Indonesian Journal of Electrical Engineering and Computer Science
Vol. 40, No. 2, November 2025, pp. 1109~1120
ISSN: 2502-4752, DOI: 10.11591/ijeecs.v40.i2.pp1109-1120

Adoption of virtual tours for tourism promotion in Tegal Regency: a technology acceptance model analysis

Dairoh, Sharfina Febbi Handayani, Dwi Intan Af'idah
Informatics Engineering, Harkat Negeri University, Tegal, Indonesia

Article Info

Article history:

Received Oct 12, 2024
Revised Sep 1, 2025
Accepted Oct 15, 2025

Keywords:

Behavioral intention
Perceived ease of use
Perceived usefulness
Technology acceptance model
Tourism promotion
Virtual tour

ABSTRACT

Tegal Regency has various tourist attractions that have the potential to be increased as a stimulus for the district's economy. So that this potential can have an optimal positive impact, the tourist destination should be promoted to the general public to increase tourism visits. This effort can be carried out by utilizing existing technological developments through virtual tour (VT), but their implementation requires careful consideration. This study explored how perceived usefulness (PU), perceived ease of use (PEU), attitude, behavioral intention (BI), and tourism promotion (TP) relate to each other within the context of virtual tourism. Data were collected from 126 participants via an an online survey developed using the technology acceptance model (TAM) framework. The partial least squares structural equation modeling (PLS-SEM) method was employed for analyzing the data. The result revealed significant relationships between PU and ease of use, user attitudes (AT), and BIs. Furthermore, BI, PU, and PEU were all considerable predictors of TP. However, no significant relationship was found between user AT and BIs.

This is an open access article under the CC BY-SA license.

Corresponding Author:

Sharfina Febbi Handayani
Informatics Engineering, Harkat Negeri University
Mataram Street 9, Tegal, Central Java 52417, Indonesia
Email: sharfina.handayani@harkatnegeri.ac.id

1. INTRODUCTION

The restoration of Indonesia's tourism sector during the recovery phase after the pandemic is characterized by significant shifts in tourist behviour. This new landscape is not a simple return to past norms. It is defined by a resilient domestic market and travelers who are increasingly digital-first. The widespread adoption of smartphones and the increasing reliance on digital platforms for travel planning have opened new avenues for tourism promotion (TP) [1], [2]. These post-pandemic travelers now heavily rely on digital platforms to plan their trips, prioritizing destinations that offer unique experiences value, and a strong sense of safety. This evolution in customer behavior presents both a critical challenge and significant opportunity for regional tourism development.

Tegal Regency in Central Java, Indonesia, boasts diverse natural, cultural, and man-made tourist destinations, presenting a significant opportunity to boost the regional economy. To optimize the economic contribution of these tourist destinations, stakeholders and tourism industry players need to focus on increasing visitor numbers to various attractions [3]. Despite the potential of Tegal Regency's tourism sector, recent statistics from the Central Bureau of Statistics reveal a decline in visitor numbers. Guci Hot Springs, a key attraction in Tegal Regency, experienced a 3.82% drop in domestic tourist visits in 2023, with 664,803 visitors in comparison with the prior year. This highlights the need for effective strategies to support tourism growth and stimulate visitor arrivals in the area. [4]. This decline is not an isolated statistic but rather

evidence of the region's struggle to compete in a new, dynamic tourism landscape, underscoring an urgent need for innovative promotional strategies.

In response to these promotional challenges and the need to optimize tourism potential, virtual tour (VT) technology emerges as a timely and strategic solution. A VT is a powerful tool perfectly suited to address the opportunities of the post-pandemic era, allowing a destination like Tegal to reach a vast domestic audience that plans travel online and level the promotional playing field with more established tourism hubs. Research has shown that VT may considerably impact potential visitors' viewpoints and planned behaviors, with elements like accessibility, virtual presence, and interactivity affecting user enjoyment and arousal [5]. The fundamental constructs of the technology acceptance model (TAM), namely perceived usefulness (PU) and perceived ease of use (PEU), have been substantiated as core factor of VT adoption [6], and TAM's applicability has been validated across various technological services including smartphone applications and smart city innovations [7], [8].

However, despite the potential of VT to overcome geographical and time-based limitations, challenges remain. Research indicates varying emotional experiences among users [9] and has identified gaps between virtual experiences and true cultural understanding [10]. There are also limitations in VT's effectiveness for learning about specific sites like museums [11], findings which are particularly relevant for Tegal's attractions such as the Semedo Site Museum. While some local studies have explored VT for promotion during pandemic restrictions [12], and the potential for economic growth is recognized [13], the sustained implications of VTs on actual tourist visits remains largely unknown, especially for a region with diverse offerings like Tegal Regency.

From a theoretical perspective, this study provides a unique impact on the TAM literature by extending its traditional boundaries. While the majority of TAM studies conclude their analysis by predicting behavioral intention (BI) or self-reported system use, our purposed model investigates the downstream effects of TAM's core constructs on a tangible, real-world marketing outcome: Tourism promotion (TP). By operationalizing and empirically validating TP as an endogenous variable influenced directly and indirectly by PU, PEU, and BI, this research offers a more comprehensive framework. It bridges the crucial gap between an individual's aptitude to adopt digital system and the technology's ultimate effectiveness as a promotional tool, offering a novel and practical extension for research in tourism technology and digital marketing.

2. THE RELATED WORK AND HYPOTHESES DEVELOPMENT

Several ideas were recently proposed aimed at providing fresh insights into IT utilization and adoption [14]. Several theoretical frameworks provide insights into technology adoption, including the theory of reasoned action (TRA) places emphasis on attitudinal orientations and commitments [15], while TAM accentuates PU and PEU [16]. The theory of planned behavior (TPB) highlights the feeling of control and ease of task completion [17]. TAM suggests that individuals exhibit a greater inclination to utilize and have an approving perspective of technology they perceive as useful and easy to use [18], [19]. TAM is a popular way to understand why people use technology. It was first used to study how small and medium businesses adopted knowledge management technology [20]. Its simplicity and effectiveness have made it a key model for understanding online streaming services [21]. PU and PEU are the two principal constructs underlying TAM [22], [23]. These aspect help explain whether someone will use a technology and keep using it. TAM has additionally been adopted for analyzing how people use technology in tourism, like when visiting destinations or using VT [24], [25].

Researchers continue exploring and investigating new factors to improve TAM, which is often used to understand why people use technologies like VT [26]. For example, studies in Indonesia [27] and Philippines [28] have utilized TAM to comprehend what encourages people to utilize VT. PU, PEU, and sustainability are key to understanding the adoption of VT. Other research shows that VT can even affect travelers' preferences for visiting destinations in person [29], [30]. This means VT can be a powerful promotional tool for places like Tegal Regency, Central Java, and Indonesia, and it's crucial to understand what makes them effective.

Using a TAM-based conceptual model to understand how people experience VT, we analyze how PU and ease of use impact virtual tourism (VT) experiences [31]. Some studies show that PU and PEU influence whether people find the technology useful [32], [33], but research on their impact on user attitude is mixed. Some studies found a strong impact [34], [35], others found no impact [18], and some didn't even examine the relationship [36]. Similarly, when looking at how PU and PEU affect attitudes (AT) toward information systems and technology in tourism, some studies show a significant impact [25], [27], [37]. While others don't explore this relationship [19], [38]. Constructed on the TAM, our study aims to understand how travelers and potential tourists feel about using VT.

PU refers to how users believe a technology is expected to improve their performance or experience. When users find a VT beneficial for planning trips or gaining deeper insights into destinations, they tend to form more positive AT toward using the technology. Studies have shown that PU significantly contributes to attitude formation in tourism applications and smart destination platforms, reinforcing its role in influencing technology acceptance in tourism settings [18], [25]. PEU reflects how effortless users believe interacting with a system will be. If users find the VT platform intuitive and easy to navigate, their attitude toward continued use will likely improve. Previous literature supports the idea that ease of access and clear interface design positively affect user satisfaction and attitude, especially in web-based tourism applications [27], [38]. As a result, our initial two hypotheses for research are outlined below,

H1. PU provides an effect on user AT

H2. PEU provides an effect on user AT

People develop positive AT towards products or services when they have good experiences with them [39]. These AT can directly or indirectly influence their intention to use those products or services [40]. Essentially, a person's attitude and their behavior are closely linked [41]. Positive AT often increase the intention to use something. TAM has been applied to understand public perceptions about and use new technologies. Several other studies have similarly corroborated the effect of attitude on BI [42], [43]. For example, studies have shown that positive AT towards social networking in tourism encourage continued use [44]. According to other previous research results, smart tourism technology greatly impacted AT regarding PEU and PU. Additionally, it was discovered that attitude exerted a direct influence on BI [25], [39]. Even when looking at new promotion technology, customer AT impact their BI [45]. Consequently, these results show that intention is influenced by attitude. Thus, the following hypothesis is put forward:

H3. User AT provide an effect on BI

TAM asserts that PU and PEU drive the implementation and exploitation of technology [16]. Essentially, if people believe something is straightforward to utilize, they have a greater tendency to see its value and want to use it [46], [47]. This has been supported by studies in Indonesia that looked at the use of VT technology. One study revealed that PEU increased PU, and both encouraged people to utilize VT [48]. Another experiment demonstrated that PU and PEU significantly influenced people's BI to use VT [38], [49] The proposed hypothesis, therefore, reads as follows,

H4. PU provides an effect on BI

H5. PEU provides an effect on BI

VT can significantly impact travel decisions. One study found that immersive VTs affect individuals' intentions to committed in digital tourism and even travel in person [26]. This highlights the potential of VT as a marketing tool and emphasizes the need for effective promotion and development strategies in this sector. Another study confirmed that positive experiences with VT increase people's desire to visit a destination in person, suggesting that VT can effectively affect TP [50]. This notion depicts the interaction between BIs that encourage travelers to visit tourist destinations. Accordingly, the hypothesis for this relationship is stated as follows,

H6. BI provides an effect on TP

VT is becoming increasingly important for tourism. They allow business to showcase their offerings and provide personalized experiences, which can improve customer satisfaction [51]. Many researchers believe virtual tourism complements real-life tourism [5], [26], [28], [50]. The study promoted the recruiting posts on Weibo to people who were possibly interested in participating in the virtual tourist experience. Consequently, through the provision of realistic virtual environments and immersive tourism encounters, VT improves travelers' intention to rush to the destination directly [50]. Another study highlighted that VT can contribute to the sustained development of tourism sites by generating new revenue streams for local communities and promoting environmental and cultural awareness [52], [53]. Essentially, VT can be a powerful marketing tool. They can provide engaging experiences that encourage people to visit a destination in person [26].

Empirical evidence shows that PU and ease of use in term of digital tourism can effectively generate interest in and attract tourists to the actual destinations represented [5]. For example, people who enjoyed using 3D VTs of tourist attractions were more likely to visit those places in real life [54]. These two studies highlight how VT can indirectly boost TP by influencing people's perceptions and intentions. Therefore, the next hypothesis relates to:

H7. PU provides an effect on TP

H8. PEU provides an effect on TP

The proposed framework has eight hypotheses combined into a model concept. The conceptual framework of this current research framework is depicted in Figure 1.

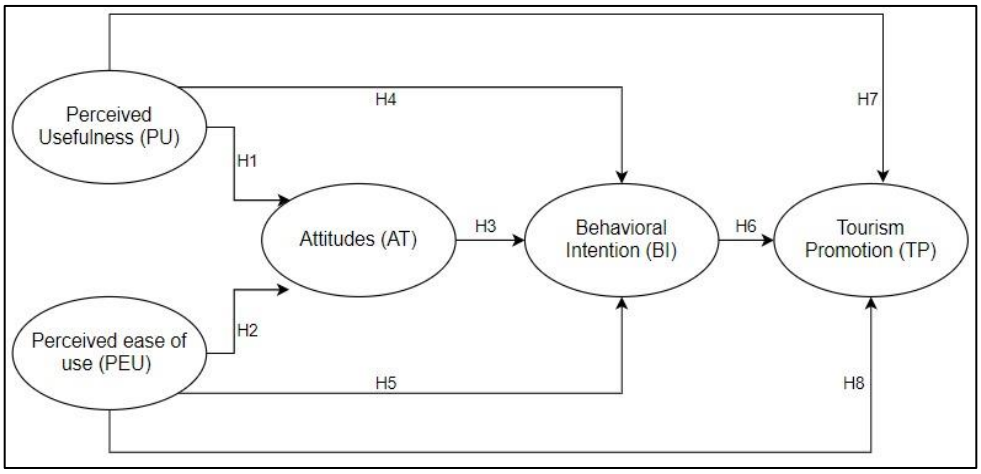

Figure 1. Research model

3. METHOD

3.1. Instruments development

To guarantee the correctness and suitability of the data gathering method, a three-step instrument development process was followed. First, the questionnaire was designed through the adaptation of items from previously standardized measures in the TAM literature to guarantee content and trustworthiness [6], [8], [20], [28], [46] and then modified to align with the particular aims of this study. The components of the research were assessed through a Likert scale with a score of 5, with respondents instructed to express their degree of agreement on an index extending from 1 (totally disagree) to 5 (absolutely agree). The 20-statement questionnaire measured PE, PEU, AT, BI, and TP. Indicators for PU and PEU were derived from seminal experiments [18], [25], [28], [16]. Similarly, items for Attitude [32], [55], BI [8], [56], and TP [50] were drawn from validated sources and adapted to the context of of virtual tourism in Tegal Regency. The final indicators corresponding to each attribute are listed in Table 1.

Table 1. Variable question indicator

Variable	Constructs
Perceived Usefulness (PE)	X1 = useful in helping plan and experience
	X2 = beneficial in enhancing the travel experience
	X3 = provides a good overview
	X4 = Improve knowledge about virtual tours
	X5 = assists in using exploration time
	X6 = helpful for obtaining travel information
Perceived Ease of Use (PEU)	X7 = easy to use when planning and exploring travel
	X8 = easy to understand information during exploration
	X9 = provide instruction that make easy to use
	X10 = flexible interactive experience
	XII = skillful in exploring virtual tour
Attitude (AT)	X12 = feel comfortable during virtual tour
	X13 = feel happy during virtual tour
	X14 = feel benefit during virtual tour
Behavioral Intention (BI)	X15 = intend to use for tourism exploration
	X16 = recommend others to use virtual tour website
	X17 = use virtual tour in planning vocations
Tourism Promotion (TP)	X18 = learn more in personally about tourism information in Tegal regency
	X19 = interested in personally visiting tourism location in Tegal regency
	X20 = recommend others to visit tourism locations in Tegal regency

Second, following the adaptation, the preliminary questionnaire was submitted to a panel consisting of five experts for review. This panel comprised two academics from Informatics Engineering Department with expertise in human-computer interaction and three representatives from the Tegal Regency Youth, Sport and Tourism Office. The experts reviewed the items for clarity, relevance, and linguistic appropriateness for the target population. Minor linguistic revisions were carried out based on the experts's suggestions to ensure the instrument was contextually valid and easily understood by participants.

Finally, the validation of the instrument was conducted through the assesment of data as presented in the measurement model section. All dimensions exhibited high levels of internal reability and convergent validity, with Cronbach's Alpha values spanned from 0.767 to 0.885 and average variance extracted (AVE) values exceeding the 0.50 threshold. These strong psychometric properties confirm that the adapted instrument was reliable and valid for this research.

3.2. Data collection

A purposive sampling approach was utilized to guarantee credibility, transferability, dependability, and confirmability [57], with the goal of accurately extrapolating findings to the target population. The data gathering process was administered online using Google Forms and took place from September 2023 to October 2023. The target population consisted of residents of Tegal, Central Java, Indonesia, who were actively involved in or had an interest in tourism within the region. In total, 126 completed survey responses were obtained to conduct this analysis. Table 2 displays the demographic profile of the participants. The majority (62.7%) were female, while 37.3% were male. The findings show that most respondents (56.3%) fall within the age range of 17 to 26. The findings indicate that younger respondents are more inclined to travel than their counterparts. About the frequency of travel, most participants (44.4%) reported traveling between 1 to 3 times a year. A key finding from the profile is that a slight majority (52.4%) do not currently use VT technology when exploring tourism sites, which underscores the relevance of this study in understanding adoption intentions.

Table 2. Participants characteristics

Profile	Frequency	Percent
Gender		
Male	47	0.373
Female	79	0.627
Age		
Under 17 years old	16	0.127
17-26 years old	71	0.563
26-35 years old	22	0.175
Above 35 years old	17	0.135
Travelling intensity in a year		
Less than 1 times	11	0.087
1-3 times	56	0.444
4-6 times	27	0.214
More than 6 times	32	0.253

3.3. Data analysis

Partial least squares structural equation modeling (PLS-SEM) was applied to analyze the gathered data, implemented in SmartPLS 3.0. This research employed a modified TAM incorporating user attitude, BI, and TP as latent variables. Following established procedures [58], the analysis was performed through a two-step process. Initially, the outer model was assessed to evaluate the associations between latent constructs and their respective indicators, confirming reliability and validity. Second, the inner model was assessed to test the hypothesized associations among latent variables. This structural model was constructed on the basis of the modified TAM framework in this present exeperiment.

4. RESULTS AND DISCUSSION

4.1. Descriptive statistics

The experiment findings were further investigated using a descriptive approach. Table 3 provide the outline statistics of the research. The mean PU score was 0.7935, as long as PEU received an average score about 0.7858. The average value of attitude is 0.841, followed by behavior intention at 0.8396, and the TP value is 0.8256. The results indicate high PU, PEU, attitude, BI, and TP associated with the Tegal tourism VT website. High PU suggests that the VT effectively addresses community needs by providing information that satisfies curiosity about tourist attractions and offers a comprehensive overview of Tegal's destinations, aiding decision-making. High PEU indicates that that website facilitates convenient exploration of Tegal's tourist destinations. The readily accessible and informative nature of The website enhances the overall user experience. The Tegal tourism VT's PU and ease of use have a favorable effect on user AT and BIs. Users perceive the VT as comfortable, enjoyable, and useful, leading to an increased intention to explore tourism offerings. This, in turn, contributes to the optimization of TP efforts.

Table 3. Descriptive statistics

Code	Items	Mean	Std. Deviation
PU1	The Tegal tourism website is useful in helping you plan or experience your travel destinations	0.751	0.037
PU2	The Tegal tourism website is beneficial in enhancing your overall travel experience	0.858	0.026
PU3	The Tegal tourism website provides a good overview of what you will directly experience	0.738	0.059
PU4	The Tegal tourism website helps you improve your knowledge about the visited virtual exploration sites	0.801	0.041
PU5	The Tegal tourism website assists you in using your exploration time effectively	0.809	0.032
PU6	The Tegal tourism website is helpful for you in obtaining travel information	0.804	0.043
PEU1	The Tegal tourism website is easy to use when planning or exploring your travel destination	0.780	0.047
PEU2	The Tegal tourism website makes it easy for you to understand the information presented during virtual exploration	0.797	0.044
PEU3	The Tegal tourism website provides instructions that make virtual exploration easy for you	0.739	0.049
PEU4	The Tegal tourism website can offer a flexible, interactive experience for you during virtual exploration	0.844	0.028
PEU5	The Tegal tourism website can help you become more skillful in virtual exploration	0.769	0.035
AT1	The Tegal tourism website makes you feel comfortable during virtual exploration.	0.885	0.030
AT2	The Tegal tourism website makes you feel happy during virtual exploration.	0.855	0.028
AT3	The Tegal tourism website makes you feel that you benefit from virtual exploration.	0.783	0.057
BI1	You intend to use the Tegal tourism website for tourism exploration purposes	0.794	0.042
BI2	You would recommend others to use the Tegal tourism website	0.881	0.031
BI3	You will frequently visit the Tegal tourism website and use virtual exploration in planning your vacations	0.844	0.029
TP1	After conducting virtual exploration using the Tegal tourism website, you want to learn more in personally about tourism information in Tegal Regency	0.782	0.054
TP2	After conducting virtual exploration using the Tegal tourism website, you are interested in personally visiting tourist locations in Tegal Regency	0.858	0.035
TP3	After conducting virtual exploration using the Tegal tourism website, you will recommend others personally to visit tourist locations in Tegal Regency	0.837	0.031

4.2. Measurement model

PLS-SEM was employed to evaluate the trustworthiness and correctness of the measurement model (Outer model). As presented in Table 4, all dimensions revealed strong internal coherence. Cronbah's alpha observed values fell within the interval of 0.767 to 0.885, and all composite reliability (CR) count surpassed the recommended threshold [21], [59]. Validity of convergen was settled as all outer loadings for the barometers were powerfull and outperformed the 0.70 benchmark, varying between 0.739 and 0.889 [60]. Furthermore, the AVE for every dimension, outperformed the lowest required value of 0.50, demonstrating that each dimension captures more than fifty percent of the variance of its measurement items [61]. Figure 2 illustrate the result of the outer model.

Table 4. The measurement model statistics

Construct	Items	Outer Loadings	Cronbach Alpha	Composite Reliability	Average Variance Extracted (AVE)	Explanation
Perceived ease of use	PEU1	0.783	0.847	0.891	0.621	Valid & Reliable
	PEU2	0.801				
	PEU3	0.739				
	PEU4	0.843				
	PEU5	0.768				
Perceived usefulness	PU1	0.752	0.885	0.913	0.636	Valid & Reliable
	PU2	0.861				
	PU3	0.746				
	PU4	0.799				
	PU5	0.809				
	PU6	0.811				
Attitude	AT1	0.889	0.799	0.882	0.714	Valid & Reliable
	AT2	0.853				
	AT3	0.791				
Behavioral intention	BI1	0.794	0.791	0.878	0.706	Valid & Reliable
	BI2	0.881				
	BI3	0.844				
Tourism promotion	TP1	0.780	0.767	0.866	0.683	Valid & Reliable
	TP2	0.861				
	TP3	0.836				

Divergent validity was verified by employing the Heterotrait-Monotrait (HTMT) ratio of interrelationship, as all values conformed to the acceptable limits established in the criteria. Table 5 presents

the HTMT statistics. The rightness of fit (GoF) was assessed for the estimated model as well as the saturated model. The standardized root mean square residual (SRMR) was 0.084, Reflecting an acceptable model fit because it approximates the standard upper threshold of 0.08 [62]. This model demonstrates that TP can be explained by four dimensions: PEU, PU, user attitude (AT), and BI. The allegation of this assessment are detailed in Table 6.

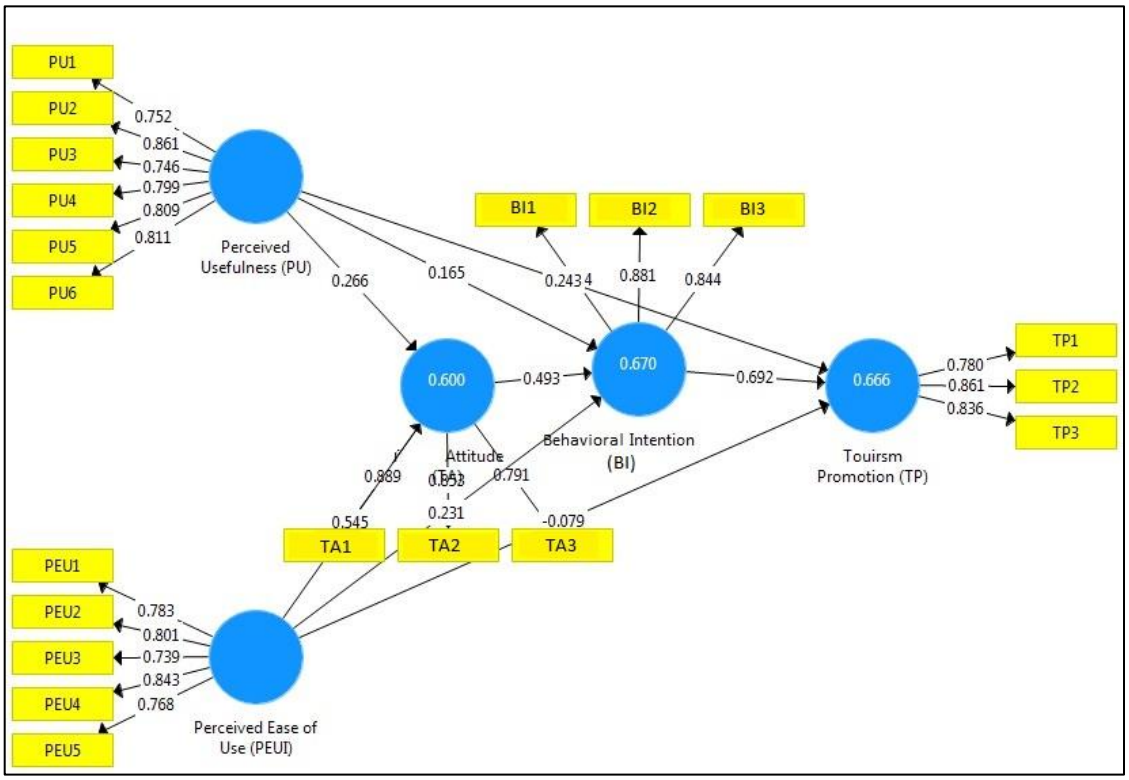

Figure 2. The result of the measurement model

Table 5. HTMT statistics

	PEU	PU	TA	TI	TP
PEU					
PU	0.923				
TA	0.917	0.828			0.914
BI	0.896	0.824	0.986		1.022
TP	0.767	0.795			

Table 6. Model fit summary

	Saturated Model	Estimated Model
SRMR	0.083	0.084
d_ULS	1.457	1.457
d_G	0.928	0.936
Chi-Square	623.908	628.136
NFI	0.679	0.677

4.3. Structural modeling

The evaluation of the architectural model was performed to validate the hypothesized affiliation [63], [64]. The model's explanatory power was evaluated using the coefficient of determination (R^2). As shown in Table 7, the the model demonstrates 60.0% of the variance in User Attitude, 67.0% in BI, and 66.6% in TP, all of which indicate substantial explanatory power. Table 8 demonstrates that the model's predictive relevance was validated through Stone-Geisser's Q^2 values, all of which exceeded zero for the dependent constructs, demonstrating that the model has predictive accuracy. The detailed path coefficient (β), t-statistics, and p-values for each interpretation are provided in Table 9.

Table 7. R-square coefficients

Variable Latent Endogenous	R-Square	R-Square Adjusted
User Attitude (AT)	0.600	0.593
Behavioral Intention (BI)	0.670	0.662
Tourism Promotion (TP)	0.666	0.657

Table 8. Q-square coefficients

	SSO	SSE	Q2
Perceived Usefulness (PU)	756000	756000	
Perceived Ease of Use (PEU)	630.000	630.000	
Attitude (AT)	378.000	220.003	0.418
Behavioral Intention (BI)	378.000	205.704	0.456
Tourism Promotion (TP)	378.000	216.475	0.427

Table 9. Path coefficients, t-statistics, and significance levels

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values	Significance	Hypothesis Testing
Perceived Usefulness (PU) → Attitude (AT)	0.266	0.267	0.124	2.148	0.032	Major	Proven
Perceived Ease of Use (PEU) → Attitude (AT)	0.545	0.535	0.121	4.517	0.000	Major	Proven
Attitude (AT) → Behavioral Intention (BI)	0.493	0.486	0.083	5.956	0.000	Major	Proven
Perceived Usefulness (PU) → Behavioral Intention (BI)	0.296	0.306	0.138	2.141	0.033	Major	Proven
Perceived Ease of Use (PEU) → Behavioral Intention (BI)	0.499	0.486	0.131	3.819	0.000	Major	Proven
Behavioral Intention (BI) → Tourism Promotion (TP)	0.692	0.686	0.084	8.239	0.000	Major	Proven
Perceived Usefulness (PU) → Tourism Promotion (TP)	0.448	0.439	0.148	3.020	0.003	Major	Proven
Perceived Ease of Use (PEU) → Tourism Promotion (TP)	0.266	0.271	0.142	1.868	0.062	Minor	Unproven

4.4. Hypothesis testing and discussion

The outcomes of the hypothesis examination are outlined in Table 10. The first hypothesis (H1) and second hypothesis (H2) were supported, indicating that both PU and PEU exert a considerable and positive affect on user AT. This propose that when users find the VT website helpful for planning and easy to navigate, their attitude towards the technology improves. This align with TAM's core premise and highlights the need for developers to focus on both functionality and user-friendly design.

Table 10. Summary of hypothesis test

Hypothesis	Significance	Hypothesis testing
Perceived usefulness (PU) has a positive effect on user attitudes (AT)	Major	Proven
Perceived ease of use (PEU) has a positive effect on user attitudes (AT)	Major	Proven
User attitudes (AT) have a positive effect on behavioral intention (BI)	Minor	Proven
Perceived usefulness (PU) has a positive effect on behavioral Intention (BI)	Major	Proven
Perceived ease of use (PEU) has a positive effect on behavioral Intention (BI)	Major	Proven
Behavioural intention (TI) has a positive effect on tourism promotion (TP)	Major	Proven
Perceived usefulness (PU) has a positive effect on tourism promotion (TP)	Major	Proven
Perceived ease of use (PEU) has a positive effect on tourism promotion (TP)	Major	Unproven

The third hypothesis (H3), which posited that user attitude (AT) positively affects BI, was strongly supported by the data (t-statistic = 5.956, p-value = 0.000, path coefficient = 0.493). This result is strongly aligned with the foundational theories of reasoned action (TRA) and TAM, which establish attitude as a primary determinant of intention. The result confirms that when users from a positive attitude towards the Tegal tourism VT perceiving it as comfortable, enjoyable and beneficial (AT1, AT2, AT3). They are significantly exhibit a stronger likelihood of intending to use it for future travel planning and encourage others to use it. This emphasizes the essential importance of the affective user experience in driving technology adoption.

Hypothesis H4 and H5, proposing that PU and PEU positively influence BI, were also supported. This illustrates that the perceived utility and simplicity of the VT website directly encourage users to intend to use it more, which can stimulate word-of-mouth promotion. Similarly, H6 and H7 were supported, showing that BI and PU are significant predictors of TP. When the VT is useful and users intend to engage with it, they are more likely to learn about Tegal's tourism destinations, develop an interest in visiting, and recommend them to others. Finally, H8, which proposed a direct link between PEU and TP, was not supported (p-value = 0.062), suggesting that while ease of use is essential for forming positive AT and intentions, its direct impact on final promotional outcome is less significant than that of PU.

While the strong, positive association between between attitude and BI align with establish TAM literature, this finding gains additional significance when considered within the Indonesian cultural context. Indonesia is characterized as a society with high power distance and a strong collectivist orientation. In such cultures, social influence and group norms are often powerful predictors of individual behavior. One might, therefore, expect the influence of personal attitude to be diminished relative to social factors. However, our findings show that an individual's positive affective response (Attitude) remains a robust and direct predictor of their BI. This suggests that the VT experience is sufficiently compelling and personal to create a strong intrinsic motivation that operates powerfully alongside, or perhaps even independent of, broader social

pressures. This reinforces the cross-cultural applicability of the core attitude-intention link within TAM, while also highlighting that well-designed, engaging technologies can foster strong individual-level acceptance even in highly collectivist societies.

This experiment offers actionable insights for management of tourism. To leverage the VT as an effective promotional tool, tourism stakeholder must prioritize three key areas. First, PU is a direct driver of promotional success ($\beta = 0.448$). Therefore, the VT must transcend being a mere visual showcase and function as a practical planning utility. It should be enriched with comprehensive, up-to-date information, such as operating hours, ticket prices, and local amenities, to maximize its value to potential visitors. Second, PEU was the most powerful predictor of user Attitude ($\beta = 0.545$) and Intention ($\beta = 0.499$). This suggests that a streamlined, intuitive user experience is non-negotiable. To prevent user abandonment, the platform must be optimized for all devices, featuring fast load times and clear navigation. Finally, because Attitude strongly mediates user intention, the VT's design must elicit a positive affective response. High-quality visuals and engaging narratives are essential to create an enjoyable experience that not only fosters platform use but also encourages subsequent physical visits to the destination.

While this experiment accomodates valuable insights, there are two limitations that provide clear directions for future research. Initially, the generalizability of our results is constrained by a demographically homogeneous sample, which consists predominantly of young, female participants. This profile may not represent all potential tourist segments. Second, the cross-sectional research design, while effective for identifying significant associations, precludes any definitive claims of causality between the variables. To build upon this work, future investigations should adopt more robust methodologies. We strongly recommend longitudinal studies to empirically test the causal relationship between VT usage and actual travel behavior, addressing the limitation of our current design. Furthermore, applying a mixed-methods methodology that integrates qualitative interviews would provide invaluable context and a deeper understanding of the user perceptions identified in our quantitative model. Finally, future models could be enriched by incorporating additional variables, such as users' prior technology experience or specific cultural dimensions, to enhance the framework's explanatory power.

5. CONCLUSION

This study successfully applied a TAM to investigate the factors fostering the utilization of VT websites for TP in Tegal Regency. The findings confirm that PU and PEU of the VT cultivate a positive user attitude, which in turn strongly predicts the BI to utilize the technology. Ultimately, this intention translates into tangible TP outcomes. The primary contribution of this research is its empirical validation of a model that bridges the gap between individual technology acceptance and real-world marketing impact. By moving beyond mere intention, this study provides a more holistic framework for considerate how VT applications function as effective promotional tools. For tourism authorities in Tegal Regency and other similar destinations, this research offers an empirically-grounded roadmap. It highlights that strategic investment in creating VTs that are not only functionally useful and easy to navigate but also aesthetically pleasing and enjoyable is critical for driving tourist interest and supporting regional economic revitalization in an increasingly digital world.

ACKNOWLEDGMENTS

The authors would like to sincerely thank the Youth, Sport and Tourism Office of Tegal Regency for the institutional support provided throughout this research. We also extend our thanks to the UPTD Guci Tourist Destination Guci, UPTD Cacaban Lake Tourist Park, and the management of Semedo Site Museum for their valuable assistance and facilitation during field activities. Special appreciation is also given to the *Kelompok Sadar Wisata* (Pokdarwis) of Lembah Rembulan Tourism Village, Cempaka Tourism Village, Kalimus Tourism Village, and Karangcengis Tourism Village, whose insights and local engagement were instrumental in the data collection process. Their contributions greatly enriched the relevance and contextual understanding of this research. We also acknowledge the contribution of students and academic staff from the Department of Informatics Engineering, Harkat Negeri University, who assisted in administering the survey and providing technical support. Lastly, we express our gratitude to the Center for Research and Community Service Harkat Negeri University for their research facilitation and administrative support throughout this project.

FUNDING INFORMATION

This research was entirely supported by the "*Penelitian Produk Vokasi*" grant provided by the Ministry of Research, Technology, and Higher Education of the Republic of Indonesia, under contract 01.16/P3M.PHB/VI/2023.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Dairoh	✓	✓	✓		✓	✓	✓		✓			✓		✓
Sharfina Febbi Handayani	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	
Dwi Intan Af'idah	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

REFERENCES

[1] R. K. Dzogbenuku and D. K. Kumi, "Exploring the key drivers of internet behaviour among the youth of emerging markets: The case of Ghana," *Global Knowledge, Memory and Communication*, vol. 67, no. 8–9, 2018, doi: 10.1108/GKMC-01-2018-0005.

[2] A. Preko, G. K. Amoako, R. K. Dzogbenuku, and J. Kosiba, "Digital tourism experience for tourist site revisit: an empirical view from Ghana," *Journal of Hospitality and Tourism Insights*, vol. 6, no. 2, pp. 779–796, 2023, doi: 10.1108/JHTI-10-2021-0294.

[3] M. H. Hidayattuloh, A. N. Bambang, and A. Amirudin, "The green economy concept as development strategy of Cempaka tourism village toward sustainable tourism development," *The Indonesian Journal of Planning and Development*, vol. 5, no. 1, pp. 30–37, 2020, doi: 10.14710/ijpd.5.1.30-37.

[4] B. P. Statistik, "Tegal Regency in figures 2024," 2024, [Online]. Available: https://tegalkab.bps.go.id/id.

[5] O. El-Said and H. Aziz, "Virtual tours a means to an end: an analysis of virtual tours' role in tourism recovery post COVID-19," *Journal of Travel Research*, vol. 61, no. 3, pp. 528–548, 2022, doi: 10.1177/0047287521997567.

[6] Y. C. Huang, L. N. Li, H. Y. Lee, M. H. E. M. Browning, and C. P. Yu, "Surfing in virtual reality: An application of extended technology acceptance model with flow theory," *Computers in Human Behavior Reports*, vol. 9, 2023.

[7] M. Jeong and H. H. Shin, "Tourists' experiences with smart tourism technology at smart destinations and their behavior intentions," *Journal of Travel Research*, vol. 59, no. 8, pp. 1464–1477, 2020, doi: 10.1177/0047287519883034.

[8] Y. Liu, J. Henseler, and Y. Liu, "What makes tourists adopt smart hospitality? An inquiry beyond the technology acceptance model," *Digital Business*, vol. 2, no. 2, 2022, doi: 10.1016/j.digbus.2022.100042.

[9] L. K. Cheng and H. L. Huang, "Virtual tourism atmospheres: The effects of pleasure, arousal, and dominance on the acceptance of virtual tourism," *Journal of Hospitality and Tourism Management*, vol. 53, 2022, doi: 10.1016/j.jhtm.2022.10.002.

[10] E. Champion, "Virtual environments: constraints and possibilities," pp. 21–34, 2022, doi: 10.1007/978-3-031-10932-4_2.

[11] C. Kyrlitsias, M. Christofi, D. Michael-Grigoriou, D. Banakou, and A. Ioannou, "A virtual tour of a hardly accessible archaeological site: The effect of immersive virtual reality on user experience, learning and attitude change," *Frontiers in Computer Science*, vol. 2, 2020, doi: 10.3389/fcomp.2020.00023.

[12] D. I. Af'idah, D. Dairoh, A. Susanto, A. Rachman, S. F. Handayani, and R. W. Pratiwi, "Utilization of virtual tours as a promotional strategy during the pandemic for Lembah Rembulan tourism," *Community Empowerment*, vol. 7, no. 2, pp. 246–252, 2022, doi: 10.31603/ce.5350.

[13] E. Polishchuk, Z. Bujdosó, Y. El Archi, B. Benbba, K. Zhu, and L. D. Dávid, "The theoretical background of virtual reality and its implications for the tourism industry," *Sustainability (Switzerland)*, vol. 15, no. 13, 2023, doi: 10.3390/su151310534.

[14] B. Ly and R. Ly, "Internet banking adoption under technology acceptance model-evidence from Cambodian users," *Computers in Human Behavior Reports*, vol. 7, 2022, doi: 10.1016/j.chbr.2022.100224.

[15] M. Fishbein and I. Ajzen, "An introduction to theory and research," *Belief, Attitude, Intention, and Behavior*, 1975.

[16] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly: Management Information Systems*, vol. 13, no. 3, pp. 319–339, 1989, doi: 10.2307/249008.

[17] I. Ajzen, "The theory of planned behavior," *Organizational Behavior and Human Decision Processes*, vol. 50, no. 2, pp. 179–211, 1991, doi: 10.1016/0749-5978(91)90020-T.

[18] S. R. Natasia, Y. T. Wiranti, and A. Parastika, "Acceptance analysis of NUADU as e-learning platform using the technology acceptance model (TAM) approach," *Procedia Computer Science*, vol. 197, pp. 512–520, 2021, doi: 10.1016/j.procs.2021.12.168.

[19] W. Senalasari, L. Setiawati, and N. Wibisono, "The role of technology acceptance and readiness on intention to adopt virtual tourism technology during the new normal era," pp. 212–217, 2022, doi: 10.2991/978-2-494069-83-1_38.

[20] J. J. Siregar, R. A. A. Wardaya Puspokusumo, and A. Rahayu, "Analysis of affecting factors technology acceptance model in the application of knowledge management for small medium enterprises in industry creative," *Procedia Computer Science*, vol. 116, pp. 500–508, 2017, doi: 10.1016/j.procs.2017.10.075.

[21] M. A. Camilleri and L. Falzon, "Understanding motivations to use online streaming services: integrating the technology acceptance model (TAM) and the uses and gratifications theory (UGT)," *Spanish Journal of Marketing - ESIC*, vol. 25, no. 2, pp. 217–238, 2021, doi: 10.1108/SJME-04-2020-0074.
[22] I. S. Nasir, A. H. Mousa, and I. L. Hussein Alsammak, "SMUPI-BIS: A synthesis model for users' perceived impact of business intelligence systems," *Indonesian Journal of Electrical Engineering and Computer Science*, vol. 21, no. 3, pp. 1856–1867, 2021, doi: 10.11591/ijeecs.v21.i3.pp1856-1867.
[23] M. Xia, Y. Zhang, and C. Zhang, "A TAM-based approach to explore the effect of online experience on destination image: A smartphone user's perspective," *Journal of Destination Marketing and Management*, vol. 8, 2018, doi: 10.1016/j.jdmm.2017.05.002.
[24] L. Y. Hua, T. Ramayah, T. A. Ping, and C. J. H. (Jacky), "Social media as a tool to help select tourism destinations: The case of Malaysia," *Information Systems Management*, vol. 34, no. 3, pp. 265–279, 2017, doi: 10.1080/10580530.2017.1330004.
[25] W. Rafdinal, "Is smart tourism technology important in predicting visiting tourism destination? Lessons from West Java, Indonesia," *Journal of Tourism Sustainability*, vol. 1, no. 2, pp. 102–115, 2021, doi: 10.35313/jtos.v1i2.20.
[26] C. Yang, S. Yan, J. Wang, and Y. Xue, "Flow experiences and virtual tourism: The role of technological acceptance and technological readiness," *Sustainability*, vol. 14, no. 9, p. 5361, Apr. 2022, doi: 10.3390/su14095361.
[27] A. P. Ramadhanty, P. W. Handayani, A. A. Pinem, and M. H. Hilman, "Virtual tour actual usage: The influence of perceived benefits and sacrifices," *Jurnal Sistem Informasi*, vol. 17, no. 2, pp. 62–76, 2021, doi: 10.21609/jsi.v17i2.1103.
[28] K. K. Acosta, J. Y. Camalig, K. A. O. Velez, R. C. De Dios, K. A. A. Librando, and B. V Mae, "Factors affecting the viability of virtual tourism in the Philippines," *European Online Journal of Natural and Social Sciences*, vol. 11, no. 4, pp. 708–728, 2022.
[29] I. Idris *et al.*, "Developing smart tourism using virtual reality as a tourism promotion strategy in Indonesia," *Geojournal of Tourism and Geosites* , vol. 35, no. 2, pp. 332–337, 2021, doi: 10.30892/GTG.35210-656.
[30] D. Y. Nugraha, L. A. Wibowo, D. Disman, and R. Hurriyati, "Smart tourism strategy in increasing the number of tourist in Indonesia," 2019, doi: 10.2991/icebef-18.2019.36.
[31] N. Wibisono, W. Rafdinal, and L. Setiawati, "Tourism in the virtual age: Predicting the adoption of virtual reality applications in tourism," *International Journal of Applied Sciences in Tourism and Events*, vol. 8, no. 1, 2024, doi: 10.31940/ijaste.v8i1.9-23.
[32] S. M. E. Sepasgozar, S. Hawken, S. Sargolzaei, and M. Foroozanfa, "Implementing citizen centric technology in developing smart cities: A model for predicting the acceptance of urban technologies," *Technological Forecasting and Social Change*, vol. 142, pp. 105–116, 2019, doi: 10.1016/j.techfore.2018.09.012.
[33] C. Buabeng-Andoh, "Predicting students' intention to adopt mobile learning: A combination of theory of reasoned action and technology acceptance model," *Journal of Research in Innovative Teaching and Learning*, vol. 11, no. 2, pp. 178–191, 2018, doi: 10.1108/JRIT-03-2017-0004.
[34] U. Suhud, T. Budak, and S. Benk, "Antecedents of e-money adoption intention among Indonesian and Turkish consumers," *Management Science Letters*, vol. 10, no. 3, pp. 609–616, 2020, doi: 10.5267/j.msl.2019.9.019.
[35] L. German Ruiz-Herrera, A. Valencia-Arias, A. Gallegos, M. Benjumea-Arias, and E. Flores-Siapo, "Technology acceptance factors of e-commerce among young people: An integration of the technology acceptance model and theory of planned behavior," *Heliyon*, vol. 9, no. 6, 2023, doi: 10.1016/j.heliyon.2023.e16418.
[36] M. O. Alassafi, "E-learning intention material using TAM: A case study," *Materials Today: Proceedings*, vol. 61, pp. 873–877, 2022, doi: 10.1016/j.matpr.2021.09.457.
[37] Y. H. Ho, S. S. Alam, M. Masukujjaman, C. Y. Lin, S. Susmit, and S. Susmit, "Intention to adopt AI-powered online service among tourism and hospitality companies," *International Journal of Technology and Human Interaction*, vol. 18, no. 1, 2022, doi: 10.4018/IJTHI.299357.
[38] A. Wicaksono and A. Maharani, "The effect of perceived usefulness and perceived ease of use on the technology acceptance model to use online travel agency," *Journal of Business Management Review*, vol. 1, no. 5, pp. 313–328, 2020, doi: 10.47153/jbmr15.502020.
[39] Sujood, N. Bano, and S. Siddiqui, "Consumers' intention towards the use of smart technologies in tourism and hospitality (T&H) industry: a deeper insight into the integration of TAM, TPB and trust," *Journal of Hospitality and Tourism Insights*, vol. 7, no. 3, pp. 1412–1434, 2024, doi: 10.1108/JHTI-06-2022-0267.
[40] V. C. S. Yeo, S. K. Goh, and S. Rezaei, "Consumer experiences, attitude and behavioral intention toward online food delivery (OFD) services," *Journal of Retailing and Consumer Services*, vol. 35, pp. 150–162, 2017, doi: 10.1016/j.jretconser.2016.12.013.
[41] G. Cao, Y. Duan, J. S. Edwards, and Y. K. Dwivedi, "Understanding managers' attitudes and behavioral intentions towards using artificial intelligence for organizational decision-making," *Technovation*, vol. 106, 2021, doi: 10.1016/j.technovation.2021.102312.
[42] K. K. W. Ho and E. W. K. See-To, "The impact of the uses and gratifications of tourist attraction fan page," *Internet Research*, vol. 28, no. 3, pp. 587–603, 2018, doi: 10.1108/IntR-04-2017-0175.
[43] Z. Ghaderi, P. Hatamifar, and J. C. Henderson, "Destination selection by smart tourists: the case of Isfahan, Iran," *Asia Pacific Journal of Tourism Research*, vol. 23, no. 4, pp. 385–394, 2018, doi: 10.1080/10941665.2018.1444650.
[44] F. Li, D. Zhu, M. T. Lin, and P. B. Kim, "The technology acceptance model and hospitality and tourism consumers' intention to use mobile technologies: Meta-analysis and structural equation modeling," *Cornell Hospitality Quarterly*, vol. 65, no. 4, pp. 461–477, 2024, doi: 10.1177/19389655241226558.
[45] P. Tavitiyaman, H. Qu, W. sze L. Tsang, and C. wah R. Lam, "The influence of smart tourism applications on perceived destination image and behavioral intention: The moderating role of information search behavior," *Journal of Hospitality and Tourism Management*, vol. 46, pp. 476–487, 2021, doi: 10.1016/j.jhtm.2021.02.003.
[46] A. F. Schiopu, R. I. Hornoiu, M. A. Padurean, and A. M. Nica, "Virus tinged? Exploring the facets of virtual reality use in tourism as a result of the COVID-19 pandemic," *Telematics and Informatics*, vol. 60, 2021, doi: 10.1016/j.tele.2021.101575.
[47] D. Sarkady, L. Neuburger, and R. Egger, "Virtual reality as a travel substitution tool during COVID-19," in *Information and Communication Technologies in Tourism 2021*, Cham: Springer International Publishing, 2021, pp. 452–463.
[48] R. A. Putra, S. Ahmad, and M. R. Febliansa, "The influence of perceived usefulness and perceived ease of use on behavioral intention on Brimo application users in Bengkulu City," *Journal of Economics, Finance and Management Studies*, vol. 06, no. 12, 2023, doi: 10.47191/jefms/v6-i12-18.
[49] M. N. Alam *et al.*, "Factors influencing intention for reusing virtual reality (VR) at theme parks: the mediating role of visitors satisfaction," *Cogent Social Sciences*, vol. 10, no. 1, 2024, doi: 10.1080/23311886.2023.2298898.
[50] D. Ye, D. Cho, F. Liu, Y. Xu, Z. Jia, and J. Chen, "Investigating the impact of virtual tourism on travel intention during the post-COVID-19 era: evidence from China," *Universal Access in the Information Society*, vol. 23, no. 4, pp. 1507–1523, 2024, doi: 10.1007/s10209-022-00952-1.
[51] A. Solihin, S. Nur Azizah, and S. Sutomo, "Implementation of virtual reality (VR) and augmented reality (AR) in marketing and service development to increase customers in the hospitality sector," *International Journal of Management Science and Information Technology*, vol. 4, no. 2, pp. 450–458, 2024, doi: 10.35870/ijmsit.v4i2.3200.

[52] J. Kim, L. Chan, K. M. Marzuki, and T. M. Mohtar, "Local community participation and responsible tourism practices in ecotourism destination: A case of lower kinabatangan, sabah," *Sustainability (Switzerland)*, vol. 13, no. 23, 2021, doi: 10.3390/su132313302.
[53] F. A. Ismatillaevna, B. D. S. Pratama, and U. E. Rohimi, "Increasing the potential of tourism destinations through combining the principles of sustainability and innovation," *Journal of World Science*, vol. 2, no. 2, 2023, doi: 10.58344/jws.v2i2.232.
[54] Y. C. Huang, K. F. Backman, S. J. Backman, and L. L. Chang, "Exploring the implications of virtual reality technology in tourism marketing: an integrated research framework," *International Journal of Tourism Research*, vol. 18, no. 2, pp. 116–128, Mar. 2016, doi: 10.1002/jtr.2038.
[55] I. P. Tussyadiah, D. Wang, and C. Jia, "Virtual reality and attitudes toward tourism destinations," in *Information and Communication Technologies in Tourism 2017*, Cham: Springer International Publishing, 2017, pp. 229–239.
[56] A. Ghose and K. W. Huang, "Personalized pricing and quality customization," *Journal of Economics and Management Strategy*, vol. 18, no. 4, pp. 1095–1135, 2009, doi: 10.1111/j.1530-9134.2009.00239.x.
[57] S. Campbell *et al.*, "Purposive sampling: complex or simple? Research case examples," *Journal of Research in Nursing*, vol. 25, no. 8, pp. 652–661, 2020, doi: 10.1177/1744987120927206.
[58] T. U. Panduputri and S. Novani, "Examining experience economy dimensions on virtual tour satisfaction and destination visit intention," *Journal of Integrated System*, vol. 4, no. 2, pp. 101–114, 2021, doi: 10.28932/jis.v4i2.4155.
[59] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User acceptance of computer technology: A comparison of two theoretical models," *Management Science*, vol. 35, no. 8, pp. 982–1003, 1989, doi: 10.1287/mnsc.35.8.982.
[60] C. Fornell and D. F. Larcker, "Structural equation models with unobservable variables and measurement error: Algebra and statistics," *Journal of Marketing Research*, vol. 18, no. 3, p. 382, 1981, doi: 10.2307/3150980.
[61] M. Sarstedt, C. M. Ringle, and J. F. Hair, "Partial least squares structural equation modeling," *Handbook of Market Research*, pp. 1–47, 2021, doi: 10.1007/978-3-319-05542-8_15-2.
[62] J. Henseler, G. Hubona, and P. A. Ray, "Using PLS path modeling in new technology research: Updated guidelines," *Industrial Management and Data Systems*, vol. 116, no. 1, pp. 2–20, 2016, doi: 10.1108/IMDS-09-2015-0382.
[63] W. W. Chin, "How to write up and report PLS analyses," in *Handbook of Partial Least Squares*, Berlin, Heidelberg: Springer Berlin Heidelberg, 2010, pp. 655–690.
[64] M. H. Hanafiah, "Formative Vs. reflective measurement model: Guidelines for structural equation modeling research," *International Journal of Analysis and Applications*, vol. 18, no. 5, pp. 876–889, 2020, doi: 10.28924/2291-8639-18-2020-876.

BIOGRAPHIES OF AUTHORS

Dairoh is a senior lecturer at the Department of Informatics Engineering, Harkat Negeri University. She received a bachelor's degree in physics from Jenderal Soedirman University, Indonesia, in 2010 and a master's degree in physics from Gadjah Mada University, Indonesia, in 2014. Currently, she is taking a doctoral program at Gajah Mada University. Her research interests include software development, machine learning, deep learning, and experiencing natural phenomena using artificial intelligence-based applications. Some of her research has been funded by the Ministry of Higher Education and Research, Indonesia. She can be contacted at dairoh@harkatnegeri.ac.id.

Sharfina Febbi Handayani is a lecturer at the Department of Informatics Engineering, Harkat Negeri University. She received her master's degree in Information Systems from Institut Teknologi Sepuluh Nopember in 2020. Her research interests include software engineering, software testing, software quality assurance, business process management, information systems, and artificial intelligence-based applications. She is actively involved in publications, research, and other related information technology innovation projects. She can be contacted at sharfina.handayani@harkatnegeri.ac.id.

Dwi Intan Af'idah received a bachelor of computer engineering and a master of information systems from Diponegoro University, Indonesia in 2014 and 2020. After graduating with a bachelor's degree and before continuing her master's studies, she worked as a systems analyst at an IT consulting company, which made her understand the need for technology in various industrial fields. Currently, she is a lecturer and a secretary of the undergraduate program in the Informatics Engineering Department at Harkat Negeri University, Indonesia. Her research interests include artificial intelligence applied, artificial intelligence-based application, machine learning, and deep learning, and she also focuses on the study of natural language processing (NLP) as well as the development of tools based on NLP like sentiment analysis systems, machine translation, and chatbots for specific domains. Some of her research has been funded by the Ministry of Higher Education and Research, Indonesia. She can be contacted at dwiintanafidah@harkatnegeri.ac.id.