

## AI Adoption For Accelerating Tourism Destination Development In Indonesia

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### Abstract

Artificial Intelligence (AI) is increasingly transforming tourism by enabling personalised experiences, optimising operations, and supporting sustainable destination development. While extensive research has explored AI applications in advanced economies, studies remain limited in emerging contexts such as Indonesia. Addressing this gap, this study investigates how AI adoption can accelerate tourism destination development in Indonesia, a country with rich natural and cultural assets but significant digital, infrastructural, and governance challenges. Employing a qualitative strategic management approach, this study integrates SWOT–TOWS analysis and expert panel validation to identify internal and external factors influencing AI readiness. The findings position Indonesia in the Strength–Opportunity (SO) quadrant, suggesting that AI technologies—such as recommendation systems, virtual storytelling, and predictive analytics—hold significant potential for destination differentiation and sustainability. However, persistent barriers include low AI literacy, fragmented data systems, and regulatory limitations. The study contributes theoretically by contextualizing Innovation Diffusion Theory and Smart Tourism frameworks within a developing economy. Practically, it offers a strategic roadmap for inclusive and ethical AI adoption in tourism. Future research should explore quantitative modeling, cross-country comparisons, and the development of tourism-specific AI governance frameworks.

**Keywords:** Artificial Intelligence (AI); Smart Tourism; Innovation Diffusion; Strategic Analysis; SWOT–TOWS; Indonesia

### A. INTRODUCTION

Tourism remains a critical sector globally, contributing significantly to economic growth, employment, and cultural exchange. Increasing demand for personalized, experience-driven travel has accelerated innovation, with Artificial Intelligence (AI) emerging as a transformative force in tourism development and destination management. AI enhances visitor experiences and operational efficiency through tools such as recommendation systems and AI-powered chatbots, improving service personalization and tourist engagement (Jang et al., 2023; Luo et al., 2024; Orden-Mejía et al., 2023). AI also supports destination branding, sustainability, and real-time visitor management, helping mitigate over-tourism while promoting responsible tourism practices (Červová & Vávrová, 2021; Chin et al., 2022; García & Ruíz, 2021; Zhou & Chen, 2023). Integrating AI with Internet of Things (IoT) technologies enables smart tourism ecosystems, offering real-time analytics for optimized resource use and enhanced cultural interactions (Abbas, 2022; Doborjeh et al., 2021; Xu, 2022). In the post-pandemic context, AI's adaptability to shifting travel behaviors further underscores its strategic value.

Indonesia's tourism sector holds vast potential, driven by rich biodiversity, cultural diversity, and strategic geography. However, critical challenges persist—from infrastructure gaps and uneven digital transformation to low AI adoption rates—hindering competitiveness against advanced smart tourism destinations. Despite national digital tourism initiatives, AI integration remains fragmented, limiting data-driven destination management and personalized visitor experiences (Gretzel, 2021; Hamid et al., 2023). Scholars emphasize stronger collaboration between government, industry, and technology providers to overcome these barriers (Singh & Duhan, 2022; Zhan & Kai, 2021). While advancements in big data applications and smart tourism

environments show promise, persistent policy and infrastructure gaps continue to delay progress (Qian et al., 2023; Syafi'i & Uula, 2022). AI-driven initiatives also offer community empowerment and digital literacy enhancement potential, supporting inclusive and sustainable tourism growth (Kusumastuti et al., 2024; Saputra et al., 2023).

Global literature on AI in tourism predominantly focuses on developed countries and technologically advanced cities, exploring AI's role in enhancing visitor experiences, operations, and market forecasting (Luo et al., 2024; Orden-Mejía et al., 2023). However, such studies often overlook emerging economies like Indonesia, where digital divides, weak governance, and limited human capital constrain AI adoption. Infrastructure gaps, particularly in rural areas, exacerbate inequalities and hinder scalable smart tourism initiatives (Saurabh et al., 2023; Yuniarta et al., 2023). Moreover, fragmented data systems and the absence of robust data protection frameworks limit the effectiveness of AI-driven strategies (Tomo & Budiyo, 2023). Scholars argue that inclusive digital transformation requires not only technological upgrades but also strong stakeholder collaboration and enabling policy environments (Atmojo et al., 2024; Mihigo & Lukenangula, 2023). Promising community-based digital tourism initiatives offer models for integrating cultural heritage into smart tourism, though structural gaps remain (Perbawa & Permadhi, 2023).

Theoretically, this study adopts a strategic management perspective, utilizing SWOT analysis to assess internal and external factors influencing AI adoption in Indonesia's tourism sector. AI empowerment aligns with the innovation diffusion model and smart tourism frameworks, positioning technology as a key driver of competitiveness and sustainability (Peterlin & Dimovski, 2015; Syaifullah et al., 2023). However, successful implementation demands context-sensitive adaptation, addressing local challenges such as digital inequity, limited AI-literate human capital, and weak governance capacity (Booyens & Rogerson, 2016; Chakim et al., 2023). Integrating AI into community-based tourism models is also critical for empowering local stakeholders and promoting cultural authenticity (Gan et al., 2022; Syaifullah et al., 2023), while capacity-building remains a key enabler for sustainable transformation (Ambarwati et al., 2023; Romão, 2020).

This study contributes novelty by addressing the research gap in AI integration within emerging tourism economies, focusing specifically on Indonesia's unique developmental challenges. Unlike previous studies centred on technologically advanced destinations or technical applications of AI, this research adopts a strategic management approach—integrating SWOT-TOWS analysis and expert panel validation—to formulate context-specific strategies. It contributes both theoretically, by extending the Innovation Diffusion and Smart Tourism frameworks to developing contexts, and practically, by proposing actionable strategies to enhance digital equity, community empowerment, and inclusive destination development. The central research question is: How can Artificial Intelligence be strategically adopted to accelerate sustainable tourism destination development in Indonesia, considering its internal capabilities and external challenges?

## **B. LITERATURE REVIEW**

### ***AI and Challenges in Global and Emerging Tourism Contexts***

The rapid advancement of Artificial Intelligence (AI) technologies—including machine learning, predictive analytics, natural language processing, and virtual reality—has significantly reshaped global tourism. AI enhances destination competitiveness by enabling personalised services, operational optimization, and data-driven decision-making (Jang et al., 2023; Luo et al., 2024). AI-powered recommendation systems, chatbots, and virtual assistants facilitate real-time tourist engagement, offering tailored experiences that improve satisfaction and loyalty (Kong et al., 2022; Orden-Mejía et al., 2023). Globally, countries like Japan, South Korea, and the United Arab Emirates (UAE) lead smart tourism adoption, integrating AI into visitor management, behavior prediction, and immersive experiences. Japan employs AI chatbots and predictive analytics to streamline services and personalize interactions (Khan, 2024), while South Korea leverages smart infrastructure for crowd management and enhanced visitor experiences (Kirtil & Askun, 2021). The UAE utilizes AI-driven augmented

reality (AR) to improve tourist engagement, showcasing AI's role in marketing, sustainability, and resource management (Aliyah et al., 2023; Guo et al., 2019).

In contrast, emerging economies like Indonesia face significant challenges in adopting AI for tourism. Major barriers include inadequate digital infrastructure, limited AI literacy, human resource shortages, and weak data governance frameworks (Fileri et al., 2021; Nagaraj et al., 2020). The urban-rural digital divide exacerbates these disparities, restricting the scalability of AI-driven tourism initiatives (Gupta et al., 2022). AI risks deepening socio-economic inequalities without addressing these structural gaps, rather than promoting inclusive growth. Moreover, ethical concerns about data privacy, protection, and equitable access complicate AI implementation. Scholars emphasize the need for ethical guidelines and responsible governance to safeguard traveler rights and ensure community equity (Skandali et al., 2024). Strengthening human capital through AI literacy and workforce training is equally critical to equip local stakeholders for managing digital transformation. While AI offers substantial potential to revolutionize tourism experiences, its success in emerging economies depends on investments in digital infrastructure, robust regulatory frameworks, and capacity-building initiatives. These efforts are essential to transform AI into a catalyst for inclusive, competitive, and sustainable tourism growth.

### ***Theoretical Foundations: Innovation Diffusion and Smart Tourism***

The integration of Artificial Intelligence (AI) in tourism is conceptually anchored in Innovation Diffusion Theory and Smart Tourism frameworks, both of which position technology adoption as a critical driver of competitiveness, enhanced visitor experiences, and long-term sustainability (Park et al., 2022; Peterlin & Dimovski, 2015). These frameworks argue that technological innovation strengthens destination resilience, optimizes operations, and enriches tourist experiences, especially amid global challenges such as climate change and shifting market dynamics (Suherlan & Cheer, 2024). Global best practices reflect these models in action. Japan leverages AI-powered chatbots and predictive analytics for efficient tourist flow management and service personalization, while South Korea integrates smart infrastructure and AI systems for real-time crowd control and feedback collection (Lakatompey et al., 2022; Ma et al., 2024). Similarly, the United Arab Emirates (UAE) employs AI and augmented reality (AR) to create immersive experiences while improving destination efficiency and appeal (Hu et al., 2019).

However, applying these models in emerging economies like Indonesia reveals distinct challenges—limited digital infrastructure, low AI literacy, human resource shortages, and weak governance frameworks (Suparjo et al., 2024). The digital divide, especially between urban and rural areas, exacerbates disparities in access and readiness, underscoring the need for capacity building and equitable implementation strategies (Rasethunsa, 2022). Scholars emphasize that collaborative governance and stakeholder engagement are essential to ensure AI adoption aligns with local socio-economic contexts. Involving governments, industry players, local communities, and technology providers in decision-making processes helps mitigate risks of exclusion and enhances sustainability outcomes (Barandiarán et al., 2019; Hakimi et al., 2023). Such collaboration strengthens local ownership and ensures that AI integration respects cultural values and environmental priorities, supporting broader sustainable tourism goals (Paredes et al., 2021; Sirisuthikul, 2018). Digital transformation risks exacerbating inequalities and undermining local identities without meaningful stakeholder participation. Therefore, AI integration must be contextually adapted, participatory, and inclusive to foster resilient, equitable, and sustainable tourism systems. This approach enhances technological outcomes and reinforces community empowerment and cultural preservation within smart tourism development.

### ***Community-Based Digital Tourism and Empowerment***

Recent studies emphasize the potential of Artificial Intelligence (AI) and digital technologies to strengthen community-based tourism (CBT) models, supporting local empowerment and sustainable tourism development. AI-enabled CBT fosters authentic cultural experiences, promotes local economic growth, and enhances environmental sustainability by integrating community participation in the tourism value chain (Gan

et al., 2022; Gillovic & McIntosh, 2020; Paliokas et al., 2021; Syaifullah et al., 2023). AI-driven platforms and digital tools such as online marketplaces and virtual tours allow local artisans, guides, and service providers to engage with tourists directly, reducing economic leakages and reinforcing community-based economic linkages (Gillovic & McIntosh, 2020; Hamdani et al., 2023). Moreover, AI supports real-time data collection on visitor preferences, environmental impacts, and carrying capacities, empowering local stakeholders to make informed decisions on resource management and strategic marketing (Hampton et al., 2017).

Collaborative governance remains central to effective community-based digital tourism. Engaging local communities in tourism planning ensures that cultural values, social structures, and environmental priorities are reflected in development strategies (Atmojo et al., 2024). Such participation strengthens community resilience against risks like over-tourism while preserving local identity and traditions (Lucia et al., 2021). Digital technologies also expand opportunities for capacity-building initiatives that improve digital literacy and technical skills at the community level. Equipping locals with these competencies democratizes access to tourism benefits and enables communities to leverage digital storytelling and content creation, offering immersive experiences aligned with cultural heritage (Hamdani et al., 2023; Hampton et al., 2017).

However, challenges persist, including limited technology access, digital literacy gaps, and economic disparities, which risk deepening the digital divide if unaddressed (Belgodere et al., 2021). Scholars argue that inclusive policy interventions and strategic partnerships are essential to ensure equitable access to digital resources, infrastructure, and training, particularly for marginalized communities (Santarsiero et al., 2024). Integrating AI and digital technologies into community-based tourism models presents a significant opportunity to empower local populations, preserve cultural heritage, and promote sustainable tourism practices. Centering communities as active agents in tourism development enhances local economic resilience while enriching visitor experiences—paving the way for a more equitable and environmentally responsible tourism sector.

### ***Human Capital Development and Digital Literacy***

The successful integration of Artificial Intelligence (AI) in tourism depends on digital infrastructure and human capital readiness. Scholars emphasize that sustained investment in digital literacy and AI skill development for tourism stakeholders, local communities, and government officials is essential to fully realize AI's potential in tourism (Ambarwati et al., 2023; García & Ruíz, 2021; Luo et al., 2024; Romão, 2020). Strengthening human resources ensures local actors can effectively utilize AI tools, engage in smart tourism ecosystems, and avoid marginalization amid rapid technological change. Human capital development is fundamental to achieving inclusive and sustainable tourism growth. Digital literacy programs empower communities to participate actively in tourism economies, fostering equitable benefit distribution and reducing dependency on external actors (García & Ruíz, 2021; Zhou & Chen, 2023). For example, community-based ecotourism initiatives have been shown to enhance local capacities for sustainability, while a skilled workforce is more resilient to disruptions such as the COVID-19 pandemic (Faeni et al., 2022; Luo et al., 2024).

Research further affirms the link between human capital strength and innovation performance in tourism. A capable workforce enhances a destination's ability to absorb, adapt, and implement new technologies, driving competitiveness and innovation (Orden-Mejía et al., 2023; Wu & Vera, 2020). This alignment is increasingly vital as global tourism adapts to digital transformation and evolving visitor expectations. Local participation in digital literacy initiatives also enriches cultural authenticity and community pride. Equipping communities with digital skills enables them to co-create tourism products that reflect their heritage, adding unique value to visitor experiences while reinforcing local ownership (Červová & Vávrová, 2021; García & Ruíz, 2021; Zhou & Chen, 2023). Recognizing these dynamics, scholars stress the role of government support and policy interventions in mainstreaming human capital development within tourism strategies. Targeted capacity-building programs are critical for fostering a tourism industry that is resilient, innovative, and responsive to environmental, economic, and social challenges (Chin et al., 2022; Hsieh et al., 2017). Integrating AI components into training modules

keeps local actors competitive, strengthens operational efficiency, and promotes a culture of continuous learning and innovation essential for long-term sustainability (Chin et al., 2022; Shafiee, 2024). Human capital development and digital literacy are indispensable for successful AI integration in tourism. Empowering local stakeholders through education and skills enhancement builds sectoral resilience, supports inclusivity, and ensures sustainable growth across the tourism value chain.

### C. METHODS

This study employs a qualitative descriptive approach within a strategic management framework to analyze how Artificial Intelligence (AI) can accelerate tourism destination development in Indonesia. Specifically, the study integrates SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis and an Expert Panel Discussion (EPD) method to assess internal and external factors influencing AI adoption systematically. This approach is well-suited to exploratory research in under-researched, emerging-economy contexts. The central research question is: "Can AI adoption accelerate tourism destination development in Indonesia?"

Data collection began with an extensive literature review involving academic articles, government reports, policy documents, and global best practices related to AI in tourism, smart tourism ecosystems, community-based digital tourism, and human capital development in digital transformation. This process established the theoretical foundation and generated an initial list of SWOT factors relevant to Indonesia's tourism context. Following this, a structured Expert Panel Discussion (EPD) was conducted to validate, refine, and prioritize the SWOT factors based on stakeholder perspectives. The expert panel consisted of 15 purposively selected individuals, representing diverse sectors: regional tourism offices, tourism industry associations, village tourism leaders, tourism academics, and AI practitioners with experience in tourism technology. Selection criteria included professional expertise in digital tourism, direct experience in AI policy or deployment, and regional representativeness. Participants were selected to ensure both institutional diversity and geographic inclusiveness.

The panel discussion used a semi-structured format, allowing for both quantitative assessments and qualitative inputs. Experts evaluated each SWOT factor by assigning a weight (ranging from 0 to 1) indicating its perceived importance and a rating (1 to 4) reflecting its impact or intensity. Weighted scores were calculated by multiplying each factor's weight by its rating. This process enabled systematic positioning within the SWOT quadrant and informed subsequent strategic mapping through the TOWS matrix. To ensure robustness, the analysis employed manual aggregation supported by spreadsheet modeling, allowing transparent tracking of expert consensus. To enhance reliability, the research implemented basic inter-rater agreement checks across ratings. Although formal statistical measures such as Cohen's Kappa or Kendall's W were not fully applied due to the exploratory nature of the research, discrepancies were discussed and resolved through facilitated consensus-building during the panel sessions. This iterative process improved the consistency of expert judgments. The TOWS Matrix was then formulated to derive four sets of strategic alternatives: SO (Strength–Opportunity) strategies to leverage strengths for emerging opportunities; WO (Weakness–Opportunity) strategies to address weaknesses using external opportunities; ST (Strength–Threat) strategies to use existing strengths to mitigate risks, and WT (Weakness–Threat) strategies to reduce vulnerability from internal and external challenges.

Triangulation was used to improve validity by integrating data from literature, stakeholder discussions, and government sources. Cross-validation occurred through iterative panel refinement of factors, with feedback loops incorporated between sessions. Ethical considerations were prioritized throughout the research process. All participants received detailed information regarding the study's objectives, process, and expected outcomes. Informed consent was obtained from all participants, with assurance of confidentiality, voluntary participation, and the right to withdraw at any time. This methodological design combines theoretical grounding, strategic analysis, and participatory validation, offering a rigorous yet flexible framework for exploring AI adoption in tourism in developing economies. However, the reliance on expert judgment introduces subjectivity,

particularly in qualitative weighting. Future studies are encouraged to apply mixed-method triangulation, including Delphi methods or quantitative modeling (e.g., AHP or SEM), to enhance reliability and generalizability.

## D. RESULTS AND DISCUSSIONS

### Strengths

The expert panel unanimously identified a set of core internal strengths that position Indonesia favorably for AI empowerment in the tourism sector. These strengths can be clustered into four thematic areas that directly align with strategic AI capabilities: (1) cultural and destination diversity, (2) institutional and policy readiness, (3) technological feasibility, and (4) data availability and community content potential. First, Indonesia's vast cultural and natural diversity was recognized as its most significant competitive advantage. This diversity supports AI-driven personalization and segmentation, enabling targeted marketing and tailored visitor experiences. AI applications such as recommendation systems and virtual storytelling can leverage this richness to attract niche tourist segments and enhance destination appeal (Expert Insight 1, 4). Second, experts acknowledged the existence of supportive institutional frameworks and government-led digital transformation initiatives. These provide a policy-enabling environment for AI experimentation and implementation, especially at the regional level. Such support aligns with AI deployment in smart tourism villages, tourism digitalization roadmaps, and partnerships between public and private sectors (Insight 2, 3).

Third, technological accessibility was noted as a growing strength. The availability of open-source AI platforms and user-friendly tools lowers entry barriers for local tourism actors. However, experts emphasized that such technological readiness must be accompanied by capacity-building to ensure effective adoption and avoid superficial integration (Insight 6). Fourth, the accumulation of tourism-related big data—including visitor behavior, booking trends, and geographic flows—was considered a key enabler for predictive analytics and real-time decision-making. Combined with rich community narratives and cultural heritage, this opens up opportunities for AI-powered immersive content creation, destination branding, and sustainable tourism management (Insights 4, 5).

**Table 1. Summary of Expert Panel Insights – Strengths Category**

No	Expert Insight	Strategic AI Capability
1	Indonesia's diverse cultural and natural tourism assets provide a strong competitive advantage for AI-driven personalization and targeted marketing.	Personalization; Segmentation
2	Existing government regulations and digital tourism initiatives offer a strategic framework to support AI integration.	Enabling policy environment
3	Growing awareness among tourism businesses of AI's role in improving service personalization and market forecasting.	Industry readiness; Forecasting
4	Rich community stories and cultural assets are suitable for AI-powered immersive experiences.	Storytelling; Immersive content
5	Accumulated tourism-related data supports AI-driven destination management.	Predictive analytics; Smart planning
6	Accessibility of open-source AI tools, contingent on human capital readiness.	Technological feasibility

Source: Research data, 2025

In summary, Indonesia's core strengths lie not only in the richness of its tourism assets but also in the emerging convergence of policy support, digital experimentation, and private sector interest in AI. Experts stressed that leveraging these strengths requires investment in human capital development, especially in local tourism communities. Doing so will allow AI to unlock untapped digital storytelling potential, preserve cultural authenticity, and foster inclusive and sustainable AI integration.

### Weaknesses

The expert panel identified several internal weaknesses that significantly hinder the optimal adoption of Artificial Intelligence (AI) in Indonesia's tourism sector. Despite substantial tourism potential and ongoing digital initiatives, systemic challenges undermine the nation's AI readiness. These weaknesses can be organized into

four thematic clusters: (1) human capital limitations, (2) infrastructural and digital access gaps, (3) institutional and policy fragmentation, and (4) financial and innovation constraints. First, human capital deficits emerged as the most persistent weakness. Limited AI literacy, especially at local and community levels, constrains effective engagement with AI technologies. Many grassroots tourism actors remain unfamiliar with digital tools, increasing their risk of digital exclusion and reducing the scalability of AI applications (Expert Insight 1). This educational and capacity gap hinders meaningful participation in the digital tourism ecosystem.

Second, infrastructural disparities across regions were highlighted as a major constraint. Uneven digital infrastructure—especially in rural and remote areas—limits equitable access to AI-driven tourism services. While urban and high-traffic destinations benefit from digital initiatives, underserved regions struggle to adopt even basic digital tools (Insight 2). This digital divide reinforces regional inequality and restricts inclusive innovation. Third, data governance limitations and institutional fragmentation emerged as technical and regulatory obstacles. Experts emphasized that fragmented, non-standardized data ecosystems inhibit the core functionality of AI systems—particularly predictive analytics and smart destination planning. Without integrated and centralized tourism data, AI applications cannot operate effectively, undermining decision-making and marketing strategies (Insight 3). Fourth, industry-level resistance to change—particularly among micro, small, and medium enterprises (MSMEs)—was identified as a structural issue. Many businesses still rely on conventional tourism models, lacking the knowledge or incentives to adopt AI-based innovations (Insight 4). Perceived high costs and low awareness of AI’s benefits further contribute to low investment levels, weakening the innovation ecosystem (Insight 5). Compounding these barriers is the absence of clear, coordinated AI policy frameworks in the tourism sector, which leads to fragmented implementation, limited stakeholder alignment, and regulatory uncertainty (Insight 6).

**Table 2. Summary of Expert Panel Insights – Weaknesses Category**

No	Expert Insight	Strategic Barrier
1	Limited AI literacy and digital skills constrain effective adoption, especially at local/community levels.	Human capital readiness
2	Unequal digital infrastructure across regions exacerbates the digital divide.	Access and infrastructure gaps
3	Fragmented data systems hinder AI-driven analytics and planning.	Data governance and integration
4	Traditional service models dominate MSMEs, limiting digital transition.	Resistance to innovation
5	Low investment in AI reflects unclear models and cost concerns.	Innovation finance barrier
6	Lack of coordinated AI policies causes fragmented implementation.	Regulatory and institutional void

Source: Research data, 2025

The expert panel emphasized that human capital limitations and infrastructural inequality are the most foundational barriers to AI integration in Indonesia’s tourism landscape. Without parallel investments in education, connectivity, and digital inclusion, AI risks deepening socio-economic disparities rather than bridging them. The absence of integrated data systems and enabling policies further compounds these weaknesses, preventing effective coordination and innovation. Overcoming these structural deficits is imperative for enabling inclusive, sustainable, and context-sensitive AI adoption in Indonesian tourism.

### **Opportunities**

The expert panel identified a set of external opportunities that can strategically accelerate AI adoption in Indonesia’s tourism sector. Global market shifts, technological evolution, and emerging digital policy frameworks drive these opportunities. They can be grouped into three thematic clusters: (1) shifting market trends, (2) supportive digital ecosystems, and (3) sustainability and technological inclusivity. First, shifting global tourism trends present strong momentum for AI integration. Rising demand for hyper-personalized and immersive experiences is reshaping how tourists interact with destinations. Tools such as predictive analytics, recommendation engines, and AI-powered virtual guides can enable Indonesia to deliver tailored, dynamic, and memorable journeys, particularly given its rich natural and cultural diversity (Insight 1). Moreover, the rise of digital nomads and remote workers introduces a new market segment seeking digitally connected, culturally

rich, and cost-effective destinations. Through AI-driven targeting and content personalization, Indonesia has an opportunity to spotlight lesser-known destinations and attract this increasingly mobile segment (Insight 3).

Second, an increasingly supportive digital ecosystem—both nationally and internationally—provides new pathways for capacity-building and innovation. The post-pandemic surge in digital adoption (Insight 2) and the emergence of global funding schemes and digital economy programs (Insight 4) offer critical support for AI experimentation, particularly among SMEs and rural tourism actors. These partnerships can provide access to infrastructure, technical knowledge, and collaborative innovation platforms that reduce entry barriers and encourage local innovation. Third, opportunities also emerge from growing global attention to sustainability and inclusive technology access. AI tools can support visitor management, environmental monitoring, and resource efficiency, aligning with Indonesia’s national tourism sustainability goals and global calls for responsible tourism (Insight 5). At the same time, the increasing availability of open-source AI platforms (Insight 6) enhances scalability and inclusivity, enabling even small operators to begin integrating intelligent systems—provided appropriate training and policy support are available.

**Table 3. Summary of Expert Panel Insights – Opportunities Category**

No	Expert Insight	Strategic Leverage Area
1	Global demand for personalized, AI-driven tourism experiences.	Personalization & Experience Innovation
2	Post-pandemic acceleration of digital adoption.	Policy & Market Readiness
3	Rise of digital nomadism and remote work culture.	Niche Market Expansion
4	Access to funding and international digital economy programs.	Capacity-Building & Innovation Finance
5	AI's role in sustainability—visitor flow, environment monitoring.	Smart & Sustainable Tourism
6	Increasing accessibility of AI tools and platforms.	Tech Inclusion for SMEs

Source: Research data, 2025

The panel emphasized that Indonesia's tourism sector is well-aligned with global trends toward personalization, sustainability, and digital experience enhancement. With its diverse tourism offerings and increasing digital experimentation, Indonesia can strategically leverage AI to enhance competitiveness, promote inclusive destination visibility, and participate more actively in global tourism innovation networks. Realizing these opportunities, however, requires synchronized investments in policy support, capacity-building, and multistakeholder collaboration to ensure that AI tools are not only available—but also equitably adopted and sustained.

### Threats

Despite Indonesia’s growing momentum for AI adoption in tourism, the expert panel identified a range of external threats that could undermine sustainable and inclusive implementation. These threats span four key thematic areas: (1) socio-digital inequality, (2) technological and ethical vulnerabilities, (3) global competition, and (4) regulatory and governance gaps. First, the risk of widening the digital divide between urban and rural destinations was identified as the most critical concern. Without targeted efforts in infrastructure and capacity-building, AI technologies could deepen socio-economic inequalities, leaving marginalized communities excluded from digital tourism benefits (Insight 1). This exclusion risks reinforcing disparities in visibility, income, and participation across Indonesia’s tourism regions.

Second, job displacement due to automation poses a direct threat to employment in labour-intensive tourism sub-sectors such as hospitality, guiding, and services (Insight 2). If not paired with inclusive reskilling and workforce adaptation programs, automation may trigger social resistance to AI and disrupt community livelihoods. Ethical and technological vulnerabilities were also flagged. Weak data protection frameworks increase exposure to privacy breaches and cybersecurity threats, potentially eroding public trust and deterring international investment (Insight 3). Furthermore, algorithmic bias, opaque decision-making, and discrimination risks could harm both tourists and local communities if AI governance remains underdeveloped (Insight 5).

Third, the panel highlighted increasing global competition as a significant external pressure. Regional peers such as Singapore, Thailand, and Vietnam are rapidly advancing their smart tourism capabilities. If Indonesia

lags in AI deployment, it risks losing market share, foreign investment, and technological relevance in an increasingly digital global tourism landscape (Insight 4). Finally, regulatory uncertainty and fragmented governance systems were considered structural threats to successful AI implementation. In the absence of clear ethical guidelines, legal frameworks, and enforcement mechanisms, stakeholder trust in AI applications may diminish, leading to inconsistent, uncoordinated adoption across regions and sectors (Insight 6).

**Table 4. Summary of Expert Panel Insights – Threats Category**

No	Expert Insight	Strategic Risk Area
1	The digital divide may worsen, excluding rural destinations from AI-driven tourism benefits.	Socio-digital inequality
2	AI-driven automation may displace traditional tourism jobs, provoking social resistance.	Employment disruption
3	Weak data protection exposes systems to privacy and cybersecurity risks.	Cybersecurity & trust erosion
4	Global competition may marginalize Indonesia if AI adoption lags.	Competitive disadvantage
5	Ethical risks—bias, opacity, discrimination—may damage trust in AI-based services.	Algorithmic integrity
6	Regulatory uncertainty and weak enforcement reduce stakeholder confidence.	Governance fragmentation

Source: Research data, 2025

The panel emphasized that AI adoption without inclusive planning, ethical safeguards, and strong governance could deepen existing disparities and expose the tourism sector to a range of vulnerabilities. Socio-digital inequality and job displacement are seen as the most immediate threats, especially for rural destinations and labour-intensive industries. Furthermore, data security, algorithmic transparency, and ethical governance emerged as essential to building trust and legitimacy around AI in tourism. Without timely regulatory alignment and strategic risk mitigation, Indonesia may fall behind in the global race toward smart and sustainable tourism development.

### SWOT Scoring Analysis

To determine Indonesia’s strategic positioning in advancing Artificial Intelligence (AI) within the tourism sector, the validated SWOT factors from the expert panel were quantitatively assessed using a structured scoring model. Each factor was assigned a normalized weight (0–1) to indicate its relative importance and a rating (1–4) to reflect its level of influence, based on consensus from experts. By multiplying these two values, a weighted score was generated for each factor. This scoring approach offers a data-driven foundation for mapping Indonesia’s position within the SWOT matrix and for developing contextually relevant TOWS strategies.

**Table 5. SWOT Scoring Table – AI Empowerment in Indonesia's Tourism Sector**

No	SWOT Factor	Weight (0-1)	Rating (1-4)	Weighted Score
<b>Strengths (S)</b>				
S1	Rich cultural and natural tourism diversity	0.15	4	0.60
S2	Government support for digital and AI-based tourism	0.12	4	0.48
S3	Growing industry awareness of AI benefits	0.10	3	0.30
S4	Potential for big data utilization in tourism	0.10	3	0.30
S5	Community-based storytelling potential	0.08	3	0.24
S6	Access to AI tools and open-source platforms	0.08	3	0.24
<b>Total Strength Score</b>				<b>2.16</b>
<b>Weakness (W)</b>				
W1	Low AI literacy and digital skills at the local level	0.14	4	0.56
W2	Infrastructure disparity between urban and rural destinations	0.13	4	0.52
W3	Fragmented data systems and governance	0.10	3	0.30
W4	Resistance to digital adoption in SMEs	0.09	3	0.27
W5	Low AI investment and innovation in tourism	0.08	3	0.24
W6	Lack of specific AI policy and institutional frameworks	0.08	3	0.24
<b>Total Weakness Score</b>				<b>2.13</b>

<b>Opportunities (O)</b>				
O1	Rising demand for AI-personalized tourism experiences	0.15	4	0.60
O2	Acceleration of digital transformation post-pandemic	0.12	4	0.48
O3	Growth of digital nomad and remote work markets	0.10	3	0.30
O4	Access to international funding and partnerships	0.10	3	0.30
O5	Alignment with global sustainability goals	0.08	3	0.24
O6	Improved AI accessibility and scalability	0.08	3	0.24
<b>Total Opportunity Score</b>				<b>2.16</b>
<b>Threats (T)</b>				
T1	Digital divide worsening regional disparities	0.14	4	0.56
T2	Job displacement and socio-economic resistance	0.12	4	0.48
T3	Data privacy and cybersecurity risks	0.14	4	0.56
T4	Rising global competition in smart tourism	0.10	3	0.30
T5	Ethical risks in AI decision-making	0.08	3	0.24
T6	Regulatory gaps and low enforcement	0.08	3	0.24
<b>Total Threat Score</b>				<b>2.12</b>
<b>TOWS Matrix Direction</b>				
Internal Factors (S - W) = 2.16 - 2.13 = +0.03				
External Factors (O - T) = 2.16 - 2.12 = +0.04				

Source: Research data, 2025

The scoring results reveal a relatively balanced strategic position for Indonesia, with the total score for strengths (2.16) slightly exceeding the total weaknesses score (2.13). This suggests that Indonesia possesses internal capabilities, particularly its rich tourism assets and growing digital readiness, which can support AI adoption. However, these strengths are closely counterbalanced by significant internal challenges, especially human capital limitations and infrastructure disparities. On the external side, the opportunities score (2.16) narrowly surpasses the threats score (2.12), indicating that favourable market trends, technological advancements, and global sustainability imperatives create a supportive environment for AI-driven tourism development. Nevertheless, threats such as the digital divide, data security risks, and increasing global competition remain pressing concerns that require strategic mitigation. The positive differential in internal and external factors positions Indonesia in the SWOT matrix's Strength-Opportunity (SO) quadrant. This quadrant signals that the country is strategically placed to pursue aggressive growth strategies by leveraging its inherent strengths and capitalizing on emerging global opportunities. However, given the marginal differences in scores, the analysis also highlights the importance of carefully addressing internal weaknesses and external risks to avoid potential setbacks. This quantitative assessment provides a robust foundation for formulating targeted TOWS strategies in the subsequent analysis, ensuring the proposed strategic directions are data-driven and contextually grounded.



Figure 1. SWOT Matrix Positioning

Source: Research data, 2025

**TOWS Matrix Formulation**

Building upon the SWOT scoring analysis, the subsequent step involves translating Indonesia’s internal and external factors into actionable strategies using the TOWS Matrix framework. Given its position in the Strength–Opportunity (SO) quadrant, Indonesia is well-suited for proactive strategies that maximize internal capabilities while capitalizing on favourable global trends. At the same time, the matrix addresses structural weaknesses (WO), mitigates external threats through internal strengths (ST), and combines risk prevention approaches (WT) to foster resilience and inclusivity. The following TOWS Matrix (Table 6) outlines strategic alternatives to empower AI adoption for sustainable and inclusive tourism development in Indonesia.

	<p><b>Opportunities (O)</b> 1. AI-personalized tourism demand 2. Post-pandemic digital acceleration 3. Remote work/digital nomadism 4. Global funding and collaboration 5. Sustainability alignment</p>	<p><b>Threats (T)</b> 1. Digital divide 2. Job displacement 3. Data privacy/cybersecurity 4. Global competition 5. Regulatory uncertainty</p>
<p><b>Strengths (S)</b> 1. Rich cultural and natural tourism assets 2. Government support for AI and digital tourism 3. Growing industry awareness 4. Big data availability 5. Community storytelling potential</p>	<p><b>SO Strategies (Maxi-Maxi)</b> 1. Develop a National Smart Tourism AI Platform integrating big data, AI-driven marketing, and virtual guide systems. 2. Establish public–private partnerships to enhance AI infrastructure and capacity-building. 3. Leverage cultural diversity for immersive, AI-powered tourism targeting niche global markets. 4. Utilize government backing and global funding to pilot sustainability-driven AI applications (e.g., smart visitor flow, carbon tracking).</p>	<p><b>ST Strategies (Maxi-Mini)</b> 1. Strengthen data governance and cybersecurity protocols to build digital trust. 2. Utilize strong destination branding to differentiate Indonesia in global smart tourism. 3. Develop national AI ethics guidelines to address bias, discrimination, and social concerns.</p>
<p><b>Weaknesses (W)</b> 1. Low AI literacy 2. Infrastructure disparity 3. Fragmented data systems 4. SME resistance 5. Limited investment</p>	<p><b>WO Strategies (Mini-Maxi)</b> 1. Implement AI literacy and digital skill-building programs for local actors and MSMEs. 2. Direct global funding towards infrastructure development in rural destinations. 3. Provide incentives for tourism AI start-ups, particularly in sustainability and community innovation. 4. Establish regional AI innovation hubs to bridge capability gaps.</p>	<p><b>WT Strategies (Mini-Mini)</b> 1. Create a national risk monitoring unit to track socio-economic impacts of AI adoption. 2. Prioritize inclusive infrastructure development to bridge urban–rural digital divides. 3. Apply phased AI deployment with community engagement to prevent job displacement and resistance.</p>

Source: Research data, 2025

The TOWS Matrix confirms that Indonesia’s optimal strategic orientation lies in the SO quadrant, where it can aggressively leverage its rich tourism assets, digital policy frameworks, and growing industry awareness to lead in AI-powered tourism innovation. Central to this direction is the proposed National Smart Tourism AI Platform, integrating diverse data assets with personalized and immersive experiences to attract high-value markets such as digital nomads and eco-conscious travellers. Complementary WO strategies target structural deficits, especially in digital literacy and infrastructure. Investing in grassroots capacity, enabling start-up ecosystems, and channelling global funding toward underserved regions are vital to ensuring that AI-driven tourism development is equitable and community-based. ST strategies focus on mitigating external risks by building ethical and governance frameworks, enhancing cybersecurity, and strengthening destination differentiation through AI branding. Finally, WT strategies adopt a cautious approach to implementation, emphasizing inclusive planning, digital equity, and impact monitoring to safeguard against job displacement, inequality, and public distrust.

## **Discussion**

This study reaffirms Indonesia's strong strategic position to harness Artificial Intelligence (AI) as a transformative enabler for tourism destination development. Positioned in the Strength–Opportunity (SO) quadrant of the SWOT-TOWS analysis, Indonesia exhibits favourable internal capacities and external conditions to pursue aggressive AI adoption strategies, building on its rich tourism diversity, improving digital infrastructure, and increasing alignment with global technological trends (Minardi et al., 2020; Nanda et al., 2023). One of the key findings is the synergistic potential between Indonesia's cultural-natural wealth and global demand for hyper-personalized, AI-powered experiences. AI tools such as recommendation systems, virtual storytelling, and predictive analytics present powerful avenues to personalize services and enrich cultural engagement, meeting the expectations of modern tourists while enhancing Indonesia's brand positioning in competitive global markets (Aliyah et al., 2023; Kumar et al., 2023; García-Madurga & Grilló-Méndez, 2023). Moreover, AI's capability to support visitor flow management, environmental monitoring, and resource optimization aligns closely with sustainable tourism imperatives (Afaq et al., 2024; Shafiee, 2024).

However, capitalizing on this potential depends heavily on addressing key structural, regulatory, and ethical challenges. Despite ongoing digital transformation, the absence of AI-specific policies and ethical frameworks exposes Indonesia's tourism sector to risks associated with data privacy, algorithmic bias, and regulatory gaps. Without robust governance, these risks may lead to consumer distrust, legal liabilities, and reputational damage, undermining Indonesia's international competitiveness (Law et al., 2024; Wang & Zhang, 2024). Establishing comprehensive AI governance frameworks, including cybersecurity standards, ethical codes, and transparent oversight mechanisms, is therefore a strategic imperative. Equally critical is human capital development, particularly in rural and community-based tourism areas. Low levels of AI literacy and digital skills may intensify existing inequalities, marginalizing the very communities tourism is meant to empower (Kirtil & Askun, 2021; Kumar et al., 2023). Strategic investments in capacity building, local training, and inclusive digital education are needed to ensure that AI adoption promotes equity, not exclusion—resonating with international calls for socially inclusive digital transformation (Afaq et al., 2024; Shafiee, 2024).

Additionally, Indonesia must respond swiftly to growing global competition. Countries such as Japan, South Korea, and the United Arab Emirates are setting new standards in smart tourism by delivering highly immersive, personalized experiences powered by integrated AI systems. Without accelerated adoption and stronger public–private partnerships, Indonesia risks falling behind in the global tourism technology race. The ethical dimension of AI integration further demands attention. Potential risks include algorithmic discrimination, cultural misrepresentation, and the erosion of authentic human interaction. Developing AI ethics guidelines specifically tailored to the tourism context will be essential to preserve cultural authenticity, safeguard community values, and promote responsible technology use. Finally, the study recommends establishing risk monitoring units within tourism governance structures. These bodies would proactively assess and respond to the socio-economic impacts of AI—particularly on employment, cultural dynamics, and community well-being. Such mechanisms are critical to ensuring that AI adoption in tourism is sustainable, inclusive, and socially responsible.

## **Policy Implications**

The findings of this study offer several critical implications for policy-makers, particularly in aligning Indonesia's digital tourism agenda with responsible and inclusive AI adoption. While technological readiness and market opportunities are growing, strategic governance and institutional support remain pivotal to transforming AI from a promising innovation into a sustainable and equitable driver of tourism development.

1. Develop a National Smart Tourism AI Framework: A coordinated national policy framework is urgently needed to standardize AI implementation in tourism. This should include: Guidelines for ethical AI use, Data governance standards, Integration models between central and local tourism authorities, and Clear

- pathways for public–private collaboration. Such a framework would reduce fragmentation and accelerate AI deployment across diverse regions while maintaining regulatory coherence.
2. **Invest in AI Literacy and Capacity Building:** The study underscores that low AI literacy and human capital deficits, especially at the grassroots level, are among the most pressing barriers to adoption. Policy-makers must: Integrate AI and digital tourism modules into vocational and tertiary education curricula, establish regional training centers and innovation hubs in tourism clusters, and partner with tech companies to deliver accessible, community-based training programs. These efforts will ensure that local tourism actors—particularly MSMEs and rural communities—are equipped to participate in and benefit from AI-driven transformation.
  3. **Prioritize Digital Infrastructure Equity:** Uneven digital infrastructure remains a major obstacle to inclusive smart tourism. Policies should: Expand broadband and 5G coverage to underserved rural and ecotourism destinations, include tourism destinations in national digital infrastructure funding schemes, and create public-private financing models to support digital access in remote areas. Such investment is critical not only for enabling AI but also for promoting balanced regional tourism development.
  4. **Strengthen Data Protection and Cybersecurity Regulations:** As AI applications process sensitive tourist data, the risks of privacy breaches and cybersecurity threats increase. Policy actions must include: Accelerating the implementation of comprehensive data protection laws aligned with global standards, Establishing sector-specific cybersecurity protocols for tourism platforms, and Requiring transparency and accountability in AI-based decision systems used in tourism services. Trust and data security are non-negotiable pillars for the long-term success of smart tourism.
  5. **Support AI Innovation for Sustainable Tourism:** AI has transformative potential for monitoring sustainability metrics such as carbon emissions, visitor flows, and resource usage. Government funding should prioritize: Pilot programs that integrate AI with green tourism goals; Incentives for start-ups focused on AI and sustainability; Tools that enable community-based monitoring and local participation in destination management. This aligns Indonesia’s smart tourism trajectory with its broader commitments to the SDGs and climate action.

## E. CONCLUSION

This study examined the strategic role of Artificial Intelligence (AI) in accelerating tourism destination development in Indonesia, a digitally emerging economy with rich cultural and ecological assets. By integrating a SWOT-TOWS strategic framework and expert panel validation, the research systematically identified the internal capacities and external dynamics shaping AI adoption within the tourism sector. The results position Indonesia within the Strength–Opportunity (SO) quadrant, signaling a readiness to pursue proactive and innovation-driven strategies. Key national strengths—including tourism diversity, digital policy support, and growing awareness of AI’s potential—align well with global trends such as the demand for personalized, immersive experiences and sustainability-driven tourism. The proposed SO strategies, including the development of a National Smart Tourism AI Platform and cross-sector collaborations, offer a transformative path toward global competitiveness and digital leadership in the tourism domain.

Nonetheless, the analysis also reveals that structural weaknesses—notably limited AI literacy, infrastructure disparities, and fragmented data ecosystems—continue to undermine inclusive development. Without targeted investment and institutional reform, AI implementation risks reinforcing existing socio-digital divides. Moreover, external threats such as data privacy concerns, job displacement, and regulatory uncertainty require immediate policy and ethical responses to safeguard public trust and social equity. Therefore, sustainable AI adoption in Indonesia’s tourism sector demands a balanced strategic approach: one that aggressively leverages strengths and opportunities while concurrently addressing structural gaps and mitigating risks. It is not

technology alone, but the governance, human capital, and inclusive planning around it that will determine the success of Indonesia's transition toward a smart tourism ecosystem.

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