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ARTICLE

Smart Tourism In The Development Of Sustainable Tourism In Indonesia: A Systematic Literature Review

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ABSTRACT
This study aims to analyze the role of smart tourism in enhancing the competitiveness and sustainability of tourism destinations in Indonesia's digital era. Employing a Systematic Literature Review (SLR) approach based on the Kitchenham (2004) framework and PRISMA guidelines, this research systematically identified, screened, and analyzed 35 final articles sourced from Google Scholar via the Harzing Publish or Perish (PoP) application, covering publications from 2021 to 2026. The findings reveal that smart tourism implementation in Indonesia encompasses three primary dimensions: digital technology and infrastructure, destination governance, and tourist experience. AI and WebGIS technologies dominate implementation (33%), followed by application digitalization (28%), e-tourism and social media (22%), and IoT-based support systems (17%). The main inhibiting factors include uneven digital infrastructure, low digital literacy among tourism actors, and fragmented regulation and coordination. Conversely, the supporting factors consist of government policy, technological development, stakeholder collaboration, and digital innovation by start-ups. Overall, smart tourism plays a strategic role in realizing inclusive and sustainable tourism in Indonesia, with its success contingent upon synergistic efforts to overcome barriers and optimize enabling factors toward the vision of Indonesia Emas 2045.

A. INTRODUCTION

The tourism industry represents a strategic sector in Indonesia's national economy, with its contribution to GDP reaching 4.8%-5.6% prior to the COVID-19 pandemic (BPS; Kemenparekraf RI). However, the pandemic triggered a sharp decline to 2.4% in 2021, and recovery has progressed slowly, particularly for destinations that have yet to optimally leverage digital technology (OECD, 2022).

In response to these challenges, the concept of smart tourism encompassing the application of digital technologies such as IoT, Big Data, Cloud Computing, and Artificial Intelligence (AI) in tourism management has become increasingly relevant for enhancing tourist experiences while supporting destination sustainability (Zhui et al., 2014; Heliany, 2019). In

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Indonesia, smart tourism implementation has been initiated at several destinations, including the Bedas application in Bandung and MATIC in Malang. Nevertheless, its adoption remains largely confined to major urban centers and has yet to be distributed equitably across the country (Vianisa & Febriyanti, 2023).

Several structural challenges continue to impede the development of smart tourism in Indonesia, including uneven digital infrastructure, low digital literacy among local tourism actors, and weak coordination among stakeholders (Noviyanti, 2014; Heliany, 2019). Conversely, Indonesia holds considerable potential, given its position as the sixth-largest internet user base globally with 123 million users, the majority of whom are millennials who actively seek travel information through digital platforms (Kominfo, 2018).

To map research trends related to this topic, VOSviewer software was employed using data retrieved through the Harzing Publish or Perish (PoP) application from the Google Scholar database, with the search terms "smart tourism" AND "sustainable tourism" AND "Indonesia," covering publications from 2021 to 2026 and yielding 996 papers. The co-occurrence visualization results through network visualization are presented in the following figure:

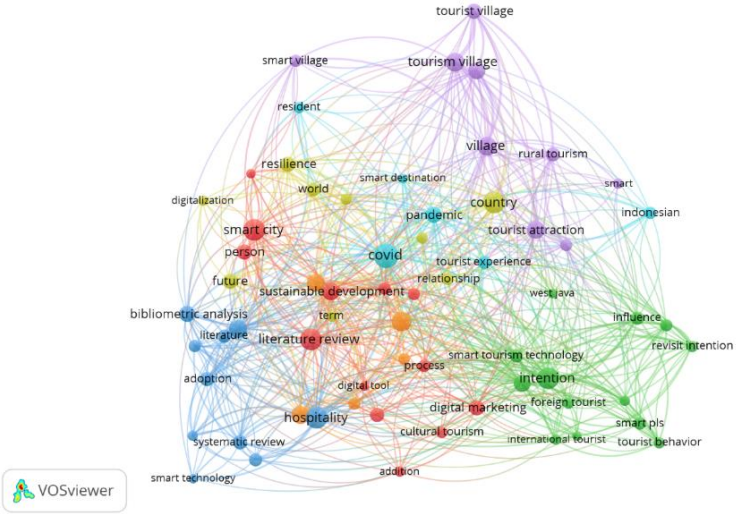

Figure 1. Network Visualization Mapping Results

Through the network visualization mapping, which is organized into several color-coded clusters, it is evident that smart tourism, sustainable development, tourist experience, and related items are interconnected within the network. This trend indicates that smart tourism research over the past five years has increasingly shifted toward the integration of technology, tourist behavior, and sustainable development principles. Key clusters such as revisit intention, tourism village, and digital marketing signal a transition in research focus from technological innovation per se toward its broader impacts on tourist loyalty and destination resilience (Chung et al., 2020; Gretzel et al., 2015; Gössling et al., 2020).

In this study, the term smart tourism refers to the application of digital technologies including IoT, Big Data, Cloud Computing, and Artificial Intelligence in the management and promotion of tourism destinations, with the dual purpose of enhancing tourist experiences and supporting sustainable development (Zhui et al., 2014; Heliany, 2019). The implementation of smart tourism in Indonesia carries two significant dimensions. On the one hand, this approach can address the limitations of conventional tourism management by improving information accessibility, optimizing resource utilization, and enabling data-driven decision-making. On the other hand, disparities in digital infrastructure across regions and low digital literacy among

local tourism practitioners risk widening the gap between technologically advanced destinations and those still developing, thereby constraining inclusive and equitable growth within the sector (Vianisa & Febriyanti, 2023; El Archi, 2023).

Despite the growing body of literature, most existing studies remain limited to case-specific destinations and do not provide a comprehensive understanding of the relationship between smart tourism and sustainable tourism development at the national level in Indonesia. This research gap underpins the present study, which adopts a Systematic Literature Review (SLR) approach to analyze the nexus between the two concepts, identify opportunities and challenges in implementation, and formulate strategic recommendations for the development of a modern and sustainable Indonesian tourism sector.

B. LITERATURE REVIEW

Development Administration

Development administration refers to a bureaucratic approach oriented toward national development goals through strategic planning, policy implementation, and adaptive oversight (Riggs, 1964). In the Indonesian context, this concept manifests through central-regional government synergy as mandated by the National Medium-Term Development Plan (RPJMN) 2020-2024, which prioritizes tourism as a leading sector. Post-1998 reform has shifted Indonesia from a centralized model toward digital governance, enabled by regional autonomy legislation (UU No. 23/2014). However, uneven digital infrastructure remains a persistent challenge, particularly in eastern regions such as Papua compared to more advanced areas like Bali (Thoha, 2010). Dwiyanto (2018) further emphasizes that bureaucratic reform is a prerequisite for sustainable development, requiring efficient public service delivery that supports the tourism industry without depleting natural resources.

Sustainable Development

The Brundtland Report (WCED, 1987) defines sustainable development as meeting present needs without compromising future generations' ability to meet their own. This is operationalized through Elkington's (1998) Triple Bottom Line framework balancing economic, social, and environmental dimensions which has been adopted into Sustainable Tourism Development Theory (Njoroge et al., 2020). In the Indonesian context, Pradana and Wardani (2020) demonstrate that community-based management combined with digital innovation most effectively achieves sustainable tourism outcomes.

Smart Tourism

Smart tourism represents a paradigm shift in destination management through the integration of ICT including IoT, big data, cloud computing, and AI to enhance tourist experiences, operational efficiency, and policy decision-making (Gretzel et al., 2015). Buhalis and Amaranggana (2014) further develop the smart destination model, in which DMOs act as orchestrators of data flows among government, businesses, communities, and tourists to optimize service quality and sustainability. Three core domains underpin this framework: smart experience (personalization), smart business (platform-based efficiency), and smart governance (data-driven coordination and transparency). In Indonesia, studies on Jakarta and Lake Toba indicate progress in smart tourism readiness, yet gaps remain in digital human capital, ICT infrastructure, and inter-agency coordination (Prasetyo, 2022; Akbar et al., 2024).

Sustainable Tourism

UNWTO (2013) defines sustainable tourism as balancing economic, socio-cultural, and environmental dimensions across all stakeholders. Key indicators include local UMKM expenditure share, community participation, environmental carrying capacity, and governance transparency. Emerging approaches integrate online platform data such as reviews and eco-labels processed through machine learning as cost-effective sustainability indicators (Hoffmann et al., 2022). Post-pandemic, Indonesian destinations have increasingly prioritized resilience and local economic empowerment, though standardization of indicators and cross-agency data integration remain critical gaps requiring strengthened destination management capacity (OECD recommendation).

C. METHOD

This research is a type of systematic review, namely a non-experimental descriptive study. A systematic review is a research method that encompasses the identification, evaluation, and interpretation of all research results relevant to the topic being studied to answer the formulated research questions. According to Paré et al. (2015), a literature review is essential for (a) identifying what has been published on a given object or topic, (b) determining the extent to which a research field exhibits interpretable trends or patterns, (c) gathering empirical findings related to a specific research question to support evidence-based practice, and (d) identifying topics or questions that require further investigation.

This study employs the Systematic Literature Review (SLR) method, with data collection conducted through the stages outlined by Kitchenham (2004), comprising three main phases: planning, conducting, and reporting. SLR is a systematic method for identifying, collecting, critically evaluating, and presenting all findings on a research topic, adhering to strict stages and protocols to minimize researcher subjectivity. The article selection process follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and replicability (Page et al., 2021). The subject of this research is smart tourism in the context of sustainable tourism in Indonesia, while the object consists of literature and studies previously conducted on this topic within the period of 2021-2026. This topic was selected given the limited number of studies that systematically connect smart tourism with sustainable tourism in Indonesia, thus necessitating a comprehensive review to identify trends, implementation patterns, enabling and inhibiting factors, and strategic recommendations for national tourism development.

Planning

Problem formulation was conducted by establishing the research questions to be addressed through the systematic literature review. The research questions were developed using the PICOS (Population, Intervention, Comparison, Outcome, and Study Design) framework to ensure a more focused research scope (Roever, 2018). The research questions formulated are as follows:

Table 1. Research Questions

Code	Research Question
RQ1	How are the research trends and forms of smart tourism implementation in the context of sustainable tourism in Indonesia?
RQ2	What are the inhibiting and supporting factors of smart tourism implementation, and how do they contribute to achieving sustainable tourism in Indonesia?

Inclusion criteria in this study encompass studies discussing smart tourism implementation in the context of sustainable tourism in Indonesia, peer-reviewed journal articles or scientific proceedings with open full-text access, written in Indonesian or English, and published between 2021 and 2026. Exclusion criteria include studies irrelevant to smart tourism or sustainable tourism in Indonesia, publications in the form of books, editorials, or opinions without empirical data, purely quantitative research not aligned with SLR criteria, articles not accessible in full-text, and articles discussing general technology without any connection to tourism.

Implementation

Researchers conducted a literature search based on the topic using the Google Scholar database via the Publish or Perish (PoP) application. The keywords used were "smart tourism", "sustainable tourism", and "Indonesia", combined using Boolean operators (AND/OR) to obtain more specific search results. Data were processed using Microsoft Excel and presented in tabular form. A quality assessment was conducted to ensure articles met methodological standards, referring to the Joanna Briggs Institute (JBI) Critical Appraisal Tools (Moola et al., 2017). The evaluation was based on the following quality assessment criteria:

Table 2. Quality Assessment

	Quality Assessment
QA1	Does the article align with the research focus, namely smart tourism in supporting sustainable tourism in Indonesia?
QA2	Does the article originate from a credible scientific source, such as an indexed journal or recognized academic publication?
QA3	Is the article available in full-text form, enabling in-depth analysis?
QA4	Does the research in the article use an empirical or case study approach, rather than purely conceptual review, specifically regarding smart tourism implementation?
QA5	Does the article discuss indicators of digital technology and infrastructure, such as the use of IoT, digital applications, big data, or information systems in tourism?
QA6	Does the article examine aspects of destination governance, including the role of government, stakeholders, and policies in the implementation of smart tourism?
QA7	Does the article explain the impact on tourist experiences, such as ease of information access, service personalization, or tourist satisfaction levels?
QA8	Is the article relevant to the context of sustainable tourism, including environmental, social, and economic aspects?

Each article is rated Y (Yes) if it meets the criteria, T (No) if it does not, and TJ (Unclear) for ambiguous cases. The final stage involves integrating findings from all selected studies to provide a comprehensive picture of smart tourism implementation in sustainable tourism in Indonesia, presented narratively or thematically in accordance with the research objectives.

Reporting

The reporting stage is the final step in writing the SLR results, presenting data extraction and synthesis findings. At this stage, the implementation of smart tourism and its contribution to sustainable tourism in Indonesia is reviewed through the selected articles, from the initial

planning phase to the presentation of general interpretations of research results, including supporting evidence, limitations, and conclusions.

D. RESULT AND DISCUSSION

Research Question 1: How are the research trends and forms of smart tourism implementation in the context of sustainable tourism in Indonesia?

I. Research Trends and Smart Tourism Implementation in Indonesia

Out of a total of 996 articles obtained through the literature search process, gradual screening was conducted based on topic relevance, publication type, language, article availability, research design, and year of publication. A total of 820 articles were deemed ineligible at the screening stage based on title and abstract, leaving only 65 articles to proceed to the full-text review and critical appraisal stage. At this in-depth stage, 30 additional articles were eliminated for not meeting the established inclusion standards, resulting in 35 articles that were determined as the final included studies for synthesis.

The 35 final articles, considered the most relevant and methodologically sound, were subsequently analyzed to identify research trends, forms of smart tourism implementation, and its enabling and inhibiting factors in the context of sustainable tourism in Indonesia. The selected articles include empirical qualitative, quantitative, and mixed-method studies discussing the application of smart tourism across various dimensions, encompassing digital technology and infrastructure, destination governance, and tourist experience.

The method employed in this study is thematic analysis, a flexible qualitative data analysis method for identifying, analyzing, and reporting meaningful patterns or themes within research data. In this study, thematic analysis was used to examine the reviewed literature in order to identify similarities and differences across studies related to smart tourism and sustainable tourism, so that the main themes could be systematically organized to provide a comprehensive overview of emerging research patterns.

Table 3. Thematic Analysis

No.	Theme	Sub-theme
1.	How are the research trends and forms of smart tourism implementation in the context of sustainable tourism in Indonesia?	1. Research Trends in Smart Tourism in Indonesia 2. Forms of Smart Tourism Implementation in Sustainable Tourism: a. Digital Technology and Infrastructure b. Destination Governance c. Tourist Experience
2.	What are the inhibiting and supporting factors of smart tourism implementation, and how do they contribute to achieving sustainable tourism in Indonesia?	1. Inhibiting Factors of Smart Tourism Implementation 2.Supporting Factors of Smart Tourism Implementation

II. Form of Smart Tourism Implementation

a. Digital Technology and Infrastructure

Of the 35 articles analyzed, 17 specifically discussed digital technology and infrastructure as the primary pillar of smart tourism implementation. Various technologies such as Artificial Intelligence (AI), WebGIS, mobile applications, and e-tourism not only enhance the operational efficiency of tourism destinations, but also contribute to environmental conservation and promote socio-economic inclusivity. Hariyanto et al. (2025) developed an

AI-based strategic roadmap using the Multi-Criteria Decision Making (MCDM) approach for strengthening tourism infrastructure, integrating real-time data to reduce overtourism while supporting the achievement of the Sustainable Development Goals (SDGs).

At the local level, destination digitalization demonstrates a significant role in supporting sustainable tourism. Arum et al. (2025) applied digital technology in Kemutug Lor Village to support ecotourism, while Garis et al. (2024) conducted digital-based governance training in Tanjungsari Village, resulting in strengthened smart tourism infrastructure without damaging the local ecosystem. Specific technologies such as AI and WebGIS were also implemented by Yahya et al. (2025) in Luwuk Banggai for eco-friendly tourism navigation, and Safrilia et al. (2025) developed a self-guided tour application in Poncokusumo Village that promotes conservation education. Based on the analysis, smart tourism technologies are grouped into four categories, with AI & WebGIS being the most dominant (33%), followed by application and digitalization (28%), e-tourism and social media (22%), and support systems and IoT (17%), as presented in Table 4.

Table 4. Distribution of Smart Tourism Technology Types in Indonesia

Technology Category	Number of Articles	Percentage
AI & WebGIS	6	33%
Applications & Digitalization	5	28%
E-Tourism & Social Media	4	22%
Supporting Systems & IoT	3	17%
Total	18	100%

b. Destination Governance

A total of 16 out of 35 articles addressed destination governance, emphasizing the integration of policy strategies, management training, and digital transformation in achieving sustainable tourism. This approach involves stakeholder collaboration, technology-based data management, and national and regional policy frameworks that directly support the achievement of SDGs 8 (decent work) and SDGs 11 (sustainable cities and communities). At the local level, smart tourism governance is manifested through community training (Garis et al., 2024), ecotourism management (Arum et al., 2025), and participatory monitoring systems (Firdasari et al., 2025). Innovative models such as MAHALTRA based on User-Centered Design (UCD) and Community-Based Tourism (CBT) by Munawaroh et al. (2024) demonstrate that participatory approaches can create inclusive governance. Overall, approximately 70% of articles addressing destination governance focus on tourism villages and conservation areas, with a common pattern that digital technology serves as the primary tool, local communities as core actors, and sustainability as the main objective, as presented in Table 5.

Table 5. Implementation of Destination Governance in Indonesia

Region/Location	Implementation	Sustainable Impact
Tanjungsari Village	Digital governance training for pioneer tourism objects	Local capacity increased 40%, implementation of eco-friendly management (Garis et al., 2024)

Kemutug Lor Village, Baturaden	Smart tourism ecotourism management	Attractiveness and sustainability of ecotourism (Arum et al., 2025)
Singkil Beach, Cilacap	Smart tourism development strategy	Coastal conservation, sustainable management (Damiasih & Wati, 2024)
Buffer Village Way Kambas NP, Lampung	Eco-tourism governance Industry 4.0	Sustainable forest management, village empowerment (Sulistiowati et al., 2022)
General Tourism Village	AHP-based decision support system	Resource optimization and carbon reduction (Kusumawardhani et al., 2024)
Madura (MAHALTRA)	UCD-CBT smart tourism development	Inclusive halal tourism governance (Munawaroh et al., 2024)
Poncokusumo Village	Digital branding & promotion	Increased visits & value creation (Setiawan et al., 2025)

c. Tourist Experience

The smart experience dimension is directly linked to tourist satisfaction and service quality. Digital technology enables service personalization and fast, accurate information access through various digital platforms (Pratama et al., 2023). The main focus of this dimension includes satisfaction (45%), interactivity and new experiences (30%), and digital branding and promotion (25%), as illustrated in Figure 2. AI-based and self-guided applications serve as the primary forms of implementation, such as those applied by Safrilia et al. (2025) in Poncokusumo Village and Yahya et al. (2025) in Luwuk Banggai. Global studies support these findings, with Buhalis and Sinarta (2022) reporting a 30% increase in tourist engagement, and Li et al. (2023) recording a 25% improvement in tourist loyalty through technology integration. In the context of sustainability, these approaches contribute to reducing carbon footprints through optimized travel routes (Yahya et al., 2025) and more targeted promotion (Puspita et al., 2025).

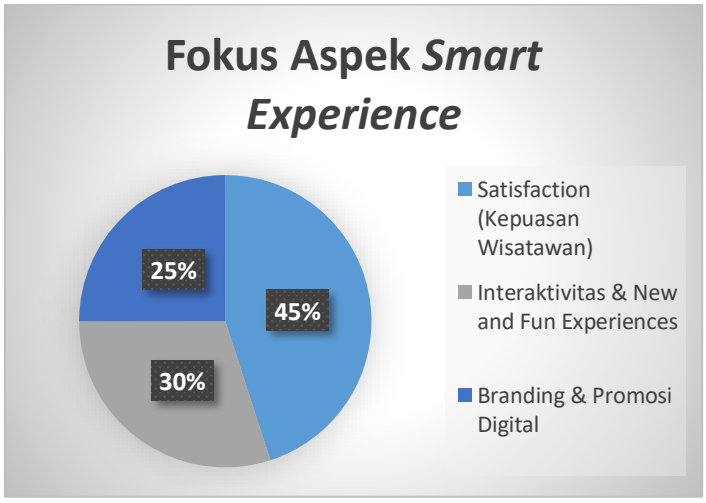

Figure 2. Focus on Smart Experience Aspects in Smart Tourism

Research Question 2: What are the inhibiting and supporting factors of smart tourism implementation, and how do they contribute to achieving sustainable tourism in Indonesia?

I. Inhibiting Factors

Smart tourism implementation in Indonesia faces three main structural barriers. First, the uneven digital infrastructure between urban and rural areas, where the gap reaches 40–50% outside Java (Nur, 2026), causes a digital divide and concentration of tourists (overtourism) at popular destinations. Second, the low digital literacy of tourism actors constitutes a significant barrier, evidenced by the failure of approximately 30% of training programs (Garis et al., 2024) and community resistance to technology (Safrilia et al., 2025). Sembiring's (2025) bibliometric analysis reveals that approximately 45% of smart tourism research in Indonesia identifies human resource issues as a key factor. Third, fragmented regulation and weak coordination among stakeholders risk causing investment duplication, management conflicts, and data security risks (Wibowo & Adzilla, 2024; Widodo & Dasiah, 2021), as summarized in Table 6.

Table 6. Inhibiting Factors of Smart Tourism Implementation in Indonesia

Factor	Main Problem	Research Findings	Impact
Uneven Infrastructure	Digital network, electricity, and technology access gaps between urban and rural areas	Infrastructure gap reaches 40-50% outside Java (Nur, 2026); network limitations on WebGIS (Yahya et al., 2025) and digital applications (Safrilia et al., 2025)	Digital divide, technology implementation limitations, overtourism at popular destinations
Low HR and Digital Literacy	Low ability of tourism actors to operate technology	30% of training programs failed (Garis et al., 2024); resistance to technology use (Safrilia et al., 2025); 45% of studies highlight HR issues (Sembiring, 2025)	Suboptimal service, declining tourist experience, poorly managed systems
Weak Regulation and Coordination	Fragmented policies and lack of coordination among stakeholders	Central-regional policy mismatch (Wibowo & Adzilla, 2024); weak inter-agency coordination (Widodo & Dasiah, 2021)	Investment duplication, management conflicts, data security risks

II. Supporting Factors

There are four main pillars driving the success of smart tourism implementation. First, government policy serves as the regulatory framework and strategic direction, including AI-driven MCDM for the national roadmap (Hariyanto et al., 2025) and the Kemenparekraf policy framework (Wibowo & Adzilla, 2024), which has been proven to increase smart destination coverage by up to 40% (Sudarmini et al., 2025). Second, technological development such as AI, WebGIS, IoT, and mobile applications can increase tourist satisfaction by up to 30% and improve destination operational efficiency (Buhalis & Sinarta, 2022; Li et al., 2023). Third, stakeholder collaboration through the community-based tourism (CBT) approach has proven to increase HR capacity by up to 40% and promote a more inclusive distribution of economic benefits (Yuanita et al., 2025). Fourth, digital innovation and start-ups can increase tourist visits by up to 35% through content creation and co-creation experience strategies (Kagungan et al., 2021; Buhalis & Sinarta, 2022), as summarized in Table 7.

Table 7. Supporting Factors of Smart Tourism Implementation in Indonesia

Factor	Description	Research Findings	Impact
Government Policy	Policy as regulatory framework and strategic direction for smart tourism implementation	AI-driven MCDM for national roadmap (Hariyanto et al., 2025); Kemenparekraf policy framework (Wibowo & Adzilla, 2024); regional implementation in DKI Jakarta and NTB (Widodo & Dasiah, 2021; Apriani et al., 2025)	Smart destination coverage increase up to 40% (Sudarmini et al., 2025); technology and sustainability integration
Technological Development	Utilization of digital technologies such as AI, WebGIS, IoT, and mobile applications	AI and WebGIS integration (Yahya et al., 2025); tourist AI profiling (Puspita et al., 2025); self-guided tour app (Safrilia et al., 2025)	Tourist satisfaction increase up to 30% and operational efficiency (Buhalis & Sinarta, 2022; Li et al., 2023)
Stakeholder Collaboration	Synergy between government, community, private sector, and academics	Community-based collaboration in Tanjungsari and Kemutug Lor (Garis et al., 2024; Arum et al., 2025); community-based tourism model (Munawaroh et al., 2024)	HR capacity increase up to 40% and more inclusive economic benefit distribution (Yuanita et al., 2025)
Digital Innovation and Start-Ups	Role of digital innovation and start-ups in creating creative solutions and tourism marketing	Digital platform utilization by GENPI (Kagungan et al., 2021); e-tourism and social media branding (Abubakar et al., 2025; Kenedi et al., 2025)	Tourist visits increase up to 35% through content creation and co-creation experience

Overall, the four supporting factors complement each other in forming an adaptive and inclusive smart tourism ecosystem. The success of implementation depends not only on technology, but also on the comprehensive readiness of the supporting ecosystem, encompassing regulation, HR capacity, digital infrastructure, and sustained cross-sector collaboration.

E. CONCLUSION

The Based on the findings, smart tourism in Indonesia demonstrates significant development in the post COVID-19 pandemic period through a shift toward the implementation of technologies such as artificial intelligence (AI), WebGIS, big data, and digital applications integrated with sustainability concepts such as green tourism and eco-smart tourism. Its implementation encompasses digital technology and infrastructure, destination governance, and tourist experience, all of which contribute to improved efficiency, service quality, and more personalized tourism experiences. However, implementation continues to face barriers including digital infrastructure disparities, low human resource quality and digital literacy, and weak regulation and coordination that exacerbate the digital divide. Conversely, government policy support, technological development, stakeholder collaboration, and digital innovation serve as the primary enabling factors. Overall, smart tourism plays a strategic role in realizing intelligent, inclusive, and sustainable tourism, with success dependent on synergistic efforts to overcome barriers and optimize enabling factors toward Indonesia Emas 2045.

Suggestions

In relation to the conclusions, the development of smart tourism in Indonesia requires accelerated equalization of digital infrastructure, particularly in rural destinations, to reduce technology access disparities. Additionally, human resource capacity enhancement must be pursued through digital-based training and mentoring involving collaboration between government, universities, and the private sector. Stakeholder collaboration must also be strengthened through a community-based tourism approach to create an inclusive and sustainable tourism ecosystem. Furthermore, digital innovation should be encouraged through support for start-ups and policies that accelerate the adoption of technologies such as artificial intelligence, big data, and the Internet of Things. Finally, future research is recommended to examine the long-term impacts of smart tourism implementation from economic, social, and environmental perspectives, as well as to develop more comprehensive technology integration models at the national level.

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