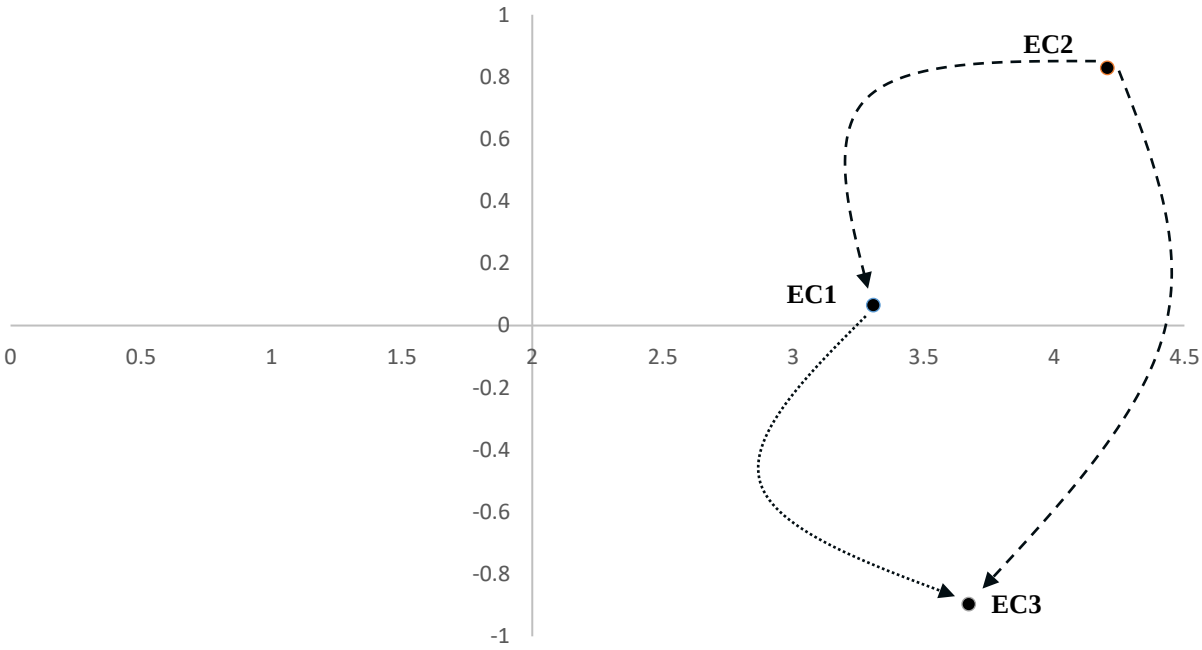


According to experts, the environmental context is the second most significant barrier affecting the digitization process of the hotel industry. The three main factors of the organizational context are Skilled digital workforce (0.121), Financial resource (0.110), and Top management (0.033), which respectively ranked fourth, fifth, and eighth out of 9 factors considered barriers to the digitalization process. As shown in Figure 5, the Skilled digital workforce is regarded as the main factor belonging to the cause group that impacts the effect group, including barriers such as Financial resources or top management. This result is entirely consistent with the empirical evidence of previous studies (Lian *et al.* 2014; Rahayu and Day, 2017) that barriers to meeting IT financial and human resources are barriers are more important than the vision and support of senior leaders in the organization. At the same time, the results of this study are also entirely consistent with previous results that show that human resources that meet technology standards are a significant obstacle in promoting the digitalization of operations and business in major hotels in China and Singapore (Lam and Law, 2019; Molinillo and Japutra, 2017). Financial resources and technology personnel are the core elements with the most significant impact in the organizational context, so prioritizing available financial resources to fund digitalization and finding talented personnel is strategically suitable to improve the effectiveness of the organizational context for SMH digitalization in Vietnam.

Table 8. Total relation and influence matrix for Environment context

Environmental Context	EC1	EC2	EC3	Sum=r_i	$r+c$	$r-c$
EC1	0.36	0.60	0.73	1.69	3.31	0.07
EC2	0.83	0.56	1.13	2.52	4.20	0.83
EC3	0.43	0.53	0.43	1.39	3.67	-0.90
Sum=c	1.62	1.69	2.28	Threshold value = 0.62		

Figure 6. Cause – effect diagram for sub-criteria (Environment context)



The environmental context is a relatively small barrier to the digitalization process of small and medium-sized hotels in Vietnam. As mentioned in Figure 2, Competition (0.139), Supplier and Customer (0.074), and Policy and regulation (0.026) are ranked third, seventh, and ninth, respectively. These factors are arranged in order of weight influence. Also, according to Figure 3, pressure from competitors, customers, and suppliers are factors in the group of causes causing the main obstacles to the digitalization process. This result is consistent with previous studies revealing 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 challenging factor for digital business. Therefore, the digitalization process is affected by environmental factors such as competitors or product suppliers.

Most previous studies only focused on identifying essential and influential factors in the digitalization process in the hospitality and tourism industry. However, these studies assume that these critical factors are independent. Because business digitalization is a multi-stakeholder and multi-dimensional transformation process that impacts and is influenced by many factors, these factors interact. Policymakers, hoteliers, and researchers should consider the influence and interaction between factors as a theoretical framework for planning, organizing, leading, and controlling hospitality digitalization.

4.2 Implication

After identifying the strategic barriers and interactions of contexts based on the TOE theoretical framework, the result reveals that the priority is to overcome the primary contexts and factors challenging the adoption of digitalization as the most optimal mode of operation. In this study, technological context and organizational context are considered the main barriers, besides factors such as Data security, IT Infrastructure, Competition, Skilled digital workforce, and Financial resources. Therefore, small and medium-sized hotels need to activate digital capabilities to optimize production and business activities, so they should apply a strategy that focuses on overcoming gaps in technology, human resources, and technology infrastructure.

Customers increasingly value a sophisticated digital experience, with younger guests and business travelers, in particular, considering integrating the latest technologies in hotels as essential. These technologies span from artificial intelligence, big data analytics, and cloud computing to flexible property management systems, the Internet of Things, and immersive experiences through virtual and augmented reality. Among the myriad of tech trends, digital channels and online travel agents stand out for small and medium-sized hotels (SMHs), offering a cost-effective way to amplify their marketing efforts. Moreover, hotels can leverage customer-centric technologies like electronic customer relationship management systems to enhance operation outcomes. This includes securing a larger market share, reaching new markets, and boosting customer satisfaction and loyalty. Pursuing these marketing advantages primarily drives the push toward digitalization in SMHs. However, financial limitations pose

a significant barrier to their digital transformation efforts. Government intervention through financial and non-financial support is deemed necessary to overcome this. Tailored funding models and digital support channels that simplify the search for funding instruments are recommended to facilitate more accessible access to resources for SMHs, enabling them to embrace digitalization rapidly. This study also implies emphasizing customer-centricity and ensuring the stable operation of a small and medium-sized hotel, with the necessary priority to improve customer experience. In addition, prioritizing digitalization will help hotels optimize costs and personnel and promote the hospitality's image on tourism platforms to attract more new customers. Small and medium-sized hotels must always focus on several factors to overcome to activate the digitalization process successfully and consider it a suitable strategy to survive in a fiercely competitive market.

Conclusions and Further Research

In conclusion, tourism's significance in developing countries' economic bones cannot be overstated, with the hospitality industry as a critical promotion in this growth process. This industry, predominantly comprised of small and medium-sized hotels, plays a crucial role despite the intense competition posed by more prominent five-star hotels or famous resorts. The emergence of digitalization offers these smaller entities a transformative tool, potentially leveling the playing field by enhancing operational efficiencies and customer service. The findings of this research contribute vitally to the existing literature by providing a stabilized theoretical framework that enriches management and equips top managers with innovative perspectives and appropriate strategies. This framework is designed to aid managers in navigating the complexities of the competitive landscape, ensuring the sustainability and development of small to medium-sized hotels. Emphasizing a harmonious strategy that integrates digital tools with traditional hospitality management, this study underscores the potential for resilience and growth in a sector critical to developing countries.

Digitalization for small and medium hotels helps optimize operational efficiency and save operating costs, and especially customer-centricity will help improve the service experience (Iranmanesh *et al.* 2022). Hotels need to determine a suitable strategy to survive with 5-star hotels and large resorts, so increasing the number of customers and maintaining business growth is essential. However, identifying the main barriers and factors that hinder the digitalization process will help small and medium-sized hotels focus their resources on overcoming them to enable the digitalization process. Based on the TOE framework, this study evaluates and prioritizes the level and direction of influence of the three contexts as well as their essential barriers. Following the combined analysis of AHP and DEMATEL, this study identifies the context, critical factors, and primary causes. Context and primary factors are valuable in identifying barriers to digitalization today, while core causes are relevant for building and implementing a long-term digitalization strategy.

The study's results contribute a new dimension of awareness to the tourism industry; however, it still has some limitations. This study only focuses on identifying barriers to digitalization for small and medium-sized hotels in Vietnam, while large 5-star hotels have financial resources. The barrier factors, human resources, and technology can be completely different. Future research could apply this study's conceptual and analytical framework to large hotels. Such comparative analysis can lead to a deeper and broader understanding of hotel digitalization. In addition, future studies could use other approaches to assess the importance of barriers to digitalization and make more extensive use of interview participants to receive more accurate feedback on research results using MCDM methods.

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Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-Assisted Technologies

The author declare that he has not used generative AI and AI-assisted technologies during the preparation of this work.

References

[1] Abdullah, Ahmed, Brychan Thomas, Lyndon Murphy, and Eoin Plant. 2018. An Investigation of the Benefits and Barriers of E-Business Adoption Activities in Yemeni Smes. *Strategic Change* 27(3): 195-208. DOI:https://doi.org/10.1002/jsc.2195

[2] Abid, Ali Abu, Md Mahbubur Rahim, and Helana Scheepers. Experienced Benefits and Barriers of E-Business Technology Adoption by Sme Suppliers. In *Communications of the IBIMA*, 2011.

[3] Alrawadieh, Ziad, Zaid Alrawadieh, and Gurel Cetin. 2021. Digital Transformation and Revenue Management: Evidence from the Hotel Industry." *Tourism Economics* 27(2): 328-45. DOI:https://doi.org/10.1177/1354816620901928

[4] Al-Weshah, Ghazi A, and Khalid Al-Zubi. 2012. E-Business Enablers and Barriers: Empirical Study of Smes in Jordanian Communication Sector. *Global Journal of Business Research,* 6(3): 1-15.

[5] Atkins, Martin H, and Julian Frank Lowe. 1997. Sizing up the Small Firm: Uk and Australian Experience. *International Small Business Journal* 15(3): 42-55. DOI: https://doi.org/10.1177/0266242697153003

[6] Berne, Carmen, Margarita Garcia-Gonzalez, and Jose Mugica. 2012. How Ict Shifts the Power Balance of Tourism Distribution Channels. *Tourism Management* 33(1): 205-14. DOI:https://doi.org/10.1016/j.tourman.2011.02.004

[7] Brunetti, Federico, *et al.* 2020. Digital Transformation Challenges: Strategies Emerging from a Multi-Stakeholder Approach." *The TQM Journal* 32(4): 697-724. DOI: https://doi.org/10.1108/TQM-12-2019-0309

[8] Buhalis, Dimitrios, and Rosanna Leung. 2018. Smart Hospitality—Interconnectivity and Interoperability Towards an Ecosystem. *International Journal of Hospitality Management* 71: 41-50. DOI:https://doi.org/10.1108/TQM-12-2019-0309

[9] Chang, Da-Yong 1992. Extent Analysis and Synthetic Decision. *Optimization Techniques Applications,* 1(1): 352-55.

[10] Chau, Patrick YK, and Kar Yan Tam. 1997. Factors Affecting the Adoption of Open Systems: An Exploratory Study. *MIS Quarterly,* 1-24. DOI: https://doi.org/10.2307/249740

[11] Cooper, Randolph B, and Robert W. Zmud. 1990. Information Technology Implementation Research: A Technological Diffusion Approach. *Management Science* 36(2): 123-39. DOI:https://doi.org/10.1287/mnsc.36.2.123

[12] DiPietro, Robin B, and Youcheng Wang. 2010. Key Issues for Ict Applications: Impacts and Implications for Hospitality Operations. *Worldwide Hospitality Tourism Themes* 2(1): 49-67. DOI:https://doi.org/10.1108/17554211011012595

[13] El-Gohary, Hatem 2012. Factors Affecting E-Marketing Adoption and Implementation in Tourism Firms: An Empirical Investigation of Egyptian Small Tourism Organisations. *Tourism Management* 33(5): 1256-69. DOI:https://doi.org/10.1016/j.tourman.2011.10.013

[14] Ezzaouia, Imane, and Jacques Bulchand-Gidumal. 2020. Factors Influencing the Adoption of Information Technology in the Hotel Industry. An Analysis in a Developing Country. *Tourism Management Perspectives,* 34: 100675. DOI: https://doi.org/10.1016/j.tmp.2020.100675

[15] Fontela, and Gabus. 1976. The Dematel Observer: Battelle Institute. *Geneva Research Center*: 56-61.

[16] Ghamgosar, M., M. Haghyghy, F. Mehrdoust, and N. Arshad. 2011. Multicriteria Decision Making Based on Analytical Hierarchy Process (Ahp) in Gis for Tourism. *Middle-East Journal of Scientific Research* 10(4): 501-07.

[17] Gössling, Stefan 2020. Technology, Ict and Tourism: From Big Data to the Big Picture. *Journal of Sustainable Tourism* 29(5): 849-58. DOI: https://doi.org/10.1080/09669582.2020.1865387

[18] Horváth, Dóra, and Roland Zs Szabó. 2019. Driving Forces and Barriers of Industry 4.0: Do Multinational and Small and Medium-Sized Companies Have Equal Opportunities?". *Technological forecasting social change* 146: 119-32. DOI: https://doi.org/10.1016/j.techfore.2019.05.021

[19] Ingram, Arthur, Roddy Jamieson, Paul Lynch, and Richard Bent. 2000. Questioning the Impact of the 'Graduatization'of the Managerial Labour Force Upon the Management of Human Resources in the Scottish Hotel Industry. *Journal of Consumer Studies and Home Economics* 24(4): 212-22. DOI:https://doi.org/10.1111/j.1470-6431.2000.00128.x

[20] Inversini, Alessandro, and Lorenzo Masiero. 2014. Selling Rooms Online: The Use of Social Media and Online Travel Agents. *International Journal of Contemporary Hospitality Management* 26(2): 272-92. DOI:https://doi.org/10.1108/IJCHM-03-2013-0140

[21] Iranmanesh, Mohammad, Morteza Ghobakhloo, Mehrbakhsh Nilashi, Ming-Lang Tseng, Elaheh Yadegaridehkordi, and Nelson Leung. 2022. Applications of Disruptive Digital Technologies in Hotel Industry: A Systematic Review. *International Journal of Hospitality Management* 107: 103304. DOI:https://doi.org/10.1016/j.ijhm.2022.103304

[22] Jones, Paul, Paul Beynon‐Davies, and Elizabeth Muir. 2003. Ebusiness Barriers to Growth within the Sme Sector." *Journal of Systems Information Technology* 7(1/2): 1-25. DOI:https://doi.org/10.1108/13287260380000771

[23] Krizaj, Dejan, Andrej Brodnik, and Boris Bukovec. 2014. A Tool for Measurement of Innovation Newness and Adoption in Tourism Firms. *International Journal of Tourism Research* 16(2): 113-25. DOI:https://doi.org/10.1002/jtr.1905

[24] Kuan, Kevin KY, and Patrick YK Chau. 2001. A Perception-Based Model for Edi Adoption in Small Businesses Using a Technology–Organization–Environment Framework. *Information and Management* 38(8): 507-21. DOI: https://doi.org/10.1016/S0378-7206(01)00073-8

[25] Lam, Carmen, and Rob Law. 2019. Readiness of Upscale and Luxury-Branded Hotels for Digital Transformation. *International Journal of Hospitality Management* 79: 60-69. DOI:https://doi.org/10.1016/j.ijhm.2018.12.015

[26] Lee, Sangjae, and Kyoung-jae Kim. 2007. Factors Affecting the Implementation Success of Internet-Based Information Systems." *Computers in Human Behavior* 23(4): 1853-80. DOI:https://doi.org/10.1016/j.chb.2005.12.001

[27] Leung, Daniel, Ada Lo, Lawrence Hoc Nang Fong, and Rob Law. 2015. Applying the Technology-Organization-Environment Framework to Explore Ict Initial and Continued Adoption: An Exploratory Study of an Independent Hotel in Hong Kong. *Tourism Recreation Research* 40(3): 391-406. DOI:https://doi.org/10.1080/02508281.2015.1090152

[28] Leung, Daniel, Rob Law, Hubert Van Hoof, and Dimitrios Buhalis. 2013. Social Media in Tourism and Hospitality: A Literature Review. *Journal of Travel Tourism Marketing* 30(1-2): 3-22. DOI:https://doi.org/10.1080/10548408.2013.750919

[29] Li, Mingfang, and L. Richard Ye. 1999. Information Technology and Firm Performance: Linking with Environmental, Strategic and Managerial Contexts. *Information and Management* 35(1): 43-51. DOI:https://doi.org/10.1016/S0378-7206(98)00075-5

[30] Lian, Jiunn-Woei, David C Yen, and Yen-Ting Wang. 2014. An Exploratory Study to Understand the Critical Factors Affecting the Decision to Adopt Cloud Computing in Taiwan Hospital. *International Journal of Information Management* 34(1): 28-36. DOI: https://doi.org/10.1016/j.ijinfomgt.2013.09.004

[31] Lin, Sheng Wei, and Hsin Pin Fu. 2012. Uncovering Critical Success Factors for Business-to-Customer Electronic Commerce in Travel Agencies. *Journal of Travel Tourism Marketing* 29(6): 566-84. DOI:https://doi.org/10.1080/10548408.2012.703034

[32] Lin, Sheng Wei. 2017. Identifying the Critical Success Factors and an Optimal Solution for Mobile Technology Adoption in Travel Agencies. *International Journal of Tourism Research* 19(2): 127-44. DOI:https://doi.org/10.1002/jtr.2092

[33] Melián-González, Santiago, and Jacques Bulchand-Gidumal. 2016. A Model That Connects Information Technology and Hotel Performance. *Tourism Management* 53: 30-37. DOI:https://doi.org/10.1016/j.tourman.2015.09.005

[34] Molinillo, Sebastian, and Arnold Japutra. 2017. Organizational Adoption of Digital Information and Technology: A Theoretical Review. *The Bottom Line* 30(01): 33-46. DOI: https://doi.org/10.1108/BL-01-2017-0002

[35] Morrison, Alison 1998. Small Firm Statistics: A Hotel Sector Focus. 1998. *Service Industries Journal,* 18: 132-42. DOI: https://doi.org/10.1080/02642069800000008

[36] Morrison, Alison, and Rhodri Thomas. 1999. The Future of Small Firms in the Hospitality Industry. *International Journal of Contemporary Hospitality Management* 11(4): 148-54. DOI:https://doi.org/10.1108/09596119910263531

[37] Moutinho, Luiz. 2013. Strategies for Tourism Destination Development: An Investigation of the Role of Small Businesses. In *Marketing Tourism Places (Rle Tourism)*, 104-22: Routledge.

[38] Nimawat, Dheeraj, and BD Gidwani. 2022. An Overview of Industry 4.0 in Manufacturing Industries. *International Journal of Industrial and Systems Engineering* 40(4): 415-54. DOI:https://doi.org/10.1504/IJISE.2022.122820

[39] Okumus, Fevzi, Anil Bilgihan, Ahmet Bulent Ozturk, and Xinyuan Zhao. 2017. Identifying and Overcoming Barriers to Deployment of Information Technology Projects in Hotels. *Journal of Organizational Change Management* 30(5): 744-66. DOI: https://doi.org/10.1108/JOCM-12-2015-0239

[40] Okumus, Fevzi, Levent Altinay, and Prakash Chathoth. 2010. *Strategic Management in the International Hospitality and Tourism Industry.* Routledge. DOI: https://doi.org/10.4324/9780080940465

[41] Oliveira, Tiago, and Maria Fraga Martins. 2011. Literature Review of Information Technology Adoption Models at Firm Level. *Electronic Journal of Information Systems Evaluation* 14(1): 110‐21.

[42] Oliveira, Tiago, Manoj Thomas, and Mariana Espadanal. 2014. Assessing the Determinants of Cloud Computing Adoption: An Analysis of the Manufacturing and Services Sectors. *Information and Management* 51(5): 497-510. DOI: https://doi.org/10.1016/j.im.2014.03.006

[43] Page, Stephen J., Pip Forer, and Glenda R. Lawton. 1999. Small Business Development and Tourism: Terra Incognita?". *Tourism Management* 20(4): 435-59. DOI: https://doi.org/10.1016/S0261-5177(99)00024-2

[44] Peillon, Sophie, and Nadine Dubruc. 2019. Barriers to Digital Servitization in French Manufacturing Smes. In *Procedia Cirp*, 146-50. DOI: https://doi.org/10.1016/j.procir.2019.04.008

[45] Poon, Simpson, and Paula MC Swatman. 1999. An Exploratory Study of Small Business Internet Commerce Issues. *Information and Management* 35 (1): 9-18. DOI: https://doi.org/10.1016/S0378-7206(98)00079-2

[46] Racherla, Pradeep, and Clark Hu. 2008. Ecrm System Adoption by Hospitality Organizations: A Technology-Organization-Environment (Toe) Framework. *Journal of Hospitality and Leisure Marketing* 17(1-2): 30-58. DOI: https://doi.org/10.1080/10507050801978372

[47] Rahayu, Rita, and John Day. 2017. E-Commerce Adoption by Smes in Developing Countries: Evidence from Indonesia. *Eurasian Business Review* 7: 25-41. DOI: https://doi.org/10.1007/s40821-016-0044-6

[48] Ramdani, Boumediene, Delroy Chevers, and Densil A. Williams. 2013. Smes' Adoption of Enterprise Applications: A Technology-Organisation-Environment Model. *Journal of Small Business Enterprise Development,* 20(4): 735-53. DOI: https://doi.org/10.1108/JSBED-12-2011-0035

[49] Ricaurte, Eric. 2012. The Hospitality Industry Confronts the Global Challenge of Sustainability.

[50] Rogers, Everett M, Arvind Singhal, and Margaret M Quinlan. "Diffusion of Innovations." In *An Integrated Approach to Communication Theory and Research*, 432-48: Routledge, 2014.

[51] Rothwell, Roy 1994. Issues in User–Producer Relations in the Innovation Process: The Role of Government. *International Journal of Technology Management* 9(5-7): 629-49. DOI:https://doi.org/10.1504/IJTM.1994.025594

[52] Saaty, Thomas L. 1991. Some Mathematical Concepts of the Analytic Hierarchy Process. *Behaviormetrika* 18(29): 1-9. DOI: https://doi.org/10.2333/bhmk.18.29_1

[53] Sara, Juliana, Rob M. Stikkelman, and Paulien M. Herder. 2015. Assessing Relative Importance and Mutual Influence of Barriers for Ccs Deployment of the Road Project Using Ahp and Dematel Methods. *International Journal of Greenhouse Gas Control* 41: 336-57. DOI: https://doi.org/10.1016/j.ijggc.2015.07.008

[54] Schwertner, Krassimira .2017. Digital Transformation of Business. *Trakia Journal of Sciences* 15(1): 388-93. DOI: 10.15547/tjs.2017.s.01.065

[55] Sima, Violeta, Ileana Georgiana Gheorghe, Jonel Subić, and Dumitru Nancu. 2020. Influences of the Industry 4.0 Revolution on the Human Capital Development and Consumer Behavior: A Systematic Review. *Sustainability* 12(10): 4035. DOI: https://doi.org/10.3390/su12104035

[56] Spencer, Andrew J, Dimitrios Buhalis, and Miguel Moital. 2012. A Hierarchical Model of Technology Adoption for Small Owner-Managed Travel Firms: An Organizational Decision-Making and Leadership Perspective. *Tourism Management,* 33(5): 1195-208. DOI: https://doi.org/10.1016/j.tourman.2011.11.01

[57] Stankovska, Ivana, Saso Josimovski, and Christopher Edwards. 2016. Digital Channels Diminish Sme Barriers: The Case of the Uk. *Economic Research-Ekonomska Istraživanja* 29(1): 217-32.

[58] Stockdale, Rosemary, and Craig Standing. 2004. Benefits and Barriers of Electronic Marketplace Participation: An Sme Perspective. *Journal of Enterprise Information Management* 17(4): 301-11. DOI:https://doi.org/10.1108/17410390410548715

[59] Taylor, Michael, and Andrew Murphy. 2004. Smes and E-Business. *Journal of Small Business and Enterprise Development* 11(3): 280-89. DOI: https://doi.org/10.1108/14626000410551546

[60] Thomas, Rhodri, and Huw Thomas. 2005. Understanding Tourism Policy-Making in Urban Areas, with Particular Reference to Small Firms. *Tourism Geographies* 7(2): 121-37. DOI:https://doi.org/10.1080/14616680500072323

[61] Thong, James YL. 1999. An Integrated Model of Information Systems Adoption in Small Businesses. *Journal of Management Information Systems* 15(4): 187-214. DOI: https://doi.org/10.1080/07421222.1999.11518227

[62] Tornatzky, Louis G, and Katherine, J. Klein. 1982. Innovation Characteristics and Innovation Adoption-Implementation: A Meta-Analysis of Findings. *IEEE Transactions on Engineering Management*, no. 1 (1982): 28-45. DOI: 10.1109/TEM.1982.6447463

[63] Tornatzky, Louis G, Mitchell Fleischer, and Alok K Chakrabarti. 1990. The Processes of Technological Innovation.

[64] Verevka, Tatiana V. 2019. Development of Industry 4.0 in the Hotel and Restaurant Business. *IBIMA Business Review,* 324071: 1-12. DOI: 10.5171/2019.324071

[65] Vogelsang, Kristin, Kirsten Liere-Netheler, Sven Packmohr, and Uwe Hoppe. 2019. Barriers to Digital Transformation in Manufacturing: Development of a Research Agenda." In *Making Digital Transformation Real*. Grand Wailea, Hawaii.

[66] Wang, Dan, Sangwon Park, and Daniel R Fesenmaier. 2012. The Role of Smartphones in Mediating the Touristic Experience. *Journal of Travel Research* 51(4): 371-87. DOI:https://doi.org/10.1177/0047287511426341

[67] Wang, Yi Shun, Hsien Ta Li, Ci Rong Li, and Ding Zhong Zhang. 2016. Factors Affecting Hotels' Adoption of Mobile Reservation Systems: A Technology-Organization-Environment Framework. *Tourism Management,* 53: 163-72. DOI: https://doi.org/10.1016/j.tourman.2015.09.021

[68] WTO. 2001. "E-Business for Tourism-Practical Guidelines for Destinations and Businesses (Russian Version)." World Tourism Organization.

[69] Yadegaridehkordi, Elaheh, *et al.* 2020. The Impact of Big Data on Firm Performance in Hotel Industry. *Electronic Commerce Research Applications* 40: 100921. DOI: https://doi.org/10.1016/j.elerap.2019.100921

[70] Yang, Lu, Baofeng Huo, Min Tian, and Zhaojun Han. 2021. The Impact of Digitalization and Inter-Organizational Technological Activities on Supplier Opportunism: The Moderating Role of Relational Ties. *International Journal of Operations and Production Management* 41(7): 1085-118. DOI:https://doi.org/10.1108/IJOPM-09-2020-0664

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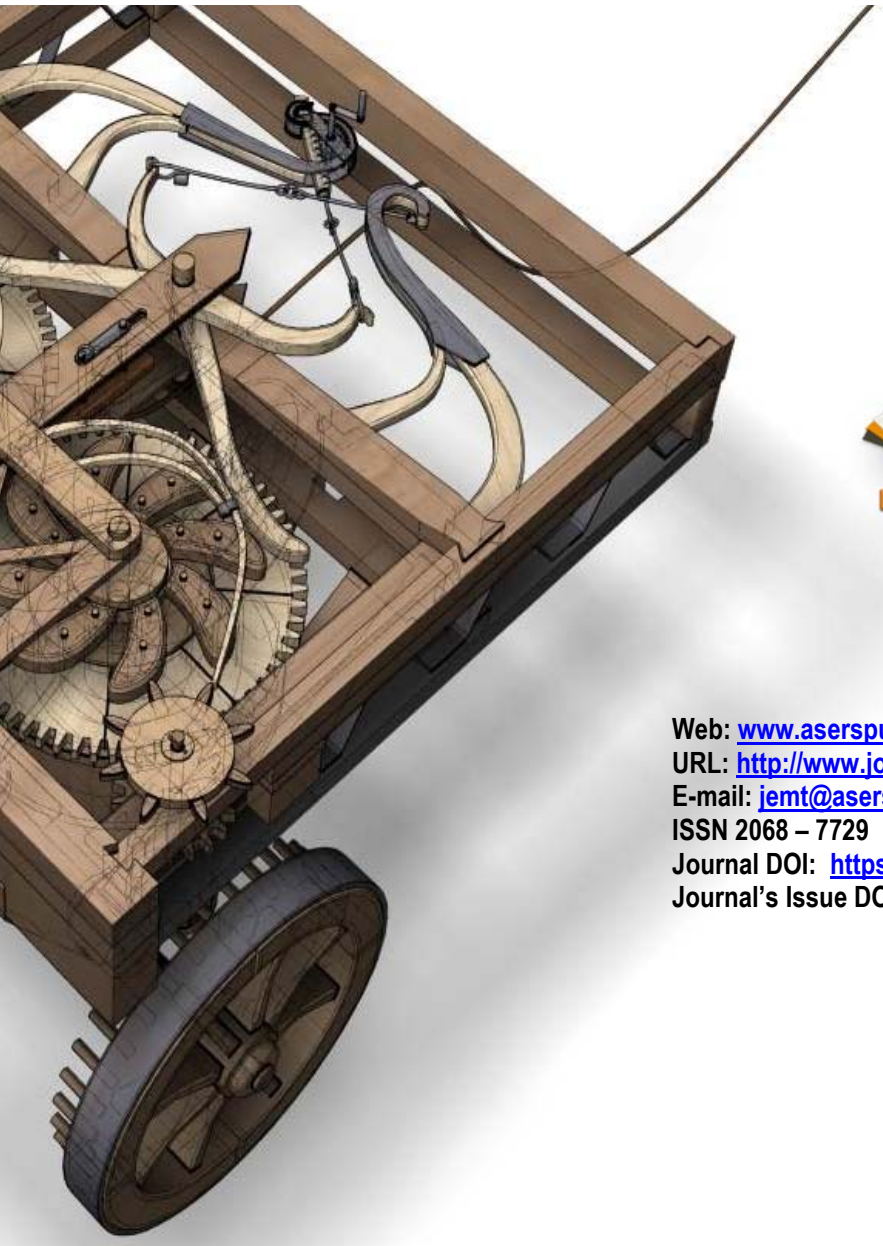

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