1st AMDI INTERNATIONAL CONFERENCE ON COLLABORATIVE RESEARCH AND INNOVATION FOR SDGS (AMDI-CRIS 2025)

"Collaborative Innovations for Sustainable Development: Integrating Education, Human Resources, Tourism, Infrastructure, and Environmental Solutions"

Proceeding homepage: cris.amdi.or.id

Digital Transformation and Collaborative Strategies for Sustainable Tourism in Achieving the SDGs

Emma Budi Sulistiarini[a,*], Imaduddin Bahtiar Efendi[b], Bambang Suhardi[c]

[a] *Industrial Engineering, Widya Gama University, Malang, Indonesia*

[b] *Industrial Engineering, Majapahit Islam University, Mojokerto, Indonesia*

[c] *Industrial Engineering, Sebelas Maret University, Surakarta, Indonesia*

* Corresponding author: emma_budi@widyagama.ac.id; emas123789@gmail.com

KEYWORD

Sustainable Tourism; Digital Transformation; Multi Stakeholder Collaboration; Smart Tourism; SDGs

ABSTRACT

GDP (Gross Domestic Product), employment, and cultural exchange. Yet, its expansion also creates challenges such as carbon emissions, waste, and resource overuse. In line with the UN SDGs (United Nations Sustainable Development Goals), tourism must be reoriented toward sustainability, resilience, and inclusivity. This paper examines the dual role of digital transformation and multi-stakeholder collaboration as enablers of sustainable tourism. Technologies including IoT (Internet of Things), AI (Artificial Intelligence), Big Data, and Blockchain are explored for their potential to improve efficiency, transparency, and green practices. Meanwhile, collaborative strategies that involve governments, industries, academia, and communities are emphasized as essential for inclusivity and long-term success. Drawing on existing studies and selected case examples, the paper develops a conceptual framework linking digital innovation with collaborative governance. The findings highlight opportunities for participation and transparency, while also recognizing challenges including digital divides, cybersecurity risks, and constraints in SME technology adoption.

1. Introduction

Tourism has long been recognized as one of the fastest growing sectors contributing to global economic development. According to international organizations such as the UNWTO (United Nations World Tourism Organization), tourism accounts for a significant share of global GDP, providing employment opportunities, stimulating innovation, and supporting cultural exchange. The tourism sector significantly contributes to global GDP and employment, representing approximately 10.4% of global GDP and creating millions of jobs worldwide, according to reports by the WTTC (World Travel & Tourism Council) and UNWTO (Khan et al., 2021; Meng et al., 2024). However, this rapid growth comes with substantial challenges.

The sector is also responsible for increasing carbon emissions, waste generation, over exploitation of natural resources, and pressure on local communities. These environmental and social burdens underscore the urgency of transforming the tourism industry into a more sustainable, resilient, and inclusive system. Tourism is linked to high carbon emissions, waste generation, and over exploitation of resources, negatively impacting ecosystems and communities (Dick-Forde et al., 2020). The UNEP (United Nations Environment Programme) has highlighted the urgent need for the tourism industry to adopt sustainable practices to mitigate these effects (Dick-Forde et al., 2020).

This transformation aligns directly with the SDGs, particularly SDG 8, which encourages sustained economic growth and decent work; SDG 11, which promotes sustainable cities; SDG 12, which addresses responsible consumption; SDG 13, which focuses on climate action; and SDG 17, which enhances partnerships for development (Khan et al., 2021; Meng et al., 2024). These interconnections suggest that responsible tourism practices can facilitate broader development goals (Khan et al., 2021; Meng et al., 2024).

In this era of digital advancement, tourism is presented with new opportunities to balance economic growth with sustainability. Digital transformation, through smart tourism solutions, green technologies, and data driven management, offers tools for improving operational efficiency, enhancing visitor experiences, and reducing environmental impacts. Technologies such as IoT in smart hotels, AI for personalized tourism, Big Data for visitor management, and Blockchain for transparent supply chains have demonstrated potential in reshaping tourism practices (Florek-Paszkowska & Ujwary-Gil, 2025). For instance, IoT facilitates real time monitoring of tourist activities, while AI and Big Data analytics enable personalized and sustainable travel recommendations (Liu et al., 2024).

Despite these advancements, the adoption of digital tools often remains fragmented and focused primarily on economic benefits, with limited integration into sustainability agendas. Such fragmented implementation reduces the ability of the tourism sector to effectively address pressing sustainability challenges. Digital transformation in tourism often remains fragmented due to barriers such as lack of integration among stakeholders, varying technological capabilities, and insufficient governmental support (Khan et al., 2021). Recommendations from previous studies emphasize the need for a coherent strategy that aligns digital initiatives with sustainability goals, including fostering public-private partnerships and enhancing stakeholder engagement (Dick-Forde et al., 2020).

Achieving comprehensive sustainability requires robust multi-stakeholder collaboration involving government bodies, private industries, academic institutions, local communities, and even tourists themselves. Collaborative governance models ensure inclusivity, accountability, and long-term viability of sustainability initiatives. Without cross-stakeholder partnerships, tourism digitalization initiatives risk remaining isolated and delivering limited sustainability outcomes. Empirical case studies such as Bali's community-based tourism (Cole, 2006; Dolezal, C. et al., 2022; Suryawan, 2016), Barcelona's smart tourism initiatives, and Thailand's collaborative tourism strategies exemplify the effectiveness of multi-stakeholder collaboration in advancing sustainable tourism (Barrane et al., 2020; Meng et al., 2024; Roring & Bong, 2022). These examples illustrate how diverse partnerships can enhance sustainability outcomes by integrating local knowledge, technology, and policy frameworks.

From a scholarly perspective, the contribution of this paper lies in bridging two streams of research that have often been studied separately: digital transformation and multi stakeholder collaboration in tourism. Much of the existing literature emphasizes the technical or managerial dimensions of digital tools without adequately linking them to broader sustainability frameworks. Similarly, research on collaborative governance tends to focus on social and policy mechanisms, with limited integration of technological innovations. By combining these perspectives, this study addresses a research gap and lays the groundwork for more holistic approaches to sustainable tourism management.

It positions the article to contribute both theoretically and practically by offering a framework for integrating technology and collaboration as mutually reinforcing drivers of sustainable tourism. This alignment with the SDGs not only strengthens the academic relevance of the research but also provides actionable insights for policymakers, industry practitioners, and community leaders engaged in shaping the future of tourism.

2. Methodology

This study employs a conceptual research approach based on a literature review combined with case study exploration. The methodological design aims to integrate theoretical insights with empirical practices in order to analyze the interrelationship between digital transformation and multi stakeholder collaboration within the framework of sustainable tourism. Secondary data sources include peer reviewed journal articles, reports from international organizations, and industry publications discussing digital practices in tourism. In addition, global and regional case studies such as Barcelona's smart tourism model, community based tourism initiatives in Bali, and collaborative governance in Thailand are used as contextual evidence for the conceptual framework.

Conceptual research approaches that combine literature reviews with case study exploration have been applied in studies on sustainable tourism and industrial engineering. For instance, Florek-Paszkowska and Ujwary-Gil conducted a literature review to develop the Digital Sustainability Ecosystem framework, which emphasizes the interconnections between digital transformation and sustainable innovation (Florek-Paszkowska & Ujwary-Gil, 2025). Similarly, Ufua et al. reviewed literature on digital transformation aligned with the SDGs (Sustainable Development Goals), highlighting stakeholder interactions as essential for implementation in Nigeria (Ufua et al., 2021).

The analytical process in this study employs content analysis to identify key themes and patterns related to digital technologies, collaboration mechanisms, and sustainability outcomes. Content analysis has been widely applied in tourism and industrial management research to examine issues related to digital transformation and collaboration. Several studies analyze qualitative data from interviews or case studies to generate insights into stakeholder dynamics and sustainability outcomes (Barrane et al., 2020). For example, Meyer et al. used a qualitative approach to explore the co-creation of sustainable tourism strategies involving the cultural and creative industries (Meyer et al., 2022).

Based on these reviews, this study develops a conceptual framework that links the drivers of digital transformation, such as Big Data, AI (Artificial Intelligence), IoT (Internet of Things), and Blockchain, with collaborative governance structures involving governments, industries, academia, and local communities. Previous studies integrating digital technologies such as AI and IoT with multi stakeholder collaboration for sustainability objectives generally emphasize processes that enhance stakeholder engagement and operational efficiency. One example is initiatives that promote transparency and build trust among stakeholders, as described by Barrane et al. (2020). Although these studies highlight the importance of trust in multi-stakeholder collaborations, research that specifically addresses the integration of advanced technologies with stakeholder engagement for sustainability goals remains limited.

The framework developed in this study is intended to provide both theoretical contributions and practical guidance, offering a structured approach to align technological innovation with sustainability objectives. Accordingly, this methodology aims to generate findings that are relevant for policymakers, practitioners, and academics in the fields of sustainable engineering and tourism management.

3. Result and Discussion

3.1 Conceptual Model

The study proposes a conceptual model that positions Digital Transformation as a catalyst for achieving Sustainable Tourism Goals, facilitated by Collaboration Drivers. In this model, digital technologies act as enablers of efficiency, transparency, and data driven decision making, while collaboration ensures inclusivity, legitimacy, and long term sustainability. The model emphasizes that technology alone cannot deliver sustainability unless reinforced by robust multi stakeholder partnerships. Figure 1 illustrates the integrated framework, linking digital tools such as AI, IoT, Big Data, and Blockchain with collaborative governance structures involving governments, industries, academia, and communities. At figure 1 illustrates this integrated framework, linking digital tools such as AI, IoT, Big Data, and Blockchain with collaborative governance structures involving governments, industries, academia, and communities.

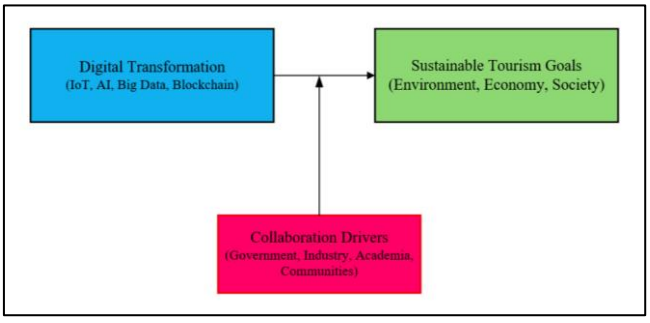

Figure 1. Conceptual Model : Digital Transformation, Collaboration, and Sustainable Tourism Goals

3.2 Findings

Analysis of the literature and case studies revealed several findings:

Digital tools enhance community participation.

Mobile applications for tourist feedback, e-governance platforms, and real time monitoring systems empower local communities to engage in tourism planning and monitoring. Empirical evidence indicates that digital tools significantly enhance community participation and engagement in sustainable tourism. For instance, mobile apps enable tourists to provide feedback and preferences, thereby fostering collaborative decision making at destinations (Ufua et al., 2021). Moreover, e-governance platforms can streamline communication between governmental bodies and local communities, promoting transparency and participation (Fernández-Díaz et al., 2022).

Digital platforms facilitate collaboration. Smart platforms and data sharing systems allow governments, industries, and local communities to coordinate more effectively in managing tourism flows and resources. Studies highlight that such systems enable stakeholders to access and share relevant data, which can optimize resource allocation and enhance tourism management strategies (Florek-Paszkowska & Ujwary-Gil, 2025). Additionally, real time monitoring technologies allow for informed decision making regarding visitor management and environmental sustainability (Guerrero & Dias, 2024).

Persistent challenges remain.

Digital divides limit participation in developing destinations, while cybersecurity concerns and resistance from SMEs hinder broader adoption of digital systems. These challenges are discussed in various studies that stress the need for targeted interventions to overcome such barriers (Nugroho et al., 2025).

Table 1. Roles of Digital Transformation and Collaboration in Sustainable Tourism

Aspect	Role of Digital Transformation	Role of Collaboration
Efficiency & Resource Use	IoT based energy monitoring ; AI optimization	Shared investment in sustainable practices
Transparency & Accountability	Blockchain for supply chain ; open data portals	Policy alignment ; cross sector governance
Community Engagement	Mobile apps, e-governance tools	Empowerment of local communities
Long term Sustainability	Predictive analytics for resource management	Institutionalized partnerships

3.3. Critical Discussion

While the integration of digital transformation and collaboration shows strong potential, the findings underscore the importance of adapting strategies to local contexts. In advanced destinations, technologies such as Blockchain and AI are widely implemented, whereas developing destinations often struggle with infrastructure and capacity limitations. Therefore, capacity building, including digital literacy programs and technical training for local communities, is essential to ensure inclusivity. Literature emphasizes the importance of adapting digital strategies to local contexts, advocating for supportive regulations, open data ecosystems, and capacity building efforts that ensure inclusive and sustainable tourism (Mihalič, 2024; Tartia & Hämäläinen, 2024).

Additionally, the study highlights the necessity of supportive regulations to promote open data ecosystems and encourage sustainable investments. Without adequate policies, digital tools may remain isolated projects rather than integrated solutions. Moreover, small-scale tourism operators require targeted support to overcome limited technology adoption, enabling SMEs to participate meaningfully in digital ecosystems.

Sustainable tourism in the digital era is not

solely about technological innovation but also about collaborative governance, inclusivity, and adaptability. The proposed model and findings offer actionable insights for policymakers, practitioners, and researchers seeking to align digital strategies with the broader objectives of sustainable tourism.

4. Conclusion

This study shows that integrating digital transformation with multi-stakeholder collaboration is an effective pathway to achieving sustainable tourism in alignment with the United Nations Sustainable Development Goals (SDGs). Digital technologies such as IoT, AI, Big Data, and Blockchain have the potential to increase efficiency, improve transparency, and enable data driven decision making within tourism systems. However, the findings confirm that technology alone cannot deliver meaningful sustainability outcomes without strong collaborative frameworks.

By analyzing case studies and synthesizing insights from the literature, the research highlights how collaborative strategies create legitimacy, inclusivity, and long term resilience. Governments, industries, academia, communities, and tourists all have critical roles to play in shaping the digital transformation of tourism. Policies that support open data, sustainable investment, and capacity building for local communities are particularly crucial in ensuring that digital solutions do not remain fragmented projects but evolve into systemic improvements.

The conceptual framework proposed in this paper illustrates how digital transformation and collaboration can act as mutually reinforcing drivers. When aligned, they create opportunities not only for environmental protection but also for social equity and economic prosperity.

Ultimately, the study contributes to the scholarly debate by addressing the gap between technology adoption and collaborative governance in tourism. It provides practical implications for policymakers, industry practitioners, and researchers, offering a roadmap for building resilient, inclusive, and sustainable tourism systems in the digital era.

References

Barrane, F. Z., Ndubisi, N. O., Kamble, S., Karuranga, G. E., & Poulin, D. (2020). Building Trust in Multi-Stakeholder Collaborations for New Product Development in the Digital Transformation Era. *Benchmarking an International Journal*, *28*(1), 205–228. https://doi.org/10.1108/bij-04-2020-0164

Cole, S. (2006). Information and empowerment: The keys to achieving sustainable tourism. *Journal of Sustainable Tourism*, *14*(6), 629–644.

Dick-Forde, E. G., Oftedal, E. M., & Bertella, G. M. (2020). Fiction or reality? Hotel leaders' perception on climate action and sustainable business models. *Worldwide Hospitality and Tourism Themes*, *12*(3), 245–260. https://doi.org/10.1108/WHATT-02-2020-0012

Dolezal, C., &, & Novelli, M. (2022). Power in community-based tourism: Empowerment and partnership in Bali. *Journal of Sustainable Tourism*.

Fernández-Díaz, E., Jambrino-Maldonado, C., Iglesias-Sánchez, P. P., & Heras-Pedrosa, C. d. l. (2022). Digital Accessibility of Smart Cities - Tourism for All and Reducing Inequalities: Tourism Agenda 2030. *Tourism Review*, *78*(2), 361–380. https://doi.org/10.1108/tr-02-2022-0091

Florek-Paszkowska, A., & Ujwary-Gil, A. (2025). *The Digital-Sustainability Ecosystem: A conceptual framework for digital transformation and sustainable innovation*. *21*(2), 116–137. https://doi.org/10.7341/20252127

Guerrero, Y. I. J., & Dias, F. (2024). Tourist Tracking Techniques and Their Role in Destination Management: A Bibliometric Study, 2007–2023. *Sustainability*, *16*(9),

3708. https://doi.org/10.3390/su16093708
Khan, H. U., Chen Kim, C., Ahmed, M. F., Tan, K. L., & Mokhtar, M. B. (2021). Systematic review of contextual suggestion and recommendation systems for sustainable e-tourism. *Sustainability (Switzerland)*, *13*(15). https://doi.org/10.3390/su13158141
Liu, Z., Liu, Y., & Osmani, M. (2024). Integration of Smart Cities and Building Information Modeling (BIM) for a Sustainability Oriented Business Model to Address Sustainable Development Goals. *Buildings*, *14*(5). https://doi.org/10.3390/buildings14051458
Meng, Z., Bhatti, S. M., Naveed, R. T., Kanwal, S., & Adnan, M. (2024). Green sustainability in the hotel sector: The role of CSR, intrinsic green motivation, and personal environmental norms. *PLOS ONE*, *19*(6 June). https://doi.org/10.1371/journal.pone.0295850
Meyer, C., Gerlitz, L., & Klein, M. (2022). Creativity as a Key Constituent for Smart Specialization Strategies (S3), What Is in It for Peripheral Regions? Co-creating Sustainable and Resilient Tourism with Cultural and Creative Industries. *Sustainability (Switzerland)*, *14*(6). https://doi.org/10.3390/su14063469
Mihalič, T. (2024). Trends in Sustainable Tourism Paradigm: Resilience and Adaptation. *Sustainability*, *16*(17), 7838. https://doi.org/10.3390/su16177838
Nugroho, C., Wulandari, A., Maulana, D., Rina, N., & Kalaloi, A. F. (2025). *Digital communication and literacy for MSME empowerment: Evidence from a rural digital village in Indonesia*. *8*(3), 4523–4535. https://doi.org/10.53894/ijirss.v8i3.7544
Roring, R. S., & Bong, B. C. (2022). TOWARDS SOCIETY 5.0: A PILOT STUDY ON COSTLESS SMART TRANSPORTATION BUSINESS MODEL. *International Journal of Business and Society*, *23*(1), 73–87. https://doi.org/10.33736/ijbs.4599.2022
Suryawan, I. B. (2016). Community-based tourism as a sustainable tourism model in Bali. *International Journal of Applied Business and Economic Research*.
Tartia, J., & Hämäläinen, M. (2024). *Co-creation Processes and Urban Digital Twins in Sustainable and Smart Urban District Development - Case Kera District in Espoo, Finland*. *4*. https://doi.org/10.12688/openreseurope.17791.1
Ufua, D. E., Emielu, E. T., Olujobi, O. J., Lakhani, F., Borishade, T. T., Ibidunni, A. S., & Osabuohien, E. S. (2021). *Digital transformation: A conceptual framing for attaining Sustainable Development Goals 4 and 9 in Nigeria*. *27*(5), 836–849. https://doi.org/10.1017/jmo.2021.45