


## **Empirical Analysis of Tourism Digitalization and MSME Innovation on Sustainable Tourism Through MSME Performance in Developing Regions**



Tri Widayati<sup>1\*</sup>, Irma Suryahani<sup>2</sup>, Ida Puspitowati<sup>3</sup>

<sup>1</sup> Faculty of Economics and Business, Universitas 17 Agustus 1945 Semarang, Semarang 50232, Indonesia

<sup>2</sup> Faculty of Economics and Business, Universitas Jenderal Soedirman, Purwokerto 53122, Indonesia

<sup>3</sup> Faculty of Economics and Business, Universitas Tarumanagara, Jakarta 11440, Indonesia

Corresponding Author Email: [triwidayati.untag@gmail.com](mailto:triwidayati.untag@gmail.com)

Copyright: ©2026 The authors. This article is published by IETA and is licensed under the CC BY 4.0 license (<http://creativecommons.org/licenses/by/4.0/>).

<https://doi.org/10.18280/ijstdp.210525>

### **ABSTRACT**

**Received:** 31 December 2025

**Revised:** 15 May 2026

**Accepted:** 23 May 2026

**Available online:** 31 May 2026

#### **Keywords:**

*digitalization, MSME innovation, MSME performance, sustainable tourism, Partial Least Squares–Structural Equation Modeling*

This study examines how micro, small, and medium enterprise (MSME) digitalization and innovation influence perceived sustainable tourism contribution through MSME performance as a mediating mechanism. The study focuses on tourism-related MSMEs in Central Java and the Special Region of Yogyakarta (DIY), Indonesia. Using a quantitative explanatory design, data were collected from 178 MSME owners and managers operating in culinary, homestay, handicraft, tourism services, and creative economy sectors. Data were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) with bootstrapping and bias-corrected and accelerated (BCa) confidence intervals. The results show that MSME digitalization ( $\beta = 0.41, p < 0.001$ ) and MSME innovation ( $\beta = 0.48, p < 0.001$ ) positively and significantly affect MSME performance. MSME performance also significantly influences perceived sustainable tourism contribution ( $\beta = 0.56, p < 0.001$ ). However, the direct effects of digitalization and innovation on perceived sustainable tourism contribution were insignificant. Mediation analysis confirmed that MSME performance fully mediates both relationships, with significant indirect effects for digitalization ( $\beta = 0.23$ ; 95% BCa CI [0.121, 0.338]) and innovation ( $\beta = 0.27$ ; 95% BCa CI [0.154, 0.391]). These findings highlight MSME performance as a strategic organizational mechanism linking digitalization and innovation to sustainable tourism development.

## **1. INTRODUCTION**

Tourism is a strategic economic sector in Indonesia, contributing significantly to national economic growth through job creation, increased foreign exchange earnings, and strengthening the role of micro, small, and medium enterprises (MSMEs). By 2024, the tourism sector contributed approximately 4% to Indonesia's Gross Domestic Product (GDP) and became an important driver of post-pandemic economic recovery through increasing domestic and international tourist mobility [1]. This contribution highlights the growing importance of sustainable tourism development, particularly in destinations that depend heavily on MSME-based tourism ecosystems.

The provinces of Central Java and the Special Region of Yogyakarta (DIY) occupy strategic positions as major tourism destinations on the island of Java due to their strong cultural identity, natural attractions, and dense concentration of tourism MSMEs. In 2024, Central Java recorded 69.48 million tourist visits supported by 1,124 tourism destinations, while Yogyakarta recorded 38.03 million domestic tourist trips during the same period [2, 3]. The tourism ecosystem in these regions is strongly supported by thousands of MSMEs operating in culinary services, handicrafts, accommodation,

transportation, tourism services, and creative industries. However, the rapid growth of tourist mobility also creates increasing pressure on destination sustainability, including environmental degradation, unequal local economic benefits, and socio-cultural vulnerability. Consequently, improving the sustainability capacity of tourism MSMEs has become an increasingly important issue in regional tourism development.

Tourism MSMEs play a central role not only as tourism service providers but also as economic and social actors that directly shape destination sustainability. MSMEs contribute to local employment, community empowerment, cultural preservation, and local economic circulation [4, 5]. Nevertheless, tourism MSMEs in developing regions continue to face substantial structural constraints, including limited technological capability, restricted access to innovation resources, low digital literacy, and limited organizational capacity [6, 7]. These limitations often weaken the ability of MSMEs to transform digital and innovation initiatives into sustainable tourism outcomes.

In response to increasing competition and changing tourist behavior after the pandemic, digitalization has become an important strategic instrument for tourism MSMEs. Tourism digitalization includes the use of e-commerce, digital payment systems, online tourism platforms, digital marketing, and data-

based business decision-making. Previous studies consistently demonstrate that digitalization improves MSME operational efficiency, market expansion, customer responsiveness, and business competitiveness [8-11]. At the same time, MSME innovation through product, process, marketing, and organizational innovation enables tourism businesses to create differentiated tourism experiences and adapt to evolving tourist preferences [12, 13]. Innovation is particularly important in tourism because tourism products are experience-based, intangible, and highly dependent on service creativity and responsiveness [14, 15].

Contemporary tourism literature further emphasizes that tourism development should not be evaluated solely from economic growth but also from environmental and social sustainability dimensions. In this regard, tourism digitalization and innovation are increasingly associated with sustainable tourism development. Digital tourism systems, smart tourism platforms, and sustainability-oriented innovations are considered capable of improving destination management efficiency, reducing environmental pressure, and encouraging sustainable tourist behavior [16, 17]. Similarly, green innovation and environmentally oriented business practices have been shown to support sustainable tourism performance across economic, environmental, and social dimensions [18, 19].

Despite the growing literature, important theoretical limitations remain unresolved. Existing studies predominantly examine the direct relationships between digitalization, innovation, performance, and sustainability, while giving limited attention to the organizational mechanisms through which digitalization and innovation are translated into sustainable tourism outcomes [16]. Recent studies, including Zuñiga-Collazos et al. [20], provide important evidence regarding the association between digitalization, innovation, sustainability, and tourism MSME performance. However, these studies primarily focus on direct causal relationships and do not sufficiently explain how organizational performance functions as an internal capability mechanism that transforms digital and innovation capacity into sustainable tourism outcomes.

Therefore, the present study does not merely replicate prior models in a different geographical setting. Instead, this study extends the existing tourism MSME literature in three important ways. First, this study reconceptualizes MSME performance not only as an outcome variable but as a strategic mediating organizational capability that operationalizes the effects of digitalization and innovation on sustainable tourism. This perspective responds to calls from Schönherr et al. [21] and capability-based tourism research emphasizing that sustainability outcomes emerge through organizational transformation processes rather than through technology adoption alone. Second, this study integrates digitalization and innovation simultaneously within a single mediation framework to explain how tourism sustainability is indirectly generated through MSME organizational performance. Previous studies tend to examine these relationships separately or emphasize direct effects without clarifying the intermediary mechanism. Third, this study contributes contextual insight from developing tourism destinations characterized by resource limitations, uneven digital readiness, and strong socio-cultural tourism dependence, conditions that differ substantially from the assumptions commonly embedded in studies conducted in more established tourism ecosystems.

Accordingly, this study addresses a critical research gap

concerning the limited empirical understanding of how MSME digitalization and innovation jointly influence sustainable tourism through MSME performance as an intervening organizational mechanism. By focusing on tourism MSMEs in DIY, this study develops and tests an integrated structural model linking digitalization, innovation, MSME performance, and sustainable tourism. The findings are expected to contribute theoretically to tourism MSME capability literature and practically to sustainable tourism policy and MSME development strategies in developing tourism regions.

## 2. LITERATURE REVIEW AND HYPOTHESES

Tourism digitalization is directly viewed as a crucial determinant in improving MSME performance, particularly in terms of operational efficiency, market expansion, and increased revenue. The adoption of digital technologies such as e-commerce, e-payments, digital tourism platforms, and digital finance enables tourism MSMEs to reach a wider consumer base, increase transaction speeds, and improve business productivity. Empirical studies show that MSMEs that adopt digital practices tend to experience better sales growth and business performance than non-digital MSMEs [8, 11].

In developing countries, including Indonesia, digitalization also plays a strategic role in addressing changing consumer behavior and the competitive dynamics of the tourism industry [6, 22]. Although some studies have found that the effect of digitalization on performance is not always statistically significant, primarily due to limited resources and digital literacy, the positive direction of the relationship remains consistent [7, 20]. Furthermore, digitalization has been shown to directly correlate with improved financial performance, supply chain performance, and sustainable performance of MSMEs [9, 10, 23, 24].

**H1:** *Tourism digitalization has a positive effect on MSME performance.*

MSME innovation is a key factor that directly determines business performance, particularly in the face of competitive dynamics, changing consumer preferences, and uncertain business environments. Innovation enables MSMEs to create added value through product development, business process improvements, marketing innovation, and organizational renewal, which impact efficiency and competitiveness. Several empirical studies have shown that MSME innovativeness is positively related to financial, operational, and commercial performance. Octasyuva et al. [12] confirmed that innovativeness is a key determinant of MSME performance in Indonesia, while Larios-Francia and Ferasso [13] found that product and process innovation explain a significant proportion of the variation in MSME organizational and economic performance in developing countries.

Other studies also show that organizational and marketing innovation have a significant direct impact on MSME performance, particularly in the context of post-crisis adaptation and external pressures [25, 26]. Furthermore, the implementation of technological innovation has been shown to improve MSME manufacturing performance and productivity [27]. A literature review also confirms that

innovation is a key foundation for the competitiveness and sustainable performance of MSMEs across sectors and regions [28]. While the effectiveness of each type of innovation may vary, the direction of the relationship between innovation and performance remains generally positive and consistent [29-31].

**H2:** *MSME innovation has a positive effect on MSME performance.*

Tourism digitalization is seen as a key driver in achieving sustainable tourism through increased efficiency and resource management, as well as strengthening economic, social, and environmental dimensions. The use of digital technologies such as smart tourism systems, digital information platforms, virtual reality, big data, and Information and Communications Technology (ICT) enables tourism destinations to manage tourist flows more effectively, reduce environmental impacts, and increase tourist awareness and participation in sustainable practices [16, 17].

Various studies have shown that the adoption of digitalization has a positive relationship with tourism sustainability, both through improving the quality of tourist experiences, protecting culture and the environment, and strengthening local economies. Gordon et al. [32] and Saseanu et al. [33] emphasized that digitalization directly contributes to green tourism practices and institutional transformation that supports sustainable development. In the context of destinations and local communities, information digitalization has been shown to strengthen community-based tourism and sustainable values, including halal and local culture [34]. Furthermore, cross-country evidence suggests that robust digital infrastructure significantly contributes to the economic and social sustainability of the tourism sector [35]. Despite differences in levels of technology adoption and readiness, the literature consistently points to a positive relationship between tourism digitalization and destination sustainability [36-39].

**H3:** *Tourism digitalization has a positive effect on sustainable tourism.*

MSME innovation plays a crucial role in promoting sustainable tourism, particularly through the creation of products, services, and business processes that align with economic, social, and environmental principles. Innovative tourism MSMEs are able to develop more environmentally friendly business practices, strengthen local community engagement, and maintain the sustainability of the destination's cultural and natural resources. The literature confirms that innovation is a key foundation in the sustainable tourism development agenda, as it enables small businesses to adapt to long-term sustainability demands [14, 40].

Empirical studies show that MSME innovation directly contributes to the sustainability of tourism destinations through local economic revitalization, job creation, and improved social welfare [15, 41]. In the context of developing countries, innovation by tourism MSMEs has been shown to strengthen the competitiveness and performance of the sustainable tourism industry, especially when MSMEs play a key role in the destination ecosystem [42, 43]. Furthermore, sustainability-oriented innovation, including green service innovation and ESG practices, directly contributes to improving sustainable tourism performance across economic, social, and environmental dimensions [18, 19].

While the level and form of innovation may vary across contexts, the direction of the relationship between MSME innovation and sustainable tourism consistently shows a positive influence [44, 45].

**H4:** *MSME innovation has a positive effect on sustainable tourism.*

The performance of MSMEs is a key pillar in realizing sustainable tourism because they play a direct role in providing tourism services, creating local economic value, and strengthening the social and environmental dimensions of destinations. MSMEs with high performance, whether in terms of human resources, operations, finance, or services, have a greater capacity to implement responsible and long-term business practices. Hermawati [4] empirically demonstrated that the human resource performance of tourism MSMEs significantly influences responsible tourism marketing and the competitiveness of sustainable tourism in East Java.

In the context of tourism villages and community-based tourism development, the performance and empowerment of MSMEs are directly related to destination sustainability, as demonstrated by Purnomo and Purwandari [43]. A study by John [5] confirms that tourism MSMEs with strong performance and organizational capabilities play a crucial role in maintaining the resilience and sustainability of the tourism sector post-crisis. Furthermore, the performance of MSMEs supported by environmentally friendly practices, green marketing, and a sustainability orientation has been shown to strengthen sustainable tourism in Indonesia [46] and encourage the sustainable growth of tourism MSMEs [47].

Furthermore, cross-sectoral evidence shows that the sustainable performance of MSMEs, through strategic planning, sustainable management, corporate social responsibility (CSR), innovation, and a green orientation, is positively correlated with the achievement of economic, social, and environmental sustainability in tourism [48-51].

**H5:** *MSME performance has a positive effect on sustainable tourism.*

Tourism digitalization is increasingly seen as a crucial prerequisite for achieving sustainable tourism, particularly in developing countries that rely heavily on MSMEs. However, various studies show that digitalization does not automatically lead to sustainability but rather works through improving MSME performance as a key mechanism. Diaz-Pelaez et al. [52] demonstrated that digital strategy significantly influences MSME performance, with innovation acting as a reinforcement. Therefore, the benefits of digitalization are only optimal when reflected in improved organizational performance. Similar findings were demonstrated by Zuñiga-Collazos et al. [20], who found that digitalization in tourism MSMEs encourages innovation and environmental management, ultimately improving business sustainability and performance.

In the context of rural tourism, Purnomo and Purwandari [43] emphasized that the use of technology and service digitalization strengthens the performance and empowerment of MSMEs, which in turn has a direct impact on tourism development and the sustainability of tourist villages. A study by Al-Omush et al. [53] also showed that digital strategy improves MSME sustainable performance by strengthening

internal capabilities, confirming the role of performance as an intervening variable. Furthermore, Pangarso et al. [54] emphasized that digitalization supports the improved performance of green economy-based MSMEs, which is a crucial foundation for the sustainability of the tourism sector.

Furthermore, cross-sectoral literature confirms that MSME performance strengthened by digital capabilities, digital literacy, green innovation, and the use of sustainable technology is a key pathway to business and destination sustainability. This is supported by Gidage and Bhide [55], Seow et al. [56], Naayif et al. [57], Yadav et al. [58], and Ibrahim and Aduah [59], who consistently demonstrate that digital practices enhance sustainability through improved business performance. Thus, in the tourism context, digitalization contributes to sustainable tourism primarily through improving MSME performance as a key mediating mechanism.

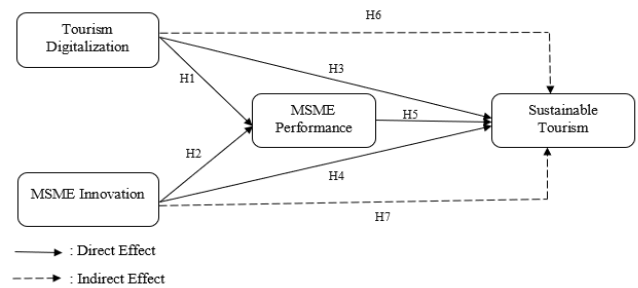
**H6:** *MSME performance mediates the effect of tourism digitalization on sustainable tourism.*

Various studies have shown that MSME innovation does not automatically lead to tourism sustainability, but rather operates through MSME performance as a key mediating mechanism. Gidage and Bhide [55] demonstrated that intellectual capital and green innovation improve MSME financial performance through sustainability mediation, confirming that organizational performance is the primary channel for transforming innovation into sustainable impact. Similar findings are supported by AlKoliby et al. [60] and Bhatti et al. [61], who show that innovation, whether knowledge-based, digital marketing, or big data analytics, only has a significant impact on sustainable performance when mediated by MSME internal capabilities and operational performance.

In the context of green entrepreneurial orientation and sustainability policy, Mondal et al. [49] asserted that green entrepreneurial orientation mediates the relationship between CSR and sustainable performance, while green innovation strengthens this effect. This suggests that MSME strategic innovation requires adaptive organizational performance to drive sustainability. Yadav et al. [58] and Ibrahim and Aduah [59] also found that digital transformation and digital literacy indirectly influence business sustainability through innovation and technology adoption, ultimately reflecting improved MSME performance.

In the tourism sector, the role of MSME performance is becoming increasingly crucial. Hermawati [4] demonstrated that the human resource performance of tourism MSMEs mediates the influence of leadership and responsible marketing practices on sustainable tourism competitiveness. Meanwhile, Neger et al. [62] emphasized that tourism innovation and policies are only effective in increasing environmental resilience when supported by adequate structural conditions and institutional performance. Overall, the literature confirms that MSME performance is a key mediator that bridges MSME innovation with tourism sustainability, making organizational performance a strategic element in MSME-based sustainable tourism development models (Figure 1) [4, 49, 55, 56, 58, 59, 61, 62].

**H7:** *MSME performance mediates the effect of MSME innovation on sustainable tourism.*



**Figure 1.** Research model

### 3. RESEARCH METHODS

This study employed a quantitative explanatory research design to examine the causal relationships between tourism digitalization, MSME innovation, MSME performance, and perceived sustainable tourism contribution, including the mediating role of MSME performance. A quantitative approach was considered appropriate because the study aims to empirically test structural relationships among latent constructs using Partial Least Squares–Structural Equation Modeling (PLS-SEM).

#### 3.1 Population and sampling

The study population consisted of tourism-related MSMEs operating in DIY, Indonesia. The MSMEs were engaged in tourism-supporting sectors, including culinary businesses, homestays, handicrafts, tourism services, and creative economy enterprises located in both established and emerging tourism destinations such as Semarang City, Semarang Regency, Magelang Regency, Wonosobo, Banjarnegara, Bantul Regency, and Sleman Regency.

The respondents were MSME owners, managers, or core decision-makers rather than operational employees. These respondents were selected because they possess strategic knowledge regarding business digitalization, innovation practices, organizational performance, and sustainability orientation. The sampling technique employed purposive sampling with the following criteria: (1) MSMEs had operated for at least two years, (2) MSMEs were directly related to tourism activities or tourism-supporting services, and (3) respondents were directly involved in strategic business decision-making.

A total of 250 questionnaires were distributed both offline and online between June and September 2025. Of these, 195 questionnaires were returned, yielding a response rate of 78%. After data screening, 17 questionnaires were excluded due to incomplete responses, inconsistent answer patterns, and outliers, resulting in 178 valid responses for analysis.

The sample size satisfies the minimum recommendation for PLS-SEM analysis, which suggests at least 10 times the largest number of structural paths directed at a construct and recommends 150–200 observations for mediation models with moderate complexity [63].

#### 3.2 Instrument development and measurement

Data were collected using a structured questionnaire measured with a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. All measurement

items were adapted from previous validated studies and adjusted to the context of tourism MSMEs in developing regions.

The questionnaire development process involved three stages. First, measurement items were adapted from prior empirical studies related to MSME digitalization, innovation, organizational performance, and sustainable tourism. Second, the wording of the items was adjusted to suit the tourism MSME context in DIY. Third, the questionnaire was evaluated through expert review and a pilot test involving several MSME

actors to ensure clarity, contextual relevance, and readability.

Importantly, the sustainable tourism construct in this study reflects respondents' perceived contribution of MSME activities toward tourism sustainability rather than objective destination-level sustainability indicators. Therefore, the construct is operationalized as perceived sustainable tourism contribution across economic, social, environmental, competitiveness, and resilience dimensions. Table 1 presents the measurement constructs, indicators, sample questionnaire items, and measurement sources.

**Table 1.** Variable measurement and questionnaire items

Variable	Indicator	Sample Questionnaire Item	Source
Digitalization	DIG1	Our MSME uses digital technology in daily operations.	[59-61]
	DIG2	We actively use digital marketing to promote tourism products/services.	
	DIG3	Our business utilizes online platforms to interact with customers.	
	DIG4	Digital systems are integrated into our business processes and value chain.	
	DIG5	Digital information supports managerial decision-making.	
MSME Innovation	INV1	Our MSME regularly develops new tourism products/services.	[55, 60, 61]
	INV2	We continuously improve operational processes.	
	INV3	We apply innovative marketing approaches.	
	INV4	We adopt digital innovation to improve competitiveness.	
	INV5	We develop environmentally friendly innovations.	
MSME Performance	PERF1	Our MSME has experienced improved financial performance.	[55, 59, 61]
	PERF2	Operational performance has improved over the last few years.	
	PERF3	Our market reach and competitiveness have increased.	
	PERF4	Business efficiency has improved significantly.	
	PERF5	Our MSME demonstrates sustainable business performance.	
Perceived Sustainable Tourism Contribution	SUST1	Our MSME contributes to the local tourism economy.	[4, 49, 62]
	SUST2	Our business activities support community welfare and social sustainability.	
	SUST3	Our MSME contributes to environmental sustainability practices.	
	SUST4	Our business strengthens destination competitiveness.	
	SUST5	Our MSME contributes to tourism resilience and long-term sustainability.	

### 3.3 Common method bias assessment

Because all variables were collected from the same respondents using a single questionnaire and at one point in time, common method bias (CMB) was assessed. First, Harman's single-factor test was conducted, and the first factor explained less than 50% of the total variance, indicating that common method variance was not a dominant issue.

Second, full collinearity variance inflation factor (VIF) values were examined following Kock's [64] recommendation. All full collinearity VIF values were below the threshold of 3.3, suggesting that CMB was unlikely to substantially inflate the structural relationships.

Procedural remedies were also applied during questionnaire administration, including anonymity assurance, voluntary participation, and clear separation between predictor and criterion construct sections.

### 3.4 Data analysis

Data analysis was conducted using PLS-SEM with SmartPLS software. PLS-SEM was selected because it is suitable for prediction-oriented research, mediation analysis, non-normal data distribution, and medium sample sizes.

The analysis procedure involved two stages: evaluation of the measurement model (outer model) and evaluation of the structural model (inner model). The measurement model assessment included convergent validity, discriminant validity, Cronbach's Alpha, Composite Reliability (CR), Average Variance Extracted (AVE), Fornell-Larcker criterion, and Heterotrait-Monotrait Ratio (HTMT).

The structural model evaluation included collinearity testing, coefficient of determination ( $R^2$ ), effect size ( $f^2$ ), predictive relevance ( $Q^2$ ), and hypothesis testing using bootstrapping procedures.

For mediation analysis, bootstrapping with 5,000 resamples and bias-corrected and accelerated (BCa) confidence intervals was employed to examine the significance of indirect effects. The mediation assessment considered direct effects, indirect effects, total effects, and Variance Accounted For (VAF) to determine whether the mediation was partial or full mediation.

## 4. RESULTS

### 4.1 Demographic profile of respondents

To improve the representativeness and interpretability of the findings, respondent profiles were classified based on region, business sector, business size, and business age. Table 2 presents the demographic and business characteristics of the respondents involved in this study. Most respondents were located in Central Java (57.3%), while 42.7% were from the DIY, indicating balanced regional representation across the two major tourism destinations. Based on business sector, culinary businesses dominated the sample (34.8%), followed by homestay/accommodation, handicraft/souvenir, tourism services, and creative economy sectors. Most businesses were micro enterprises (61.2%), reflecting the dominant structure of tourism MSMEs in Indonesia. Regarding business age, the majority had operated for 6–10 years (41.6%), indicating relatively mature business experience among respondents.

**Table 2.** Respondent profile

Category	Classification	Frequency	Percentage
Region	Central Java	102	57.3
	Yogyakarta	76	42.7
	Culinary	62	34.8
Business Sector	Homestay/ Accommodation	33	18.5
	Handicraft/Souvenir	29	16.3
	Tourism Services	28	15.7
	Creative Economy	26	14.7
Business Size	Micro	109	61.2
	Small	51	28.7
	Medium	18	10.1
Business Age	2–5 years	52	29.2
	6–10 years	74	41.6
	>10 years	52	29.2

#### 4.2 Evaluation of measurement model (Outer model)

The measurement model was evaluated to ensure the validity and reliability of the constructs used in this study

(Table 3). Convergent validity was tested using outer loading and AVE values. The analysis showed that all indicators had outer loading values above the recommended threshold of 0.70. This indicates that each indicator adequately represents the latent construct. Although some indicators had outer loading values in the 0.70–0.75 range, this value is still acceptable considering the research context, which focuses on tourism MSMEs in developing regions.

The AVE values for all constructs were above 0.50, with a range of 0.62 to 0.69. This finding indicates that each construct explained more than 50 percent of the variance in its indicator, thus meeting the convergent validity criterion.

Furthermore, internal consistency reliability was evaluated using Cronbach's Alpha and CR. The test results showed that all constructs had Cronbach's Alpha and CR values above 0.70. Thus, it can be concluded that the indicators in each construct have good internal consistency and the research construct is declared reliable. Overall, the measurement model has met the requirements for validity and reliability, making it suitable for use in testing the structural model.

**Table 3.** Outer loading and Average Variance Extracted (AVE)

Variable	Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Digitalization	DIG1	0.812	0.84	0.89	0.62
	DIG2	0.784			
	DIG3	0.801			
	DIG4	0.769			
	DIG5	0.823			
MSME Innovation	INV1	0.836	0.87	0.91	0.66
	INV2	0.812			
	INV3	0.791			
	INV4	0.804			
	INV5	0.827			
MSME Performance	PERF1	0.842	0.88	0.91	0.67
	PERF2	0.819			
	PERF3	0.786			
	PERF4	0.803			
	PERF5	0.821			
Sustainable Tourism	SUST1	0.854	0.89	0.92	0.69
	SUST2	0.826			
	SUST3	0.801			
	SUST4	0.819			
	SUST5	0.833			

**Table 4.** Fornell–Larcker criterion

Variable	DIG	INV	PERF	SUST
Digitalization	0.79			
MSME Innovation	0.54	0.81		
MSME Performance	0.57	0.62	0.82	
Sustainable Tourism	0.51	0.58	0.65	0.83

Note: DIG = Digitalization; INV = MSME Innovation; PERF = MSME Performance; SUST = Sustainable Tourism.

**Table 5.** Heterotrait–Monotrait Ratio (HTMT) value

Construct Relationship	HTMT
DIG – INV	0.63
DIG – PERF	0.66
DIG – SUST	0.61
INV – PERF	0.71
INV – SUST	0.69
PERF – SUST	0.75

Note: DIG = Digitalization; INV = MSME Innovation; PERF = MSME Performance; SUST = Sustainable Tourism.

Discriminant validity was evaluated using the Fornell–Larcker criterion, by comparing the square root of the Average Variance Extracted ( $\sqrt{\text{AVE}}$ ) and the correlation between constructs (Table 4). The test results showed that all  $\sqrt{\text{AVE}}$  values on the main diagonal were greater than the correlation between other constructs. MSME Digitalization, MSME Innovation, MSME Performance, and Sustainable Tourism each had  $\sqrt{\text{AVE}}$  values of 0.79; 0.81; 0.82; and 0.83, respectively, all of which exceeded the correlation values between constructs. These findings confirmed that each construct had a sufficient level of uniqueness and could be empirically distinguished, thus the discriminant validity criteria were declared met.

Discriminant validity was also tested using the HTMT approach with a maximum value limit of 0.90 (Table 5). The test results showed that all HTMT values between constructs were in the range of 0.61–0.75, which was consistently lower than the recommended threshold. This finding indicates that each construct has clear conceptual differences and there is no measurement overlap between latent variables. Thus, the

discriminant validity of the measurement model was strongly met.

### 4.3 Structural model evaluation (Inner model)

Table 6 presents the results of the structural collinearity and full collinearity assessments. The structural VIF values for all predictor relationships ranged from 1.87 to 2.31, which are below the recommended threshold of 5 and the ideal threshold of 3. These findings indicate that no multicollinearity issues exist among the predictor constructs in the structural model.

Since all variables were collected from the same respondents using a single questionnaire at one point in time, CMB was also evaluated. Harman’s single-factor test revealed that the first factor explained 38.4% of the total variance, which is below the recommended threshold of 50%, indicating that common method variance was not a serious concern. Furthermore, the full collinearity VIF values ranged from 2.11 to 2.45, remaining below the threshold of 3.3 suggested by Kock [64]. Therefore, the model is considered free from substantial CMB.

**Table 6.** Structural collinearity and full collinearity variance inflation factor (VIF) assessment

Structural Relationships / Constructs	VIF	Full Collinearity VIF
DIG → PERF	1.87	–
INV → PERF	1.87	–
DIG → ST	2.04	–
INV → SUST	2.12	–
PERF → SUST	2.31	–
Digitalization	–	2.11
MSME Innovation	–	2.27
MSME Performance	–	2.45
Sustainable Tourism	–	2.38

Note: DIG = Digitalization; INV = MSME Innovation; PERF = MSME Performance; SUST = Sustainable Tourism.

The results of the structural model evaluation are presented in Table 7. Based on the test results, an R<sup>2</sup> value of 0.53 indicates that MSME digitalization and MSME innovation explain 53 percent of the variation in MSME performance,

which falls into the moderate category. Meanwhile, an R<sup>2</sup> value of 0.61 indicates that the combination of MSME digitalization, MSME innovation, and MSME performance explains 61 percent of the variation in sustainable tourism, which falls into the moderate to near-strong category. This finding confirms that the model has adequate explanatory power in explaining the main endogenous constructs.

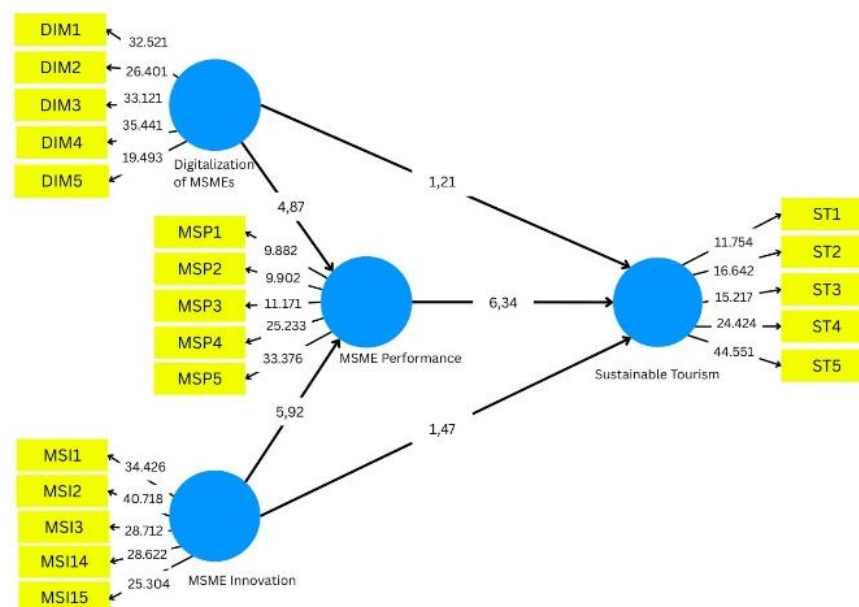
Furthermore, the effect size (f<sup>2</sup>) test shows that MSME innovation has a greater contribution (f<sup>2</sup> = 0.29) than MSME digitalization (f<sup>2</sup> = 0.21) in improving MSME performance, both of which fall into the moderate category. For sustainable tourism, MSME performance has the most substantial impact, with an f<sup>2</sup> value of 0.32, approaching the large category, compared to MSME digitalization and innovation, which contribute relatively little to moderately. Furthermore, the results of the predictive relevance test show that all Q<sup>2</sup> values are positive, namely 0.34 for MSME performance and 0.41 for sustainable tourism. These values confirm that the structural model has good predictive ability and is empirically relevant.

**Table 7.** Fornell–Larcker criterion coefficient of determination, effect size, and predictive relevance of the structural model

Endogenous Variables	Predictor	R <sup>2</sup>	Q <sup>2</sup>	f <sup>2</sup>	Category f <sup>2</sup>
MSME Performance	Digitalization	0.53	0.34	0.21	Medium
	MSME Innovation			0.29	Medium
	Digitalization of MSMEs (DIM)	0.61	0.41	0.08	Small
Sustainable Tourism	MSME Performance			0.14	Small-Medium
	MSME Innovation			0.32	Medium-High
	MSME Performance				

### 4.4 Path and mediation significance test

The results of the hypothesis testing, including the path coefficients and their significance levels, are visually summarized in Figure 2.



**Figure 2.** Hypothesis framework

**Table 8.** Path significance test results (bootstrapping)

Hypothesis	Path	Coefficient ( $\beta$ )	T-Statistic	P-Value	Information
H1	Digitalization $\rightarrow$ MSME Performance	0.41	4.87	0.000	Supported
H2	MSME Innovation $\rightarrow$ MSME Performance	0.48	5.92	0.000	Supported
H3	Digitalization $\rightarrow$ Sustainable Tourism	0.09	1.21	0.226	Not Supported
H4	MSME Innovation $\rightarrow$ Sustainable Tourism	0.11	1.47	0.141	Not Supported
H5	MSME Performance $\rightarrow$ Sustainable Tourism	0.56	6.34	0.000	Supported

Hypothesis 1 states that MSME digitalization has a positive effect on MSME performance. The bootstrapping analysis results indicate that MSME digitalization has a positive and significant effect on MSME performance, with a path coefficient of  $\beta = 0.41$ , a t-statistic of 4.87, and a p-value of 0.000 (Table 8). A t-statistic exceeding 1.96 and a p-value below 0.05 confirm the support for H1. These findings indicate that the use of digital technology in operations, marketing, and decision-making significantly improves the efficiency and performance of MSMEs in the tourism sector.

Hypothesis 2 states that MSME innovation has a positive effect on MSME performance. The test results indicate that MSME innovation has a positive and significant effect on MSME performance, with a coefficient of  $\beta = 0.48$ , a t-statistic of 5.92, and a p-value of 0.000. Based on the significance criteria, H2 is supported. These findings indicate that the ability of MSMEs to innovate products, processes, and marketing is a key factor in driving sustainable business performance.

Hypothesis 3 states that tourism digitalization has a positive effect on sustainable tourism. The analysis results show that tourism digitalization has a path coefficient of  $\beta = 0.09$ , with a t-statistic of 1.21 and a p-value of 0.226. Since the t-statistic is below 1.96 and the p-value exceeds 0.05, H3 is not supported. These findings indicate that tourism digitalization does not directly contribute to sustainable tourism outcomes. This suggests that the benefits of digitalization may require improved organizational capability and MSME performance before generating sustainability impacts.

Hypothesis 4 states that MSME innovation has a positive effect on sustainable tourism. The analysis results show that MSME innovation has a path coefficient of  $\beta = 0.11$ , a t-statistic of 1.47, and a p-value of 0.141. Based on the significance criteria, H4 is not supported. These findings

indicate that MSME innovation does not directly affect sustainable tourism but instead operates through improvements in MSME performance as an intermediary organizational mechanism.

Hypothesis 5 states that MSME performance has a positive effect on sustainable tourism. The analysis results show that MSME performance has a positive and significant effect on sustainable tourism, with a path coefficient of  $\beta = 0.56$ , a t-statistic of 6.34, and a p-value of 0.000. Thus, H5 is supported. These findings confirm that MSMEs with strong organizational and operational performance make significant contributions to economic, social, and environmental sustainability within tourism destinations.

Table 9 presents the results of the mediation analysis using the bootstrapping procedure with 5,000 resamples and BCa confidence intervals at the 95% confidence level. The indirect effect of MSME digitalization on sustainable tourism through MSME performance was significant ( $\beta = 0.23$ ;  $t = 4.11$ ;  $p < 0.001$ ), with a 95% BCa confidence interval ranging from 0.121 to 0.338, which does not include zero. Similarly, MSME innovation showed a significant indirect effect on sustainable tourism through MSME performance ( $\beta = 0.27$ ;  $t = 4.68$ ;  $p < 0.001$ ), with a confidence interval of 0.154 to 0.391.

The direct effects of digitalization and innovation on sustainable tourism were previously found to be insignificant. Therefore, MSME performance fully mediates the relationship between MSME digitalization, MSME innovation, and sustainable tourism. These findings strengthen the theoretical argument that digitalization and innovation do not automatically generate sustainability outcomes, but instead require improved organizational and business performance as the key mechanism linking MSME transformation to sustainable tourism development.

**Table 9.** Mediation test results (indirect effect – bootstrapping)

Hypothesis	Mediation Path	Indirect Effect ( $\beta$ )	T-Statistic	P-Value	95% BCa CI	Direct Path Result	Type of Mediation
H6	DIG $\rightarrow$ PERF $\rightarrow$ SUST	0.23	4.11	0.000	[0.121, 0.338]	Not Significant	Full mediation
H7	INV $\rightarrow$ PERF $\rightarrow$ SUST	0.27	4.68	0.000	[0.154, 0.391]	Not Significant	Full mediation

Note: DIG = Digitalization; INV = MSME Innovation; PERF = MSME Performance; SUST = Sustainable Tourism; BCa CI = bias-corrected and accelerated (BCa) confidence intervals.

## 5. DISCUSSION

This study provides important theoretical and empirical insights into the relationship between MSME digitalization, MSME innovation, MSME performance, and sustainable tourism in tourism destinations in DIY. The findings demonstrate that digitalization and innovation significantly improve MSME performance, while MSME performance becomes the primary mechanism through which sustainable tourism outcomes are achieved.

First, MSME digitalization was found to positively and significantly affect MSME performance ( $\beta = 0.41$ ;  $p < 0.001$ ). The adoption of digital technologies, including e-commerce, digital payments, online marketing, and tourism information systems, improves operational efficiency, market access, and business responsiveness. These findings support previous studies by Verma et al. [11] and Kilay et al. [8], which emphasized the role of digital transformation in enhancing MSME competitiveness and performance. However, this study extends prior research by showing that, in tourism

MSMEs within developing destinations, digitalization primarily functions as an organizational capability rather than a direct sustainability driver. Digital technologies contribute to sustainability only when they strengthen MSME operational and business performance.

Second, MSME innovation also showed a positive and significant influence on MSME performance ( $\beta = 0.48$ ;  $p < 0.001$ ), indicating that innovation is a stronger determinant of MSME performance than digitalization. Product innovation, service differentiation, marketing innovation, and environmentally friendly practices allow tourism MSMEs to adapt to changing tourist preferences and increasing destination competition. These findings align with Octasyva et al. [12] and Larios-Francia and Ferasso [13], who identified innovation as a central driver of MSME competitiveness and long-term business performance. In tourism destinations, innovation is particularly important because tourism products are experience-based and require continuous adaptation to maintain customer satisfaction and destination attractiveness.

Third, MSME performance was proven to have a strong positive effect on sustainable tourism ( $\beta = 0.56$ ;  $p < 0.001$ ). This finding confirms that MSMEs with stronger financial, operational, and market performance possess greater capacity to support economic sustainability, destination competitiveness, community welfare, and tourism resilience. In the context of DIY, tourism MSMEs are closely connected to local communities and cultural resources. Therefore, high-performing MSMEs are more capable of supporting local employment, preserving cultural identity, and implementing environmentally responsible business practices. These findings reinforce previous studies by Hermawati [4], John [5], and Purnomo and Purwandari [43], which position MSME organizational performance as a key pillar of sustainable tourism development.

An important finding of this study is that tourism digitalization and MSME innovation did not directly influence sustainable tourism. The direct effect of digitalization on sustainable tourism was insignificant ( $\beta = 0.09$ ;  $p > 0.05$ ), while the direct effect of innovation on sustainable tourism was also insignificant ( $\beta = 0.11$ ;  $p > 0.05$ ). These findings indicate that digitalization and innovation alone are insufficient to directly create sustainability outcomes in tourism destinations. In many tourism MSMEs, digitalization remains operational and transactional, focusing mainly on promotion, communication, and online sales rather than sustainability-oriented transformation. Similarly, innovation is often directed toward short-term business adaptation and market survival instead of environmental or social sustainability goals.

This finding differs from several prior studies that suggested direct relationships between digitalization, innovation, and sustainability outcomes [32, 40]. However, the present results align more closely with organizational capability perspectives proposed by Schönherr et al. [21] and Zuñiga-Collazos et al. [20], which argue that digitalization and innovation only contribute to sustainability when transformed into improved organizational performance and internal business capability. Therefore, the present study contributes theoretically by clarifying the causal mechanism underlying sustainable tourism development in MSME-based destinations.

The mediation analysis further strengthens this contribution. MSME performance fully mediated the relationship between digitalization and sustainable tourism ( $\beta$  indirect = 0.23;  $p < 0.001$ ), as well as the relationship between

innovation and sustainable tourism ( $\beta$  indirect = 0.27;  $p < 0.001$ ). These findings indicate that the sustainability impact of digitalization and innovation operates indirectly through improvements in MSME performance. Sustainable tourism outcomes emerge not merely from technology adoption or innovation activities but from the extent to which these capabilities improve organizational effectiveness, service quality, operational resilience, and business competitiveness.

This study therefore contributes theoretically beyond geographical replication. Unlike prior studies that mainly examined direct relationships between digitalization, innovation, and sustainability, this research demonstrates that MSME performance functions as a strategic organizational capability mechanism connecting digital transformation and innovation to sustainable tourism outcomes. The findings extend the work of Zuñiga-Collazos et al. [20] by emphasizing the full mediating role of MSME performance in tourism destinations characterized by limited resources, uneven digital readiness, and structurally constrained MSMEs. Overall, the study confirms that sustainable tourism development depends not only on adopting digital technologies and innovation but also on the ability of MSMEs to convert these capabilities into stronger organizational performance that supports long-term tourism sustainability.

## 6. CONCLUSION

This study aims to analyze the role of MSME digitalization and innovation in promoting sustainable tourism by utilizing MSME performance as a mediating variable. The main findings indicate that both MSME digitalization and innovation have a positive and significant impact on MSME performance. Innovation is shown to have a relatively stronger influence than digitalization in improving business performance, highlighting the importance of MSMEs' ability to create added value through product, process, and marketing development. Furthermore, MSME performance significantly impacts sustainable tourism, confirming that high-performing MSMEs have a greater capacity to support the economic, social, and environmental sustainability of tourist destinations.

However, the results indicate that MSME digitalization and innovation do not directly influence sustainable tourism. A mediation test confirmed that MSME performance fully mediates the relationship between digitalization and sustainable tourism, as well as between innovation and sustainable tourism. These findings confirm that digitalization and innovation will only impact destination sustainability when both are successfully transformed into improved MSME performance. Thus, MSME performance plays a key role in the MSME-based sustainable tourism development model.

The practical implications of this research suggest that tourism development policies and programs should not focus solely on adopting digital technology and encouraging innovation, but should also be directed at strengthening the performance of MSMEs, including operational, financial, and business sustainability aspects. The theoretical implication is the strengthening of the mediation model in the sustainable tourism literature, which positions MSME performance as a strategic intervening variable.

This research is limited by its relatively limited sample size and geographic coverage, as the study only covers tourist destinations in DIY. Furthermore, the research model is limited to three main variables, thus failing to capture the

complexity of other factors influencing sustainable tourism. Future research is recommended to expand the study area, increase the sample size, and include additional variables such as policy support, institutional capacity, and community participation to gain a more comprehensive understanding.

## REFERENCES

- [1] Ekon/Coordinating Ministry for Economic Affairs of the Republic of Indonesia. (2025). Mendongkrak kinerja sektor pariwisata, pemerintah siapkan berbagai program lintas sektor. <https://www.ekon.go.id/publikasi/detail/6253/mendongkrak-kinerja-sektor-pariwisata-pemerintah-siapkan-berbe-gai-program-lintas-sektor>.
- [2] BPS-Statistics Indonesia Jepara Regency. (2025). Jawa Tengah Tourism Development December 2024. <https://jeparakab.bps.go.id/en/pressrelease/2025/02/03/58/jawa-tengah-tourism-development-december-2024.html>.
- [3] BPS-Statistics Indonesia. (2025). Tourism in Daerah Istimewa Yogyakarta, Desember 2024. <https://yogyakarta.bps.go.id/en/pressrelease/2025/02/03/1611/perkembangan>.
- [4] Hermawati, A. (2020). Transglobal leadership approach to sustainable tourism competitiveness at tourism sector-engaged MSMEs through integrated human resource performance and responsible marketing. *International Journal of Tourism Cities*, 6(4): 863-883. <https://doi.org/10.1108/IJTC-06-2019-0085>
- [5] John, L. (2023). Can MSMEs in tourism survive the COVID-19 storm? A MSME view of their stakeholders. *Benchmarking: An International Journal*, 30(6): 2166-2188. <https://doi.org/10.1108/BIJ-11-2021-0687>
- [6] Fauzi, A.A., Sheng, M.L. (2022). The digitalization of micro, small, and medium-sized enterprises (MSMEs): An institutional theory perspective. *Journal of Small Business Management*, 60(6): 1288-1313. <https://doi.org/10.1080/00472778.2020.1745536>
- [7] Rosyidiana, R.N., Narsa, I.M. (2024). Micro, small, and medium-sized enterprises (MSMEs) during the post-pandemic economic recovery period: Digitalization, literation, innovation, and its impact on financial performance. *Cogent Business & Management*, 11(1): 2342488. <https://doi.org/10.1080/23311975.2024.2342488>
- [8] Kilay, A.L., Simamora, B.H., Putra, D.P. (2022). The influence of e-payment and e-commerce services on supply chain performance: Implications of open innovation and solutions for the digitalization of micro, small, and medium enterprises (MSMEs) in Indonesia. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(3): 119. <https://doi.org/10.3390/joitmc8030119>
- [9] Indriastuti, M., Kartika, I. (2022). The impact of digitalization on MSMEs' financial performance: The mediating role of dynamic capability. *Jurnal Economia*, 18(2): 240-255. <https://doi.org/10.21831/economia.v18i2.42790>
- [10] Sudrajad, A.I., Tricahyono, D., Yulianti, E.B., SM, A., Rosmawati, W. (2023). The role of digitalization performance on digital business strategy in Indonesia MSMEs. *International Journal of Professional Business Review*, 8(6): 1-18. <https://doi.org/10.26668/businessreview/2023.v8i6.2260>
- [11] Verma, A., Das, K.C., Misra, P. (2025). Digital finance and MSME performance in India: Evidence from World Bank Enterprise Survey data. *Journal of Economic Studies*, 52(5): 887-903. <https://doi.org/10.1108/JES-12-2023-0744>
- [12] Octasyilva, A.R.P., Yuliati, L.N., Hartoyo, H., Soehadi, A.W. (2022). Innovativeness as the key to MSMEs' performances. *Sustainability*, 14(11): 6429. <https://doi.org/10.3390/su14116429>
- [13] Larios-Francia, R.P., Ferasso, M. (2023). The relationship between innovation and performance in MSMEs: The case of the wearing apparel sector in emerging countries. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(1): 100018. <https://doi.org/10.1016/j.joitmc.2023.100018>
- [14] Bressan, A., Pedrini, M. (2020). Exploring sustainable-oriented innovation within micro and small tourism firms. *Tourism Planning & Development*, 17(5): 497-514. <https://doi.org/10.1080/21568316.2019.1673810>
- [15] Antão-Geraldes, A.M., Sheppard, V.A. (2020). Promoting sustainable tourism in rural and natural areas through small business innovation: The case of Atenor village (Northeast, Portugal). *Journal of Ecotourism*, 19(2): 185-193. <https://doi.org/10.1080/14724049.2019.1607864>
- [16] El Archi, Y., Benbba, B., Kabil, M., Dávid, L.D. (2023). Digital technologies for sustainable tourism destinations: State of the art and research agenda. *Administrative Sciences*, 13(8): 184. <https://doi.org/10.3390/admsci13080184>
- [17] Sonuç, N., Süer, S. (2023). Smart tourism destinations and digitalization of cultural heritage for sustainability. In *Smart Cities for Sustainability*, pp. 151-168. <https://doi.org/10.1108/S1877-636120230000033010>
- [18] Elizabeth, E., Prabowo, H., Setiowati, R., Bandur, A. (2025). Sustainable tourism strategies: Examining green service innovation as a mediator between the marketing mix and business performance in Bali's tour and travel SMEs. *Tourism and Hospitality*, 6(3): 129. <https://doi.org/10.3390/tourhosp6030129>
- [19] Rahman, M., Islam, F., Hossain, E., Rehman, M.Z., Siddik, A.B. (2025). Environmental, social, and governance-driven sustainable tourism management in small and medium enterprises. *International Journal of Sustainable Development & World Ecology*, 32(8): 988-1008. <https://doi.org/10.1080/13504509.2025.2576023>
- [20] Zuñiga-Collazos, A., Galvez-Albarracin, E.J., Vera-Jaramillo, F., Patiño-Giraldo, L.V. (2025). Digitalization, innovation, sustainability and performance: A causal analysis applied to tourism MSMEs. *International Journal of Innovation Studies*, 9(1): 46-59. <https://doi.org/10.1016/j.ijis.2024.12.001>
- [21] Schönherr, S., Eller, R., Kallmuenzer, A., Peters, M. (2023). Organisational learning and sustainable tourism: The enabling role of digital transformation. *Journal of Knowledge Management*, 27(11): 82-100. <https://doi.org/10.1108/JKM-06-2022-0434>
- [22] Hervé, A., Schmitt, C., Baldeger, R. (2021). Digitalization, entrepreneurial orientation & internationalization of micro-, small-, and medium-sized enterprises. *Technology Innovation Management Review*, 10(4): 5-17.

- <https://doi.org/10.22215/timreview/1343>
- [23] Sanusi, Z.M., Roostika, R. (2023). Digital skills, digital entrepreneurship, job satisfaction, and sustainable performance of MSMEs: A survey on MSMEs in Indonesia. *International Journal of Sustainable Development and Planning*, 18(2): 465-473. <https://doi.org/10.18280/ijstdp.180215>
- [24] Ahmad, M., Wu, Q., Ahmed, S. (2024). Does CSR digitalization improve the sustainable competitive performance of SMEs? Evidence from an emerging economy. *Sustainability Accounting, Management and Policy Journal*, 15(1): 119-147. <https://doi.org/10.1108/SAMPJ-03-2023-0169>
- [25] Muafi, M. (2020). A nexus among strategic orientation, social network, knowledge sharing, organizational innovation, and MSMEs performance. *The Journal of Asian Finance, Economics and Business*, 7(6): 327-338. <https://doi.org/10.13106/jafeb.2020.vol7.no6.327>
- [26] Sudjatmoko, A., Ichsan, M., Astriani, M., Mariani, Clairine, A. (2023). The impact of COVID-19 pandemic on the performance of Indonesian MSME with innovation as mediation. *Cogent Business & Management*, 10(1): 2179962. <https://doi.org/10.1080/23311975.2023.2179962>
- [27] Singh, D. (2019). Implementation of technology innovation in MSMEs in India: Case study in select firms from Northern region. *Journal of Science and Technology Policy Management*, 10(3): 769-792. <https://doi.org/10.1108/JSTPM-06-2018-0065>
- [28] Dambiski Gomes de Carvalho, G., Resende, L.M.M.D., Pontes, J., Gomes de Carvalho, H., Mendes Betim, L. (2021). Innovation and management in MSMEs: A literature review of highly cited papers. *Sage Open*, 11(4). <https://doi.org/10.1177/21582440211052555>
- [29] Damiyana, D., Maulina, E., Muftiadi, A., Auliana, L., Kurniadi, K. (2024). The influence of innovation, knowledge management, and e-commerce adoption on MSME performance, and its impact on MSMEs sustainability. *Journal of Infrastructure, Policy and Development*, 8(11): 1-30. <https://doi.org/10.24294/jipd.v8i11.7994>
- [30] Latifah, L., Setiawan, D., Aryani, Y.A., Rahmawati, R. (2021). Business strategy-MSMEs' performance relationship: Innovation and accounting information system as mediators. *Journal of Small Business and Enterprise Development*, 28(1): 1-21. <https://doi.org/10.1108/JSBED-04-2019-0116>
- [31] Sreen, N., Sharma, V., Alshibani, S.M., Walsh, S., Russo, G. (2024). Knowledge acquisition from innovation failures: A study of micro, small and medium enterprises (MSMEs). *Journal of Knowledge Management*, 28(4): 947-970. <https://doi.org/10.1108/JKM-03-2023-0184>
- [32] Gordon, R., Wadim, S., Elena, K. (2021). Sustainable tourism in the digital age: Institutional and economic implications. *Terra Economicus*, 19(4): 141-159. <https://doi.org/10.18522/2073-6606-2021-19-4-141-159>
- [33] Saseanu, A.S., Ghita, S.I., Albastroiu, I., Stoian, C.A. (2020). Aspects of digitalization and related impact on green tourism in European countries. *Information*, 11(11): 507. <https://doi.org/10.3390/info11110507>
- [34] Nurhayati, I., Gustiawati, S., Rofiáh, R., Pujiastuti, S., et al. (2025). Community-based halal tourism and information digitalization: Sustainable tourism analysis. *Tourism and Hospitality*, 6(3): 148. <https://doi.org/10.3390/tourhosp6030148>
- [35] Khosravi, E., Gholizadeh, A., Saneinia, S. (2025). Bridging the digital divide: Exploring digitalization's role in sustainable tourism for BRI countries. *Journal of Environmental Management*, 394: 127420. <https://doi.org/10.1016/j.jenvman.2025.127420>
- [36] Myrovali, G., Tzanis, G., Morfoulaki, M. (2025). Sustainable tourism through digitalization and smart solutions. *Sustainability*, 17(12): 5383. <https://doi.org/10.3390/su17125383>
- [37] Talwar, S., Kaur, P., Nunkoo, R., Dhir, A. (2023). Digitalization and sustainability: Virtual reality tourism in a post pandemic world. *Journal of Sustainable Tourism*, 31(11): 2564-2591. <https://doi.org/10.1080/09669582.2022.2029870>
- [38] Loureiro, S.M.C., Nascimento, J. (2021). Shaping a view on the influence of technologies on sustainable tourism. *Sustainability*, 13(22): 12691. <https://doi.org/10.3390/su132212691>
- [39] Kummitha, H.R. (2025). Digitalization and sustainable branding in tourism destinations from a systematic review perspective. *Discover Sustainability*, 6(1): 1-18. <https://doi.org/10.1007/s43621-025-01751-3>
- [40] Edwards, D., Martinac, I., Miller, G. (2008). Research agenda for innovation in sustainable tourism. *Tourism and Hospitality Research*, 8(1): 56-61. <https://doi.org/10.1057/thr.2008.6>
- [41] Maziliauske, E. (2024). Innovation for sustainability through co-creation by small and medium-sized tourism enterprises (SMEs): Socio-cultural sustainability benefits to rural destinations. *Tourism Management Perspectives*, 50: 101201. <https://doi.org/10.1016/j.tmp.2023.101201>
- [42] Achmad, F., Prambudia, Y., Rumanti, A.A. (2023). Sustainable tourism industry development: A collaborative model of open innovation, stakeholders, and support system facilities. *IEEE Access*, 11: 83343-83363. <https://doi.org/10.1109/ACCESS.2023.3301574>
- [43] Purnomo, S., Purwandari, S. (2025). A comprehensive micro, small, and medium enterprise empowerment model for developing sustainable tourism villages in rural communities: A perspective. *Sustainability*, 17(4): 1368. <https://doi.org/10.3390/su17041368>
- [44] Núñez-Ríos, J.E., Sánchez-García, J.Y., Ramirez-Nafarrate, A. (2023). Sustainable performance in tourism SMEs: A soft modeling approach. *Journal of Modelling in Management*, 18(6): 1717-1739. <https://doi.org/10.1108/JM2-06-2021-0136>
- [45] Susanti, E., Mulyanti, R.Y., Wati, L.N. (2023). MSMEs performance and competitive advantage: Evidence from women's MSMEs in Indonesia. *Cogent Business & Management*, 10(2): 2239423. <https://doi.org/10.1080/23311975.2023.2239423>
- [46] Andriyansah, A., Subchan, S., Pamungkas, K., Geraldina, I., Arifin, A.H., Manggarani, C.A. (2025). Exploring sustainable tourism resources to realise ergo green tourism in Indonesia. *Aptisi Transactions on Technopreneurship*, 7(2): 334-342. <https://doi.org/10.34306/att.v7i2.499>
- [47] Ebdane, T.M.L. (2019). Entrepreneurial intention towards sustainable growth: The case of tourism MSMEs. *DLSU Business & Economics Review*, 28(3): 11-20. <https://doi.org/10.59588/2243-786X.1196>

- [48] Sari, R.K., Alfari, M., Ab Talib, M.S. (2024). Sustainable strategic planning and management influence on sustainable performance: Findings from halal culinary MSMEs in Southeast Asia. *Journal of Modelling in Management*, 19(6): 2034-2060. <https://doi.org/10.1108/JM2-12-2023-0324>
- [49] Mondal, S., Singh, S., Gupta, H. (2024). Exploring the impact of green entrepreneurial orientation on sustainable performance: Insights from CSR, policy and innovation. *Management Decision*, 62(12): 3946-3977. <https://doi.org/10.1108/MD-10-2023-1816>
- [50] Pompeia, M.L.F. (2021). Assessing the suitability of a single brand of MSMEs in the hospitality sector to boost sustainable development: The case of Mauritius. *Worldwide Hospitality and Tourism Themes*, 13(1): 109-123. <https://doi.org/10.1108/WHATT-08-2020-0094>
- [51] Babber, G., Mittal, A. (2025). Achieving sustainability through the integration of lean, agile, and innovative systems: Implications for Indian micro small medium enterprises (MSMEs). *Journal of Science and Technology Policy Management*, 16(2): 365-400. <https://doi.org/10.1108/JSTPM-05-2023-0087>
- [52] Díaz-Pelaez, A., Chura-Quispe, G., Clemente-Almendros, J.A., Velarde-Molina, J.F. (2025). Analysing the influence of digital strategy and innovation on MSMEs' performance in emerging countries. *Creativity and Innovation Management*, 34(2): 351-363. <https://doi.org/10.1111/caim.12642>
- [53] Al-Omush, A., Momany, M.T., Hannon, A., Anwar, M. (2023). Digitalization and sustainable competitive performance in small-medium enterprises: A moderation mediation model. *Sustainability*, 15(21): 15668. <https://doi.org/10.3390/su152115668>
- [54] Pangarso, A., Sisilia, K., Setyorini, R., Peranginangin, Y., Awirya, A.A. (2022). The long path to achieving green economy performance for micro small medium enterprise. *Journal of Innovation and Entrepreneurship*, 11(1): 1-19. <https://doi.org/10.1186/s13731-022-00209-4>
- [55] Gidage, M., Bhide, S. (2025). Exploring the nexus between intellectual capital, green innovation, sustainability and financial performance in creative industry MSMEs. *Journal of Enterprising Communities: People and Places in the Global Economy*, 19(3): 457-484. <https://doi.org/10.1108/JEC-07-2024-0134>
- [56] Seow, A.N., Chan, M.S., Tan, C.H., Yap, Y.Y. (2025). Sustainable business performance of small and medium-sized enterprises in green hotels: The mediating role of competitive advantage. *Cogent Business & Management*, 12(1): 2526144. <https://doi.org/10.1080/23311975.2025.2526144>
- [57] Naayif, A., Swacha, J., Saeed, S., Śpiewak, R. (2025). Digital literacy as a mediator in the link between digital marketing adoption and business performance: Insights from micro and small enterprises (MSEs) in the Maldives. *Asia-Pacific Journal of Business Administration*. <https://doi.org/10.1108/APJBA-12-2024-0688>
- [58] Yadav, U.S., Ghosal, I., Pareek, A., Khandelwal, K., Yadav, A.K., Chakraborty, C. (2024). Impact of entrepreneurial orientation and ESG on environmental performance: Moderating impact of digital transformation and technological innovation as a mediating construct using Sobel test. *Journal of Innovation and Entrepreneurship*, 13(1): 86. <https://doi.org/10.1186/s13731-024-00443-y>
- [59] Ibrahim, M., Aduah, E.W. (2025). Digital literacy, digital intelligence and small and medium enterprises' (SMEs) sustainability: The mediating role of digital technology usage. *Information Development*. <https://doi.org/10.1177/02666669251335001>
- [60] AlKoliby, I.S.M., Abdullah, H.H., Suki, N.M. (2024). Linking knowledge application, digital marketing, and manufacturing SMEs' sustainable performance: The mediating role of innovation. *Journal of the Knowledge Economy*, 15(2): 6151-6177. <https://doi.org/10.1007/s13132-023-01157-4>
- [61] Bhatti, S.H., Ahmed, A., Ferraris, A., Hirwani Wan Hussain, W.M., Wamba, S.F. (2025). Big data analytics capabilities and MSME innovation and performance: A double mediation model of digital platform and network capabilities. *Annals of Operations Research*, 350(2): 729-752. <https://doi.org/10.1007/s10479-022-05002-w>
- [62] Neger, M., Rahid, A.O., Alnour, M. (2025). Moderating effects of energy poverty for sustainable tourism, policy, innovation, and environmental resilience: Evidence from SEM-ANN approaches. *Discover Sustainability*, 6(1): 103. <https://doi.org/10.1007/s43621-025-00904-8>
- [63] Hair, J.F., Risher, J.J., Sarstedt, M., Ringle, C.M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1): 2-24. <https://doi.org/10.1108/EBR-11-2018-0203>
- [64] Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, 11(4): 1-10. <https://doi.org/10.4018/ijec.2015100101>