

Utilization of Augmented Reality as a Virtual Marketing Innovation for Local MSMEs: Implications for Digital Tourism Attraction in North Sumatra, Indonesia

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Abstract: - This study aims to analyze the effect of augmented reality utilization as a virtual marketing innovation for local MSMEs on digital tourism attractiveness in Medan City, North Sumatra. This research method uses a quantitative approach through distributing questionnaires to 190 respondents who are active users of social media and have experience interacting with Augmented Reality (AR)-based MSME product promotions. The data analysis technique uses Structural Equation Modeling (SEM) with the help of SmartPLS. The results showed that the use of augmented reality (AR) significantly increased the attractiveness of digital tourism, both through direct and indirect effects with user experience and perceptions of innovation as mediators, while tourist visit intentions did not play a role in the influence mechanism. This research also supports the development of a resilient, innovative, and globally competitive locally-based creative economy ecosystem.

Key-Words: - Augmented Reality, Digital Marketing, Local MSMEs, Digital Tourism, Interactive Experience, Attraction

Received: June 23, 2025. Revised: October 15, 2025. Accepted: November 11, 2025. Published: May 11, 2026.

1 Introduction

The evolution of digital technology has altered the way businesses interact with customers. In the 4.0 industrial era, traditional marketing approaches are being phased out in favour of immersive, personalised, and interactive digital marketing models [1]. Augmented Reality (AR) has emerged as a strategic solution to this transformation. AR allows the merging of the real world and digital elements, creating a more immersive experience for consumers in learning about the product or service virtually [2]. This technology is more than just a promotional tool; it is also a medium for increasing emotional engagement and user experience. Specifically in Indonesia, the adoption of digital technology in the Micro, Small, and Medium Enterprises (MSMEs) sector is increasing, driven by the need for marketing efficiency and market reach [3]. MSMEs are the backbone of the national economy, contributing significantly to Indonesia's GDP while also employing a large number of people [4]. However, most MSMEs are still lagging in terms of adopting cutting-edge technology like augmented reality [5]. Local MSME players, particularly in North Sumatra, continue to face a variety of challenges, including

limitations in creative digital promotions and difficulties in building broad brand awareness, particularly in the tourism industry.

Medan City, as the capital city of North Sumatra province, is the center of regional economic and tourism activities. Many MSME products are based on local culture and have the potential to be marketed widely, but have not received maximum exposure in digital media. On the other hand, the trend of digital tourism shows a significant increase, where modern tourists are not only looking for attractions, but also authentic and interactive experiences, including through digital media before traveling [6].

The main problem faced by MSMEs in Medan City in supporting the digital tourism sector is the low utilization of Augmented Reality [7] technology as an interactive promotional strategy, which reflects the low digital literacy and lack of promotional innovation in this sector. Most MSME promotions still use conventional media that do not match the preferences of the digital generation [8]. In addition, limited technical training support and a collaborative ecosystem between MSMEs, government, and technology industry players also exacerbate this digital divide [9]. The cross-sector collaboration is

still very low in the development of interactive digital-based content for regional tourism, and the absence of integration between regional tourism promotion strategies and MSME digitization initiatives makes local products lose their strategic value as part of the tourist destination narrative [10].

The urgency of this research stems from the need to bridge the gap between the enormous potential of Medan City's local MSME sector and the rapidly expanding global trend of experiential digital marketing. Digital transformation is no longer an option; it is a must-have for MSMEs to remain competitive in the experience economy era [11]. Today's consumers purchase not only products, but also the values, stories, and experiences that accompany them [12]. With the rise of digital-based tourism and shifting consumer preferences that prioritise virtual exploration over physical visits, the use of AR technology has become increasingly popular. This research is important to provide empirical evidence and an AR application model that is appropriate to the local context, so that it can be a reference in formulating policies for developing MSMEs and digital-based tourism in the regions.

Furthermore, the research findings are expected to encourage collaboration among local governments, technology providers, MSME players, and educational institutions to create an inclusive and sustainable digital ecosystem. Without concrete steps towards interactive and immersive digitalisation, local MSMEs will struggle to compete, even on a regional scale [13]. As a result, the presence of this research is critical for addressing the challenges of digital transformation in the MSME sector, which plays a strategic role in improving the image and attractiveness of North Sumatra tourism. Previous research has limitations because it focuses on the effectiveness of AR in the context of e-commerce in general, but it has not specifically linked it to MSME-based tourism promotion [14]. Some previous studies even show inconsistent results regarding the effectiveness of AR in shaping purchase intentions or perceptions of tourist destinations.

AR can significantly increase consumer engagement, but other studies mention that the impact is short-term or has a lower influence if not accompanied by strong and relevant content [15]. This research also offers a contribution to the user experience-based digital marketing model by involving immersive and interactive elements of AR, which have not been widely explored in local literature. The main objective of this research is to analyze the effect of Augmented Reality technology utilization in MSMEs virtual marketing strategy on

digital tourism attractiveness in Medan City, North Sumatra. This study aims to determine how user perceptions of AR can influence purchase interest, loyalty to local products, and the image of tourist destinations that are integrated into the promotion of MSMEs. As a result, this study is critical in addressing the need for an adaptive and contextual digital marketing model, as well as providing an empirical foundation for MSME players and tourism policymakers to incorporate AR technology into a more innovative, sustainable, and user experience-based promotional strategy.

2 Literature Review

2.1 Technology and Innovation Diffusion

In the 4.0 industrial era, digital technology has transformed how people interact, shop, and travel [16]. Two major theories serve as the foundation for understanding the use of Augmented Reality (AR) in the context of MSMEs and tourism: the Technology Acceptance Model (TAM) and the Innovation Diffusion Theory (IDT) [17], which focuses on how individuals or organisations accept technology based on their perceptions of its ease of use and benefits [18]. Ozili believes that the easier and more useful a technology is perceived to be, the more likely it will be adopted by individuals or organisations. In this context, AR is seen as a technology that can provide interactive visual experiences to users, so it has a lot of potential in the world of marketing [19].

2.2 Innovation Diffusion Theory

Reinforces this concept by describing how innovations spread in society from early adopters to the larger community [20]. Abdul Waheed identified five attributes that influence innovation adoption in the IDT concept: relative advantage, compatibility, trialability, and observability. AR, as a marketing innovation, has a relative advantage because it can create immersive experiences that are difficult to match with traditional media, are simple to try, and can be directly observed for their benefits, particularly in the MSME and digital tourism sectors [21]

2.3 Augmented Reality as a Virtual Marketing Innovation

Augmented reality (AR) is a technology that combines virtual elements with the real world in real time [22]. In the context of marketing, AR enables consumers to interact with products digitally, increasing the perceived value and improving the shopping experience. In Indonesia, the use of AR in

MSMEs is still relatively new, but the potential is enormous, particularly in the creative economy and tourism sectors [23]. AR increases consumer engagement by providing a high level of control, interaction, and entertainment.

In the world of digital marketing, AR can present product information visually and interactively, as seen with the "try before you buy" feature in shopping apps. This is especially important for MSMEs in North Sumatra that produce handicrafts, regional culinary specialties, or other cultural products because augmented reality allows them to display the artistic and cultural value of their products more immersively. Furthermore, demonstrate that the use of AR can increase customer satisfaction and purchase intentions, which can be used as a strategic tool to increase MSMEs' competitiveness [24].

2.4 Strengthening Local MSMEs

MSMEs form the foundation of the local and national economies. MSMEs in North Sumatra not only produce goods, but they also represent local culture and wealth. MSMEs use augmented reality to not only digitise products, but also package local values into virtual experiences that can be enjoyed by consumers from various regions and countries [25]. Digitalisation plays a significant role in strengthening MSMEs' business structures, expanding market access, and improving branding strategies [26]. The use of AR in marketing allows MSMEs to present their products in a more modern, informative, and interactive way. This is important because the competitiveness of MSME products is no longer determined only by physical quality, but also by how the product is communicated to the market [27]. MSMEs in North Sumatra can use AR-based marketing strategies to expand their market to digital-native segments, such as millennial tourists or global consumers looking for regional specialty products packaged creatively.

2.5 Digital Tourism Attraction

Digital tourism is the use of information technology to promote, manage, and improve tourist experiences [28]. One of the key factors in digital tourism attraction is experience marketing, which provides potential tourists with an initial experience before physically visiting the destination [29]. Here is where augmented reality comes into play. Augmented reality (AR) can enhance the tourist experience by providing additional contextual information, such as the history of tourist attractions, local culinary recommendations, or cultural narratives via interactive applications [30]. This improves the

tourist experience by making it more personalised, educational, and interesting. AR technology can be used to create a "preview" of North Sumatra's natural tourism (Lake Toba), Batak culture, regional culinary specialties, and local products. Visitors can virtually explore tourist attractions, watch interactive MSME product demos, and interact with local cultural elements all before leaving. The use of AR not only increases the value of MSME products but also improves the image of tourist destinations, resulting in a synergy between product marketing and tourism promotion [31].

2.6 Relationship between Variables

Products that were previously only physically visible can now be accessed, explored, and comprehended digitally [32]. Second, local MSMEs that use AR become more adaptable to the digital transformation. Improving marketing quality with AR will expand market opportunities, both geographically and demographically. This has a direct impact on local economic growth and the preservation of cultural heritage. Third, ARs and MSMEs are playing an increasingly important role in the development of digital tourism attractions. Modern travellers seek out experiences as well as destinations. With AR-based promotions, the experience begins before tourists arrive at the destination. MSME products incorporated into the digital tourism narrative increase tourists' emotional connection and curiosity. All relationship variables can be seen in Figure 1

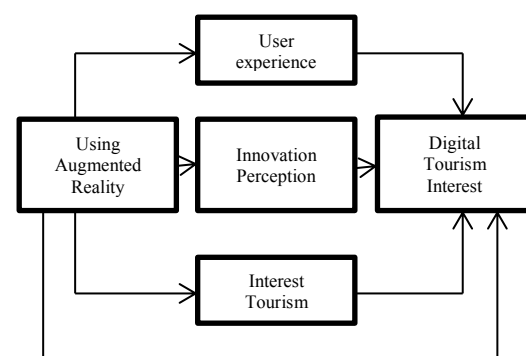


Fig. 1: Conceptual Framework
Source: Created by the authors

3. Research Method

This study employs a quantitative approach with a survey method of distributing questionnaires. The research will be conducted in North Sumatra, specifically in Medan City, which is one of the region's MSME growth centres. The sampling

technique used was purposive sampling with the following criteria:

1. Aged between 17-40 years (digital savvy age segment),
2. Actively using social media (at least 3 times per week),
3. Have seen or interacted with AR-based local MSME promotions, either through Instagram, TikTok, websites, or other digital applications.

The sample size was 190 respondents, adjusted according to Hair's recommendations, which state that the minimum sample size is 10 times the number of variable indicators in the research model, so that this number is considered representative for SEM-PLS analyses. The data were analysed using the Structural Equation Modelling (SEM) method with Partial Least Squares (PLS).

4 Results and Discussion

Table 1 Respondenst Characteristic

N o	Characteris tics	Category/ Subcatego ry	Numb er (Perso n)	Percenta ge (%)
1	Gender	Male	84	44,2
		Female	106	55,8
2	Age	17-24 years old	78	41,1
		25-30 years old	62	32,6
		31-35 years	30	15,8
		36-40 years old	20	10,5
3	Frequency of Social Media Use	3-4 times per week	38	20
		5-6 times per week	66	34,7
		Every day (≥ 7 times)	86	45,3
4	Ever seen/interact ed with an AR Promotion	Yes	162	85,3
		No	28	14,7

Source: Created by the authors

According to Table 1, this study involved 190 respondents from North Sumatra to explore the utilization of Augmented Reality (AR) in virtual marketing of local MSMEs and its impact on digital tourism appeal. The demographic characteristics of the respondents showed that the majority were

young, actively used social media, and had experience with AR-based promotions. Most respondents were female, reflecting the significant role of women in the adoption of new technologies in the digital tourism sector. The 17-30 age group dominates, indicating that the younger generation is more open to digital innovations in tourism. The high frequency of social media usage among respondents signifies a great potential to utilize these platforms in marketing strategies. These characteristics support the importance of developing AR-based marketing strategies to increase the attractiveness of digital tourism in North Sumatra.

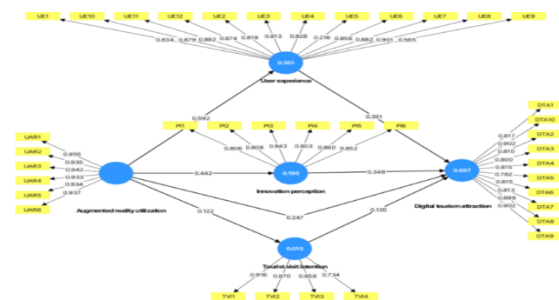


Fig. 2: Validity Testing based on *Outer Loading*
Source: Created by the authors

Based on testing the validity of *outer loading* in Figure 2, it is known that indicator items PP5 and PP9 are invalid, because the *outer loading* value of PP5 = 0.216 and PP9 = 0.565, smaller than 0.7. So that indicator items PP5 and PP9 are eliminated from the analysis process.



Fig. 3: Validity Testing based on *Outer Loading*
(After Elimination of Invalid Indicator Items)
Source: Created by the authors

Based on Figure 3, the *outer loading* validity test, it is known that all *outer loading* values are > 0.7, which means that it has met the validity requirements based on the *outer loading* value. Furthermore, validity testing is carried out based on the *average*

variance extracted (AVE) value, and reliability based on composite reliability (CR) and Cronbach's alpha (CA).

Table 2 Validity Testing based on Average Variance Extracted (AVE); Reliability based on Composite Reliability (CR) and Cronbach's Alpha (CA)

	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
Digital Tourism Attraction	0,952	0,959	0,700
Tourist Visit Intention	0,875	0,910	0,717
Augmented Reality Utilization	0,973	0,978	0,883
User Experience	0,960	0,965	0,736
Perceived Innovation	0,909	0,929	0,687

Source: Created by the authors

According to Table 2, show that all constructs have met the validity criteria based on Average Variance Extracted (AVE), with an AVE value > 0.5 . Next, reliability was tested with Composite Reliability (CR) and Cronbach's Alpha (CA), both of which showed values > 0.7 , so they were considered reliable. Finally, discriminant validity using the Fornell-Larcker criterion has been verified-the AVE square root for each construct is greater than its correlation with other constructs, so construct discriminant validity can be confirmed.

Table 3 Discriminant Validity Testing: Fornell & Larcker

	Digital Tourism Attraction	Tourist Visit Intention	Augmented Reality Utilization	User Experience	Perception of Innovation
Digital Tourism Attraction	(0,837)				
Tourist Visit Intention	0,165	(0,847)			
Augmented Reality Utilization	0,625	0,122	(0,939)		
User Experience	0,603	-0,006	0,597	(0,858)	
Perceived Innovation	0,585	0,016	0,442	0,343	(0,829)

Source: Created by the authors

According to Table 3, discriminant validity testing follows the Fornell-Larcker criterion, which is achieved by comparing the square root of the AVE value of each latent variable with the correlation between other latent variables. Because the square root of the AVE of each variable is higher than the value of its correlation with other variables, it can be concluded that discriminant validity has been met, meaning that each construct is clearly distinguished from other constructs.

Table 4 Discriminant Validity Testing: HTMT

	Digital Tourism Attraction	Tourist Visit Intention	Augmented Reality Utilization	User Experience
Tourist Visit Intention	0,167			
Augmented Reality Utilization	0,648	0,118		
User Experience	0,632	0,054	0,604	
Perceived Innovation	0,628	0,100	0,468	0,372

Source: Created by the authors

According to Table 4, show that based on the results of testing discriminant validity with the HTMT approach, it is known that all values are <0.9, which means that it is concluded.

that it has met the requirements for discriminant validity based on the HTMT approach.

Table 5 Path Coefficient Test & Significance of Influence

Hypothesis to	Original sample (O)	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values	Results
1	Augmented Reality Utilization -> User Experience -> Digital Tourism Attraction	0,197	0,191	0,081	2,435	0,015	Hypothesis Accepted
2	Augmented Reality Utilization -> Perceived Innovation -> Digital Tourism Attraction	0,158	0,167	0,067	2,343	0,020	Hypothesis Accepted
3	Augmented Reality Utilization -> Tourist Intention -> Digital Tourism Attraction	0,016	0,015	0,018	0,875	0,382	Hypothesis Rejected
4	Augmented Reality Utilization -> Digital Tourism Attraction	0,254	0,256	0,123	2,059	0,040	Hypothesis Accepted
5	Augmented Reality Utilization -> Digital Tourism Attraction (through all mediators)	0,625	0,628	0,082	7,577	0,000	Hypothesis Accepted
6	User Experience -> Digital Tourism Attraction	0,330	0,318	0,115	2,882	0,004	Hypothesis Accepted
7	Perceived Innovation -> Digital Tourism Attraction	0,358	0,363	0,102	3,500	0,001	Hypothesis Accepted
8	Tourist Visit Intention -> Digital Tourism Attraction	0,130	0,120	0,074	1,766	0,078	Hypothesis Rejected

Source: PLS Output (2025)

Table 5 shows that the utilization of Augmented Reality (AR) directly increases the attractiveness of digital tourism. In addition, AR also contributes indirectly through two main pathways, namely, enriching user experience and increasing the perception of innovation, both of which prove to be significant mediators. On the other hand, tourist visit intention does not play a significant role, either as a mediator or as a direct influence on digital tourism attractiveness.

Table 6 R-Square

	R-square
Digital Tourism Attraction	0,589
Tourist Visit Intention	0,015
User Experience	0,356
Perceived Innovation	0,195

Source: Created by the authors

According to Table 6, the results show that key variables such as Augmented Reality (AR) utilization, user experience, perceived innovativeness, and visit intention together contribute significantly to the formation of digital tourism attraction. The use of augmented reality was shown to have a moderate effect on improving user experience and perceived innovativeness, but its effect on visitation intention was significantly weaker. Thus, AR plays an important role in influencing digital tourism attractiveness, primarily through experience and innovation pathways, though its impact on visit motivation is less significant.

Table 7 Q-Square

	$Q^2 (=1-SSE/SSO)$
Digital Tourism Attraction	0,402
Tourist Visit Intention	0,002
User Experience	0,243
Perceived Innovation	0,128

Source: Created by the authors

According to Table 7, the Q-Square test results show that all variables in the model predict the main dependent variable. In other words, AR utilisation, user experience, perceived innovation, and visit intention can all be used to predict changes in the attractiveness of digital tourism, and AR can predict user experience and perceived innovation quite well. Despite the weak prediction for visit intention, the model as a whole demonstrated the expected fit and predictive relevance.

Table 8 Testing Goodness of Fit Model

	Estimated model
SRMR	0,077

Source: Created by the authors

According to Table 8, the SRMR (Standardised Root Mean Square Residual) value is less than the recommended limit (less than 0.1), indicating that the model is feasible and fits the data, also known as fit. According to the results of data processing on 190 respondents, the majority of respondents are young, between 17 and 30 years old, and use social media frequently (more than three times per week). Around 76% of the total respondents said they had seen or interacted with local MSME promotions using Augmented Reality (AR) on platforms like Instagram, TikTok, or websites. However, as many as 62% of respondents stated that they did not have a strong interest in making a direct visit to the MSME premises, even though they liked the digital display.

This fact reflects that there is visual interest, but it is not fully followed by actual visit behavior. Field conditions in Medan City, North Sumatra, also reinforce this phenomenon. While MSMEs in Medan have started to embrace digitalization, especially after the pandemic, the use of technologies such as AR is still very limited to MSME segments that have access to technology training or support from the creative community and local government. A small number of MSME players, such as producers of local coffee, Deli weaving, and Medan culinary specialties, can display products in an AR-based interactive form. In fact, of the MSME players who use AR, most only rely on free features such as built-in Instagram filters, not complex AR technology that is deeply integrated with their digital promotion system.

Another fact is that many MSMEs in Medan still lack integrated digital infrastructure, such as purchase links, location maps, customer testimonials, or product story narratives, so that even if the initial AR-based display is appealing, consumers do not feel compelled or motivated to proceed to the purchase stage or physical visit. Some argue that the location of MSMEs is less strategic or not well-known. This finding is very relevant to the outcomes of hypothesis testing in the study. The first and sixth hypotheses show that AR utilisation has a positive and significant effect on digital tourism attractiveness via user experience, which is supported by data from respondents who believe AR experiences are enjoyable and interesting.

Similarly, the second and seventh hypotheses are significant, indicating that AR influences digital tourism attractiveness through perceived innovation,

as demonstrated by the majority of respondents rating AR-using MSMEs as more modern and creative. However, the findings of the third and eighth hypotheses indicate that AR has no significant effect on visit intentions or repeat visits, as evidenced by the tendency of the majority of respondents who have not yet expressed an interest in making an actual visit. They believe that, while the digital visuals are appealing, there is insufficient compelling follow-up information to prompt action.

This finding can be theoretically explained using the Technology Acceptance Model, which states that perceived usefulness and ease of use influence technology acceptance. The use of Augmented Reality (AR) as a virtual marketing innovation for local SMEs in North Sumatra has great potential for increasing the appeal of digital tourism in the region. AR, as an interactive technology, enables SMEs, particularly in the craft, culinary, and fashion sectors, to provide consumers with a more immersive marketing experience. Local products can be promoted more effectively and packaged as part of a larger digital tourism narrative by presenting digital-based visual content that interacts in real time via mobile devices.

The results of data collection through observation, interviews, and documentation studies revealed that most MSME actors still have a limited understanding and use of AR technology. They did, however, express strong enthusiasm for this innovation after receiving basic training and usage simulations. One effective method of implementation is to use location-based AR applications that display cultural information and local products when users point their cameras at specific objects, such as cultural heritage sites, traditional markets, or souvenir shops. This creates a link between the promotion of MSME products and local tourism narratives, attracting tourists to explore further.

Strategically, incorporating AR into MSME marketing promotes the growth of digital-based tourism in North Sumatra. With an increasing number of tourists relying on technology to plan and carry out their travels, augmented reality (AR) becomes an important tool for presenting contextual, interactive, and visually appealing information. Not only does this technology help to promote local products, but it also has the potential to highlight the historical, cultural, and unique values of regions that were previously underrepresented on digital channels. This creates a digital tourism ecosystem that is both informative and entertaining, as well as educational.

Nonetheless, the main challenges in implementing AR for MSMEs in North Sumatra include limited digital infrastructure, low technological literacy, and the need for assistance from local governments and technology partners. As a result, collaboration among academics, the government, the private sector, and the MSME community is critical to ensuring the longevity of this innovation. A systematic approach is required, consisting of training, technical assistance, and the provision of easily accessible and usable AR platforms for local MSME actors.

Thus, the use of Augmented Reality as a virtual marketing innovation not only helps to improve the competitiveness of local SMEs but also strengthens North Sumatra's position as a modern and inclusive digital tourism destination. This innovation bridges the gap between traditional promotion and the need for digital transformation in the age of Industry 4.0 and Society 5.0, when digital experiences are an inseparable part of consumption and tourism activities. In this context, most respondents stated that the use of AR by MSMEs is quite simple (because it is only accessible via a common social media platform), and the appearance is also appealing, resulting in a positive perception (usefulness and ease of use are met).

However, the behavioural intention aspect of TAM has not been strongly formed, as not all respondents are encouraged to take concrete actions following digital interaction. Thus, the field data and respondents' responses support the conclusion that while AR is effective at creating an engaging initial experience and forming innovative perceptions of MSMEs, it is not yet powerful enough to drive actual visiting intentions and actions. This suggests that the use of technologies such as augmented reality in the promotion of MSMEs in Medan should be viewed as part of an initial awareness-creation strategy, followed by a more integrated marketing system to drive consumer intentions and actions.

5 Conclusions

The use of augmented reality (AR) technology influences the attractiveness of digital tourism, particularly by improving user experience and perceptions of innovation. The majority of respondents in this study are active social media users from the digitally savvy generation who are interested in interactive promotional content for local MSME products in Medan, North Sumatra. The test results show that AR has a significant impact on improving positive perceptions of MSME products

and increasing the digital appeal of destinations, both directly and through user experience and innovative perceptions.

However, the influence of AR on behavioral intentions such as direct visits and repeat visit interest has not shown strong significance. Most respondents agree that AR content is interesting and entertaining, but they were not encouraged to take action after seeing the promotion. This finding suggests that while AR is effective at raising awareness and initial interest, it is not yet capable of driving behavioural conversion without external factors such as the availability of location information, accessibility, and continued interaction with the product. Within the framework of the Technology Acceptance Model (TAM), AR has met the criteria for perceived usefulness and ease of use. However, these findings highlight the importance of understanding that technology adoption is not always directly proportional to intentions or actions, particularly in the context of MSME-based digital tourism promotion.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

The authors equally contributed to the present research, at all stages from the formulation of the problem to the final findings and solution.

Sources of Funding for Research Presented in a Scientific Article or the Scientific Article Itself

This research was funded by the Directorate of Research and Community Service (DPPM), Ministry of Higher Education, Science and Technology of the Republic of Indonesia, through the 2025 research grant under contract No. 122/C3/DT.05.00/PL/2025, No. 7/SPK/LL1/AL.04.03/PL/2025 and No. 105/P3MPI.3.3.1/VI/2025.

Conflict of Interest

The authors declare there are no conflicts of interest.

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