Jurnal Kepariwisataan Indonesia 19 (1) (2025) 1-14
http://ejournal.kemenpar.go.id/index.php/jki
P-ISSN: 1907-9419, E-ISSN: 2685-9075, Juni 2025

STRATEGIC ROADMAP FOR AI-DRIVEN SUSTAINABLE TOURISM DEVELOPMENT IN INDONESIA: AN EXPERT-BASED MCDM APPROACH

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Article Info

Keywords:
AI-driven tourism, digital infrastructure, sustainable tourism, policy roadmap, smart tourism development.

Received:
February 3, 2025
Approved:
June 24, 2025
Published:
June 30, 2025

Abstract

While rich in cultural and natural assets, Indonesia's tourism sector faces substantial challenges in adopting digital technologies, particularly artificial intelligence (AI). The persistent digital divide between more developed and remote regions within Indonesia and limited AI readiness among tourism micro, small, and medium enterprises (MSMEs) hampers the sector's inclusive and sustainable growth potential. This study aims to identify and prioritize strategic directions for AI-driven tourism development in Indonesia by employing an expert panel method integrated with the Analytic Hierarchy Process (AHP). In 2025, this study was carried out in various provinces across Indonesia. Through structured pairwise comparisons, the research analyses expert judgments to rank five core strategies: strengthening digital infrastructure, enhancing AI literacy for MSMEs, developing an integrated national AI tourism platform, formulating ethical and data governance frameworks, and promoting sustainable AI utilization. The results revealed that digital infrastructure development is the most critical enabler, followed by capacity building for MSMEs. These two priorities form the foundational basis upon which other strategies depend. The study concludes that a phased and inclusive approach to AI integration is essential, supported by targeted investments, regulatory clarity, and cross-sector collaboration. It recommends a national policy roadmap that ensures AI technologies serve economic objectives and the goals of community empowerment and environmental preservation, positioning Indonesia as a regional leader in sustainable, AI-powered tourism development.

How to cite:
Hariyanto, Susanto, E., Aji, B., Goeltom, A. D. L., Widyastuti, S. U. (2025). Strategic Roadmap for AI-Driven Sustainable Tourism Development in Indonesia: An Expert-Based MCDM Approach. *Jurnal Kepariwisataan Indonesia: Jurnal Penelitian dan Pengembangan Kepariwisataan Indonesia, 19*(1), 1-14. https://doi.org/10.47608/jki.v19i12025.1-14

INTRODUCTION

Tourism remains a cornerstone of Indonesia's national economy, contributing significantly to employment, foreign exchange, and regional development. A 1% rise in international tourist arrivals correlates with a 0.11% increase in GDP, illustrating the sector's macroeconomic relevance (Ramadhaniah, 2020). However, despite its rich cultural and natural resources, Indonesia's tourism competitiveness is being reshaped by global digital transformation—particularly through the adoption of artificial intelligence (AI)—yet the country continues to lag due to uneven technology integration and persistent operational inefficiencies (Af'idah et al., 2023; Syafi'i & Uula, 2022). Among emerging segments, post-pandemic recovery has accelerated demand for personalized and immersive experiences, amplifying the relevance of AI-powered solutions such as recommender systems, chatbots, and virtual assistants to enhance tourist satisfaction and operational resilience (Zheng et al., 2021; Rashid & Aziz, 2022). Smart tourism tools like virtual reality (VR) also offer new pathways for destination marketing and sustainable engagement aligned with evolving traveler expectations (Aryaningtyas et al., 2023; Chan et al., 2024).

All over the world, AI technologies like chatbots, assistance apps, big data, and recommendations have changed tourism service models by making things more personal for customers, predicting their actions, and saving resources (Aliyah et al., 2023; Shin et al., 2021). In conjunction with IoT, AI enables the development of smart destinations that feature real-time interactivity and dynamic visitor management, thereby directly supporting sustainability objectives by mitigating overtourism and safeguarding cultural and ecological assets (Jeong & Shin, 2019; Pai et al., 2020; González-Reverté, 2019; Yan et al., 2023). However, Indonesia's AI adoption in tourism remains embryonic, constrained by infrastructural, organizational, and regulatory gaps (Aliyah et al., 2023).

A prominent challenge is the digital divide between advanced tourism hubs like Bali and Yogyakarta and underdeveloped eastern regions like Maluku and Papua. Data from (BPS, 2023; Komdigi, 2024) show that while Java-based provinces enjoy over 80% 4G coverage and higher broadband penetration, several eastern provinces still record less than 70% network access, with limited fiber-optic reach. This disparity hampers the implementation of AI-dependent technologies such as real-time visitor analytics and smart platforms. Further compounding the problem, the 2022 Digital Literacy Index (Statista, 2024) highlights significant digital skill gaps between Java and peripheral regions. Meanwhile, tourism MSMEs—that constitute the majority of sectoral enterprises—face barriers related to low AI awareness, inadequate funding, and limited training opportunities, preventing them from adopting intelligent technologies and adapting to market shifts (Parsons et al., 2022; Nanda et al., 2023). The lack of integrated digital platforms and robust governance for AI ethics and data privacy further inhibits collaboration and erodes consumer trust (Gonçalves et al., 2022; Gretzel et al., 2020).

Despite the extensive literature on tourism digitalization, few empirical studies in Indonesia have examined how AI adoption intersects with MSME empowerment and sustainability goals (Samara et al., 2020; García-Madurga & Grilló-Méndez, 2023). This gap is significant given the growing evidence that strategic AI use can improve service delivery, foster innovation, and enhance resilience, particularly among digitally underserved MSMEs (Doborjeh et al., 2021). Furthermore, AI's potential to drive sustainable tourism through environmental monitoring, resource efficiency, and digital

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heritage preservation remains underexplored and underutilized (Setiawan, 2024; Elkhwesky et al., 2022; Shafiee, 2024). Lacking both unified systems and good ethics, the broad use of AI may become uncoordinated and not include everyone (Dhamija & Bag, 2020; Skandali et al., 2024).

A new method is presented in this study to support Indonesian tourism using AI through experts and an analysis of various factors. The research highlights and suggests the most important ways to integrate AI to support inclusive growth, sustainability, and cultural values after gathering views from academia, policymakers, and stakeholders in the field. The aim of the findings is to contribute to making the tourism sector in the country strong, creative, and competitive in the global market, using AI responsibly and equally.

METHODOLOGY

This study employs qualitative research (Creswell & Creswell, 2018) and combines it with methods from decision sciences (called MCDM) and the Analytic Hierarchy Process (AHP) to support the development of AI in Indonesia. The data collection process was conducted in January-February 2025 by a purposefully selected expert panel, including people from academia, government groups, tourism practices, and digital technology. Each panelist was chosen based on their wide-ranging knowledge and experience in artificial intelligence, tourism, policy-making, and MSMEs, which ensured diverse perspectives and suggestions. The first step involved identifying the main strategy and dividing it into several parts: digital infrastructure development, building capacity for MSMEs, clear laws, plans for sustainability, and use of technology for growth. For each element, the participants conducted pairwise comparisons and rated their importance level using a (Saaty, 1987) scale from 1 to 9.

The judgments were put into the AHP matrix one by one to evaluate the priority importance of all the criteria. Every matrix was assigned a consistency ratio (CR) and checked to see if it met the requirement for coherence and reliability; the CR was not allowed to exceed 0.1. The calculation of priority scores and the way the ranking was shown were both ensured through data analysis by AHP software and Excel templates. To enhance the validity and credibility of the findings, triangulation was employed by validating qualitative insights from the expert discussions with the quantitative AHP results, ensuring alignment between subjective expert reasoning and empirical outputs. The AHP method was specifically selected for its methodological rigour in translating complex qualitative expert judgments into quantifiable and objective priority rankings. This integrated approach ensures that the resulting strategic framework is empirically grounded and reflective of diverse stakeholder perspectives, providing a robust foundation for actionable policy recommendations to foster inclusive, sustainable, and competitive AI-driven tourism development in Indonesia.

FINDINGS AND DISCUSSION

Overview of Expert Panel and AHP Analysis

The expert panel discussion served as this study's primary data collection method, gathering insights from professionals across academia, government, the tourism industry, and digital technology sectors. A total of 12 experts participated, comprising four academics specializing in tourism and digital transformation, three government representatives from tourism and technology agencies, three industry practitioners,

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including representatives from travel agents and the tourism community, and two AI and digital platform experts. This diverse composition ensured a balanced perspective covering strategic, operational, and technological dimensions of AI-driven tourism development in Indonesia. The panel discussion aimed to confirm crucial strategic elements from the literature review and determine how important they were with the help of AHP. Discussions that involved experts helped them settle on five main priorities for the AI strategy: increasing digital capabilities, helping micro and small businesses, developing united AI platforms, setting up policies on ethics and data, and promoting sustainable AI in tourism.

Once their experience was checked by the experts, each panelist prepared a pairwise comparison matrix, indicating the importance of the different strategic criteria from 1 to 9 created by (Saaty, 1987). The results from the AHP matrices were combined and processed to find out the priority weights and consistency ratios (CR). The analysis showed that the Consistency Ratio (CR) was 0.08, proving that the experts' opinions were consistent and the results were reliable. The result provided numbers that rank the strategic priorities according to how the experts saw them. The use of a step-by-step process made it possible for the created framework to be based on reality and genuine facts from Indonesia's tourism and technology industries. The report concluded that boosting digital infrastructure and MSMEs were the main needs for installing AI in Indonesia's tourism industry.

Priority Ranking of AI-Driven Tourism Development Strategies

The panel members were given a survey that used the Analytic Hierarchy Process to measure the relative worth of five important priorities in AI tourism development for Indonesia. Every expert compared two criteria at a time to measure their level of importance using the strategic elements shown in Table 1.

Table 1. Strategic Criteria

No	Code	Strategic Criteria
1	K1	Strengthening Digital Infrastructure in Tourism Destinations
2	K2	Enhancing Digital Literacy and AI Capacity Building for MSMEs
3	K3	Development of an Integrated National AI Tourism Platform
4	K4	Formulating Regulations for Data Privacy and Ethical AI Utilization
5	K5	Promoting Sustainable and Responsible AI Adoption in Tourism

Source: Research data, 2025

The experts assessed these criteria using Saaty's 1–9 scale to express the relative importance of each element in comparison to the others. The pairwise comparison process allowed the experts to rank each strategy and explain the rationale behind their choices based on Indonesia's unique tourism and digital context, as presented in Table 2.

Table 2. Pairwise Comparison Matrix

Criteria	K1	K2	K3	K4	K5	Priority Vector
K1 - Digital Infrastructure	1	3	4	5	6	0.325
K2 - MSME Capacity Building	1/3	1	2	4	5	0.257
K3 - AI Platform Development	1/4	1/2	1	3	4	0.184
K4 - Ethics & Data Regulation	1/5	1/4	1/3	1	3	0.132
K5 - Sustainable AI Utilization	1/6	1/5	1/4	1/3	1	0.102
Total	1.783	4.95	7.583	13.333	19	**1.00**

Source: Research data, 2025

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The final AHP output in Table 3 presents the weighted ranking of strategic priorities. "Strengthening Digital Infrastructure" (K1) emerged as the most critical priority with 32.5%, followed by "MSME Capacity Building" (K2) at 25.7%, and "Integrated AI Tourism Platform Development" (K3) at 18.4%. Ethical governance (K4) and sustainable AI adoption (K5) completed the hierarchy.

Table 3. Final Priority Ranking

Rank	Strategic Priority	Weight (%)	Description
1	K1 - Strengthening Digital Infrastructure	32.5%	Improving internet access, connectivity, and digital infrastructure, especially in remote tourist destinations.
2	K2 - Enhancing Digital Literacy and MSME Capacity Building	25.7%	Upskilling tourism MSMEs to adopt AI-based tools, improving digital literacy, and fostering local innovation.
3	K3 - Integrated National AI Tourism Platform	18.4%	Creating a unified platform for AI-driven services, data sharing, and interoperability across stakeholders.
4	K4 - Data Privacy and Ethical AI Regulations	13.2%	Establishing legal and ethical frameworks to protect data and ensure responsible AI implementation.
5	K5 - Sustainable and Responsible AI Adoption	10.2%	Utilizing AI for environmental monitoring, heritage preservation, and sustainable tourism practices.

Source: Research data, 2025

The analysis clearly illustrates that Strengthening Digital Infrastructure (K1) is the most critical priority, receiving the highest weight of 32.5%. Experts consistently agreed that the entire AI-driven tourism ecosystem would struggle to function without robust internet access and digital infrastructure, especially in Indonesia's remote and emerging destinations. Connectivity gaps remain the primary hurdle, preventing equitable access to AI-based innovations. The second priority, Enhancing Digital Literacy and MSME Capacity Building (K2), reflects the panel's concern over the low readiness of local tourism actors to engage with AI technologies. Although MSMEs play a vital role in the country's tourism industry, most lack the necessary skills and resources to operate effectively in the digital era. Consequently, MSMEs need to receive targeted training programs digital incubation efforts, and form partnerships with tech companies to stay ahead in the digital tourism industry.

The experts believe that Indonesia needs a single, unified digital tool for tourism, and this is why the K3 proposal came in third. It would offer AI-powered solutions for recommendations, checking visitor numbers live, and analyzing vast data, improving the tourism sector and assisting policymakers with the right information for making plans. "Formulating Ethical and Data Privacy Regulations" (K4) and "Promoting Sustainable AI Adoption" (K5) may not be as important as others, but they are essential for the organization's future. Specialists agreed that specific rules need to be put in place to secure consumer data and make sure AI is deployed ethically. At the same time, AI should be used to make things more efficient and personal, helping to protect the environment and save Indonesia's precious heritage and resources.

The significant area of infrastructure readiness and people's knowledge must be in place first before proceeding to design platforms, make regulatory laws, and include AI in operations. The priorities depend on each other, yet it is clear from the sequence that other projects will struggle without having solid digital systems and qualified staff. Evidence shows that supporting infrastructure and helping small and medium-sized enterprises with

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AI is the first priority for policymakers, while developing policy regulations and focusing on sustainability should happen as AI adoption progresses.

Discussion

All members of the expert panel agreed that digital technologies are the most important factor that can drive digital tourism in Indonesia. Since it ranks first with a weight of 32.5%, this shows that Bali and Yogyakarta are still much more digitally connected than the underdeveloped communities in the East. It was highlighted by experts that AI applications such as chatbots, data analytics, and applications for travelers need stable internet, working data centers, and secured environments. If this problem is not solved, there is a possibility that only urban areas can fully use AI, widening the divide between rich and poor regions. Providing remote areas with better access to the internet would facilitate AI implementation, enhance tourism development in new regions, and improve local economies.

Ranked second at 25.7%, capacity building and AI literacy for MSMEs were recognized as a vital step in ensuring that Indonesia's tourism sector can fully benefit from AI integration. MSMEs represent the majority of tourism operators, especially in cultural villages, homestays, local attractions, and culinary tourism. However, they remain digitally marginalized due to limited knowledge, resources, and exposure to AI tools. Although AI offers various benefits, such as operational efficiency and enhanced customer service, tourism MSMEs in Indonesia still face significant barriers, including low digital literacy and inadequate infrastructure (Indaryanto et al., 2023; Lei et al., 2023). Experts highlighted the need for structured government programs, public-private partnerships, and incubators to equip MSMEs with AI utilization, digital marketing, and data-driven decision-making skills. Structured training and community-based empowerment programs have proven essential to improving MSMEs' digital readiness and promoting inclusive, grassroots-level AI-driven innovation (Achmad et al., 2023; Nurhaida et al., 2023). With a weight of 18.4%, the third priority is developing an integrated AI-powered tourism platform that connects stakeholders and enables data-driven services. Experts stressed that current tourism data is fragmented across various systems—government portals, OTAs, and private platforms—making it difficult to generate holistic insights. A centralized national platform would allow interoperability, facilitating AI-driven features such as personalized itineraries, real-time crowd management, and predictive visitor flow analysis. This would enhance tourist satisfaction and support policymakers in designing evidence-based interventions, especially mitigating over-tourism in popular sites.

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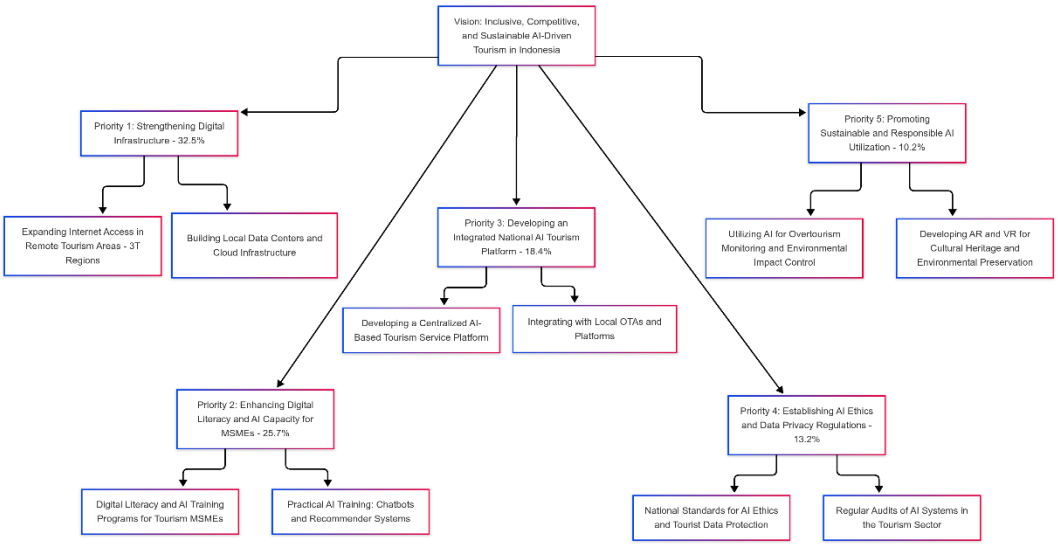

Figure 1. AI-Driven Indonesia Sustainable Tourism Development Strategy Map
Source: Research data, 2025

A greater priority in the adoption of AI in tourism, identified with a weight of 13.2%, is the development of ethical and privacy-based guidelines. As AI becomes more embedded in tourism services, concerns about personal data misuse, algorithmic bias, and diminishing public trust have intensified. Experts emphasize that without proper legal and ethical frameworks, AI systems could unintentionally harm tourists or local communities (Kumar & Suthar, 2024; Singh et al., 2024). Therefore, detailed protocols on data consent, security, transparency, and accountability are necessary to ensure responsible AI implementation (Fan, 2024; Fetahović et al., 2023). These ethical considerations also reflect broader societal concerns around human rights and fairness, making it essential for AI adoption to be governed by principles of non-maleficence and social equity (Huriye, 2023; Ridzuan et al., 2024). In parallel, sustainable AI adoption—though ranked fifth at 10.2%—was deemed equally critical. Experts argue that AI in tourism should support economic viability, environmental preservation, and cultural protection (Ma, 2024; Ray & Ray, 2024). This involves the use of AI to manage tourist flows, reduce overtourism, and promote eco-friendly practices through technologies such as AR and virtual tours, which help preserve heritage sites from physical degradation (Radanliev et al., 2024). Emphasizing ethics and sustainability ensures that AI enhances tourism without compromising privacy or local integrity while fostering trust and long-term resilience.

All in all, the experts emphasize that building AI-driven sustainable tourism in Indonesia requires a solid technological basis and training for the people. It will be difficult to put sophisticated measures such as platform integration or making new rules into practice if the infrastructure and literacy problems are not solved first. On the other hand, first creating ethical and sustainable guidelines for AI and then making related AI-based apps will help sustain both economic growth and society's and nature's strength. Thanks to these priorities, stakeholders can organize their efforts and funds to make sure AI leads to inclusive and sustainable tourism in Indonesia.

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Policy Recommendations

Based on what this study discovered, certain policy strategies are needed to make AI-driven tourism in Indonesia effective, inclusive, and sustainable. Such policies deal with issues of infrastructure, boost the role of MSMEs, promote teamwork, and create ethical rules for official duties.

1. Prioritize Digital Infrastructure Investment in Tourism Destinations: The government should allocate targeted investments in expanding internet connectivity and digital infrastructure, particularly in remote and underdeveloped tourism areas (3T regions). Incentives for private sector participation in building local data centres and cloud systems are essential to support AI-based applications and reduce the digital divide.
2. Develop a National AI Literacy and Capacity Building Program for MSMEs: A national-level program focused on enhancing tourism MSMEs' digital literacy and AI adoption capacity is crucial. This should include: a) Regular AI workshops and practical training (e.g., chatbot development, recommender systems); b) Financial support schemes for MSMEs investing in AI technologies; and c) Establishment of regional AI innovation hubs and incubators targeting tourism MSMEs.
3. Establish an Integrated National AI Tourism Platform: The government should initiate the development of a centralized, interoperable AI-based tourism platform to a) Integrate data from OTAs, local governments, and tourism stakeholders; b) Enable real-time analytics, predictive visitor management, and personalized travel experiences; and c) Ensure data accessibility for evidence-based tourism policy-making.
4. Formulate and Enforce Ethical AI and Data Privacy Regulations: Develop comprehensive regulations that govern: a) Ethical AI use in tourism services, ensuring transparency and accountability; b) Personal data protection aligned with global standards (e.g., GDPR-like frameworks); and c) Periodic audits of AI systems deployed in tourism to monitor risks and mitigate bias or misuse.
5. Provide Incentives for Local AI Startups and Industry Collaboration: Introduce fiscal incentives, grants, or low-interest loans for local AI startups developing tourism-specific solutions. Foster public-private partnerships by a) Encouraging AI startups to collaborate with tourism MSMEs, b) Promoting local content and innovations in AI applications, and c) Supporting AR/VR development projects for cultural heritage and environmental preservation.
6. Embed Sustainability and Cultural Preservation into AI Deployment: Ensure that AI strategies contribute to sustainable tourism by: a) Integrating AI tools for over-tourism monitoring and environmental impact assessments; b) Using AI to promote responsible tourist behaviour and minimize ecological footprints; and c) Leveraging AR/VR to enhance cultural education and reduce physical strain on heritage sites.

Based on these prioritized strategies, a phased roadmap was developed (see Table 4) to guide Indonesia's AI-driven tourism transformation through 2030. The roadmap delineates year-by-year milestones aligned with expert-validated priorities.

Table 3. Roadmap AI-Driven Tourism Development in Indonesia (2025–2030)

Year	Strategic Focus / Milestone	Key Actions	Expected Outcome
2025	Foundation: Digital	1. Expand internet connectivity in priority destinations (3T areas)	Digital access parity between major and remote destinations begins to form

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Year	Strategic Focus / Milestone	Key Actions	Expected Outcome
	Infrastructure Strengthening	2. Build local data centres and cloud support	
2026	MSME Digital Literacy & AI Capacity Building	1. National MSME AI literacy program rollout 2. Pilot AI tools (chatbots, recommender systems) in 5 tourism hotspots	200+ MSMEs adopt basic AI applications; first AI-driven MSME clusters created
2027	Platform Development & Early Integration	1. Launch National AI-based Tourism Platform 2. Integrate OTA platforms 3. Pilot data analytics	An AI-driven ecosystem lives with predictive visitor flow and early smart tourism service personalization.
2028	Regulatory Frameworks and Ethical AI Enforcement	1. Issue AI ethics and data privacy regulations for tourism 2. Conduct the first national audit of AI tourism systems	AI deployment secured by ethical standards, data protection, and system accountability
2029	Sustainability Embedding & Expansion	1. AI tools to monitor over-tourism and environmental impact 2. Scale up AR/VR-based cultural preservation experiences	10+ smart destinations operate with AI-led sustainability and heritage protection modules
2030	Consolidation, Evaluation & Scaling	1. Evaluate AI's impact on tourism sector competitiveness and MSME resilience 2. Expand the model to creative economy sectors	Indonesia is recognized for its inclusive, AI-driven, and sustainable tourism framework.

Source: Research data, 2025

The roadmap begins with foundational investments in digital infrastructure and capacity building (2025–2026), then developing a national AI platform and integrating smart systems (2027). Regulatory frameworks and ethical enforcement are scheduled for 2028, ensuring responsible AI adoption. The plan culminates with sustainability embedding and sector-wide scaling (2029–2030), positioning Indonesia as a global leader in inclusive, AI-driven, sustainable tourism.

The results reveal a coherent and actionable strategy where digital infrastructure and MSME empowerment are the keystones of AI-driven tourism transformation. Ethical and sustainability considerations are designed to evolve in parallel, ensuring that AI integration supports economic growth and environmental-cultural resilience. This study provides empirical guidance for Indonesian policymakers, suggesting that immediate focus should be placed on bridging infrastructure gaps and enhancing MSME readiness. Simultaneously, efforts to build ethical governance structures and integrate AI sustainability must be institutionalized to safeguard long-term sectoral integrity.

CONCLUSION

This study provides a strategic framework for advancing AI-driven tourism development in Indonesia, responding to the growing need for technological transformation in the tourism sector. By gathering experts and conducting an AHP study, the five most important priorities for the adoption of inclusive and sustainable AI were identified. The report notes that setting up strong digital infrastructure is the main priority for adopting AI, mainly when applied in remote and less developed tourist areas. Many areas of Indonesia's tourism sector will not be able to use AI applications unless they have reliable connectivity and adequate technological support. It is just as important to support small and medium businesses by enhancing AI and digital literacy. Because MSMEs are so important to Indonesia's tourism sector, they should have access to technologies that help them offer better service, work smarter, and drive innovation.

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The analysis points out that a national AI tourism platform should collect all tourism data and enable AI-driven personalized services and oversee the movement of tourists. If AI is to be adopted safely, ensuring there are ethical rules and data privacy guidelines will building public trust on AI. Besides, adopting sustainability practices in AI is very crucial so that tourism is less harmful to culture and nature. AI should be used to support the country's economy and also increase the strength and sustainability of the nation's tourism destinations. This research prepares clear guidelines for policymakers, businesses in the industry, and those in academia. High-quality infrastructure, a skilled workforce, ethical practices, and environmental stewardship are key factors in positioning Indonesia as a leader in inclusive, sustainable, and AI-powered tourism. Plans for further research could involve piloting these strategies and measuring their effects over time on competitiveness, the strength of communities, and their natural environment.

Future Research Directions

Even though this work steps a way for choosing AI-centered tourism strategies in Indonesia, there are still many possibilities to improve research in this direction. First, future studies should explore empirical implementation models by conducting pilot projects in selected tourism destinations, particularly in Indonesia's underdeveloped regions. This will enable researchers to assess the practical challenges of AI deployment in low-connectivity environments, generate field-based insights, and refine infrastructure strategies that address regional disparities in digital readiness. Second, longitudinal studies are recommended to monitor the evolving impacts of AI adoption on tourism MSME resilience, competitiveness, and innovation capacity. Given the dynamic nature of AI technologies and market behaviours, longitudinal research could provide valuable data on how MSMEs adapt, identifying factors that accelerate or hinder their digital transformation.

Third, future research should focus on developing AI ethics and governance frameworks tailored to tourism contexts, especially within culturally diverse societies like Indonesia. Specific attention should be paid to data privacy issues, algorithmic transparency, and bias mitigation in tourism recommender systems and predictive analytics. Comparative studies examining best practices from other countries could inform regulatory refinement in Indonesia. Fourth, quantitative modelling and simulation techniques—such as system dynamics or agent-based modelling—can be employed to predict AI's long-term socio-economic impacts on tourism ecosystems. This would help policymakers anticipate unintended consequences, such as labour displacement, over-tourism, or widening digital inequalities, and design proactive mitigation measures.

Fifth, given the growing importance of sustainability and heritage preservation, future research could investigate the role of AI-driven AR/VR technologies in enhancing cultural tourism while minimizing physical impacts on heritage sites. Interdisciplinary studies bridging tourism, computer science, and environmental sciences could generate innovative approaches to balance tourism growth with environmental protection. Lastly, future research should consider expanding the stakeholder base to include local communities, tourists, and digital consumers as part of participatory research models. This would provide more nuanced perspectives on AI acceptance, ethical considerations, and user preferences, ensuring that AI-driven tourism development remains inclusive, socially responsible, and culturally appropriate.

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ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to the Ministry of Tourism of the Republic of Indonesia, regional tourism offices, industry associations, tourism academics, village tourism leaders, and technology experts who generously contributed their time and insights during the expert panel discussions. Their valuable perspectives were instrumental in enriching the analysis and ensuring the practical relevance of this study. Appreciation is extended to all reviewers and academic peers whose constructive feedback helped strengthen the quality of this paper.

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