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Digital Transformation of Rural Tourism Villages: A Systematic Literature Review on Strategies, Challenges, and Opportunities for Sustainable Tourism Development

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Abstract. This study aims to examine the strategies, challenges, and opportunities for digital transformation in rural tourism villages in the context of sustainable tourism development. Using the Systematic Literature Review (SLR) method, 28 relevant scientific articles indexed by Scopus are explained thematically using a content analysis approach. The results of the study indicate that digital tourism village transformation consists of three main phases: digital empowerment, digital integration, and digital innovation, with strategies that are greatly influenced by technological readiness, socio-cultural capacity, and institutional support. The main challenges in its implementation include low digital literacy, limited infrastructure, cultural resistance, and data privacy issues. However, digitalization presents significant opportunities for community participation, cultural preservation, tourism market expansion, and achieving the United Nations' Sustainable Development Goals (SDGs). The conclusion of this study is the importance of a multidisciplinary and collaborative approach in designing an effective digital village transformation. The suggestion from this study is the need for case study-based field research, as well as the development of a digital readiness evaluation model and a technology-based community empowerment strategy, to effectively and inclusively implement digital tourism village transformation.

Keywords. digital transformation, tourism village, sustainable tourism, literature systematics, rural development

Introduction

The development of digitalization has revolutionized various sectors, including rural tourism. In many regions of the world, tourist villages have begun to adopt digital technologies, including websites, booking applications, social media marketing, and virtual tickets, to attract visitors while preserving local culture and the environment. This phenomenon is not only a transformation of infrastructure but also a socio-cultural shift: rural communities are now more open to global interactions and economic collaboration with tourism actors. They can promote their traditional values through digital platforms. However, the reality on the ground shows that the application of technology in tourist villages experiences significant disparities depending

on the availability of infrastructure, the level of digital education, and policy support. This condition drives a systematic study on how digitalization can serve as a tool for sustainable development at the local level.

Theoretically, the tourism industry has been identified through the concept of "Tourism 4.0" as a combination of Industry 4.0 technology and sustainable development goals. However, not many have reviewed it exclusively in the context of tourist villages. Two international studies from the last decade provide essential foundations. First, Madzik et al. (2023) reviewed the literature on digital transformation (DT) in the tourism industry broadly, using bibliometrics, and concluded that the final phase of DT, defining new digital-based business models, has not been studied in depth. Second, studies by Wu et al. (2024) and Bekele and Raj (2022) map the evolution of technology integration, such as big data, AI, blockchain, and augmented reality, in smart tourism but urge an in-depth study of adaptation strategies at the community level of tourist villages.

On the practical side, the literature shows a significant gap between theory and implementation. For example, Melo et al.'s (2023) study on nature tourism SMEs found that although companies have begun to integrate big data and data science training, digital transformation remains limited, primarily focusing on marketing and operations. Furthermore, Kamutuezu et al.'s (2021) study in Namibia reveals real barriers, including a lack of infrastructure, limited digital skills, and cybersecurity issues, as major hindrances to ICT adoption in rural communities. Others highlight the implementation gap that requires contextualizing strategies according to the local characteristics of tourism villages.

Six previous studies from the last decade have revealed significant gaps in the research on digital transformation in rural tourism villages. First, Bekele & Raj's (2024) study found that the application of digital twins (DT) in tourism still largely reflects large-scale cultural destinations without adequately highlighting the village context that often has limited digital infrastructure and capacity. Second, Florido Benítez (2024) formulated the use of DT to address the challenges of smart tourism destinations but only targeted urban tourism areas without considering the adaptation of technology for rural communities. Third, Maquera's (2017) study developed an AI-based multi-agent system for rural tourism reservations; however, it was technical in nature and did not address aspects of village community involvement or empowerment. Fourth, Du et al. (2023) developed a random forest-based recommendation model for rural tourism in China, focusing on personalization for tourists rather than the holistic transformation of the village system.

Fifth, the study by Polukhina et al. (2025) on the use of DT to improve tourism competitiveness, especially in the food service sector, only touches on the competitive aspect and has not targeted the integration of local communities in the digitalization process. Finally, Suanpang and Pothipassa (2024) designed the integration of generative AI and IoT in cultural heritage tourism in Thailand, but their approach was limited to UNESCO sites and did not cover the unique characteristics of tourist villages. All of these studies demonstrate the prevalence of high-tech approaches in prominent tourism locations, with a minimal focus on rural tourist villages that present distinct complexities in terms of resources, digital capacity, and community participation.

The novelty of this research lies in the systematic integration of strategies, challenges, and opportunities for the digitalization of tourist villages from a triple-bottom-line perspective (economic, social, and environmental), as well as the implementation of real-world policy solutions. By combining bibliometric analysis, scoping review, and comparative case studies from various countries, this research will also present a strategic implementation model based

on stage-gate adaptation, which ultimately forms an original contribution in the form of a digital transformation framework for rural tourist villages that is applicable and contextual.

The contributions of this research include (1) providing theoretical and practical maps related to the phases of DT in tourist villages; (2) identifying and validating key challenges, especially infrastructure, human resources, and cybersecurity; (3) developing a balanced strategy based on community participation and appropriate technology; (4) developing evidence-based policy recommendations for local governments and village stakeholders; and (5) enriching sustainable tourism literature with a comprehensive digitalization approach.

Research Method

This study employs a systematic literature review (SLR) approach to identify, extract, and synthesize scientific literature related to digital transformation in rural tourism villages. This method was chosen because it enables researchers to systematically collect empirical evidence from various relevant academic publications while also building a structured theoretical and practical understanding of digitalization strategies, challenges, and opportunities in the context of sustainable tourism development.

In the identification stage, literature searches were conducted through three major academic databases with global reputations, namely Scopus, Web of Science, and ScienceDirect. The keywords used in the search process were: "digital transformation", "smart tourism", "rural tourism villages", "sustainable tourism", "ICT adoption", and "community-based tourism". Inclusion criteria included: (1) Scopus-indexed journal articles with Q1–Q3 rankings, (2) publication period between 2014 and 2024, (3) focus on aspects of digital transformation in rural or community tourism, and (4) available in English. Meanwhile, the exclusion criteria are: (1) publications in abstract form only, (2) duplicate articles across databases, and (3) literature that is only conceptual without an empirical basis or literature review results.

Next, in the screening and selection stage, researchers read the abstracts of 42 articles found and checked for duplication. After this process, 28 articles that met the criteria were continued to be read in full (full-text reading). Each article was analyzed based on several primary categories, namely: (1) research objectives and scope, (2) approach and methodology, (3) focus of digital technology adopted, (4) implementation challenges, (5) strategy development, and (6) relevance to sustainable development in tourist villages. Researchers employed content analysis techniques to categorize findings based on themes and trends that emerged from the literature review.

To maintain the quality and accuracy of the research, researchers also applied inter-researcher validation (inter-rater reliability) at the data categorization and classification stage. Two researchers independently assessed the initial 15 articles using matrix synthesis, and then the results were compared to ensure consistency. Discrepancies were resolved through discussion and clarification of context until a common understanding was achieved. The results of the analysis of the 28 articles were then stored in the form of thematic tables and concept network visualizations to facilitate an understanding of the relationships between topics, the direction of research development, and the research gaps that remain open. Overall, this SLR method aims to provide a comprehensive overview of global landscape research related to digital transformation in rural tourism villages, as well as to develop a strategic framework that can be used by researchers, policymakers, and local tourism actors in planning sustainable tourism development based on inclusive and contextual digital technology.

Result and discussion

Result

The systematic review of 28 selected articles reveals that digital transformation in rural tourism villages exhibits a diverse development pattern influenced by technological readiness, local community socio-cultural capacity, and institutional support. The main findings of the content analysis are divided into three major themes: (1) Digital Transformation Strategies and Phases, (2) Implementation Challenges, and (3) Opportunities for Sustainable Development. Most articles show that rural tourism villages undergo a digital transformation process in three-tiered phases: (a) digital empowerment (introduction of basic infrastructure and digital literacy), (b) digital integration (use of technology in tourism operations such as online reservation systems, digital marketing, and visitor management), and (c) digital innovation (development of AI-based services, IoT, and community-based applications).

Table 1. Literature Review of Digital Transformation Strategies and Phases

No	Findings	Findings from Literature
1	Digitalization strategies vary by regional context	Bekele & Raj (2024) show that digital strategies in tourism depend on technological maturity and national policies
2	The transformation phase involves the digitalization of products, processes and platforms	Madzik et al. (2023) group the transformation phases into the stages of data digitalization, management systems, and customer interactions
3	Managerial preparation is essential in determining the implementation phase	Saputra et al. (2024) highlighted the importance of village management readiness in entering the digitalization phase of tourism products
4	Technology adoption requires a community approach	Maquera et al. (2022) developed a digital platform that involved local communities from the design stage
5	AI and IoT strategies improve destination efficiency	Suanpang & Pothipassa (2024) proposed the integration of AI and IoT as a foundation for efficient and scalable smart tourism
6	Digital twin as an advanced phase of tourism planning	Almeida et al. (2025) pressure the use of digital twins for simulation and management of sustainable destinations

Table 1 summarizes the main findings from various studies related to digital transformation strategies and phases in the tourism village sector. One important finding is that digitalization strategies are not uniform but rather highly dependent on regional contexts. Bekele and Raj (2024) emphasize that the level of technological maturity and national policy direction influence how tourism villages implement digitalization. Meanwhile, Madzik et al. (2023) explain that the digital transformation process occurs in stages, beginning with the digitalization of data, followed by the implementation of internal management systems, and then customer interaction through digital platforms.

Additionally, managerial readiness at the local level also significantly influences the success of implementing digital strategies. Saputra et al. (2024) emphasized that village managers play a crucial role in adopting digital technology, particularly in developing digital tourism products. On the other hand, Maquera et al. (2022) demonstrated the importance of a

community-based approach in implementing technology, where community involvement from the design stage can increase acceptance and desire for the digitalization of the program. This underlines that digital transformation is not just about technology but also a participatory social process.

In recent developments, digital tourism village strategies also include the use of sustainable technology. Suanpang and Pothipassa (2024) advocate for the integration of artificial intelligence (AI) and the Internet of Things (IoT) to develop efficient smart tourism destinations. Furthermore, the concept of digital twins, as studied by Almeida et al. (2025), offers an advanced approach to tourism planning, where digital replicas of physical destinations can be utilized for simulation, monitoring, and data-driven decision-making. These findings suggest that digital transformation strategies are continually evolving in response to technological advancements and the changing needs of the rural tourism sector.

Table 2. Literature Review of Implementation Challenges

No	Findings	Findings from Literature
1	Low digital literacy in society	Kamutuezu et al. (2021) found that a limited understanding of technology hinders the adoption of digital applications in villages
2	Digital infrastructure is still limited in remote areas	Ferrari et al. (2021b) reported that basic infrastructure such as internet and electricity are significant barriers in tourist villages
3	Resistance to changes in work culture	Polukhina et al. (2025) identified the rejection of digital systems by traditional actors in the tourism ecosystem
4	Lack of training and local capacity building	Mutmainah et al. (2025) found that the lack of training caused stagnation in the implementation of digital transformation in Bogor
5	Not all technology solutions fit the local context	Ananda (2023) highlights that many villages adopt technology without adapting it to their specific needs
6	Data management and privacy challenges	Wu et al. (2024) noted that digital data collection in the tourism sector raises concerns regarding privacy and regulation.

Table 2 summarizes the main challenges in implementing digital transformation in rural tourism villages. One of the most significant challenges is the community's low digital literacy. Kamutuezu et al. (2021) noted that a limited understanding of technology is a substantial obstacle to the use of digital applications based on entrepreneurship in rural communities. This obstacle is further exacerbated by limited digital infrastructure, such as internet access and electricity, as reported by Ferrari et al. (2021b). They emphasized that without adequate basic infrastructure, the digitalization of programs will be challenging to run optimally.

In addition to technical factors and capabilities, implementation challenges also arise from social and cultural aspects. Polukhina et al. (2025) found that resistance to changes in work culture was prevalent, especially among traditional tourism actors who felt uncomfortable with the new digital system. This finding is in line with the research of Mutmainah et al. (2025),

who highlighted that the lack of training and strengthening of local capacity led to stagnation in the digital transformation process, as observed in tourist villages in Bogor. Therefore, training tailored to local needs is a crucial element in reducing resistance and fostering active community participation.

Another equally important challenge is the incompatibility of technological solutions with local contexts. Ananda (2023) emphasizes that the application of technology often overlooks the specific characteristics and needs of each village, ultimately reducing the effectiveness of implementation. On the other hand, Wu et al. (2024) noted challenges in terms of data management and privacy, where the use of digital systems to collect tourist and business data raises concerns regarding security information and data protection regulations. Overall, the challenges of implementing digital transformation in tourist villages are multidimensional, covering technical, social, cultural, and ethical aspects.

Table 3. Literature Review of Sustainable Development Opportunities

No	Findings	Findings from Literature
1	Digitalization encourages community participation	Rasoolimanesh & Jaafar (2019) showed that digitalization can strengthen the role of citizens in tourism decision-making
2	Digital promotion expands local tourism market access	Mumtaz & Karmilah (2023) emphasized that digital media helps villages reach a broader range of tourists
3	Digital transformation strengthens social inclusion	Visvizi & Lytras (2020) present smart villages with increased welfare and security for rural communities
4	Digital platforms accelerate the achievement of SDGs	Zeqiri et al. (2025) explain how technology drives the achievement of tourism goals in the tourism sector
5	Digital storytelling strengthens cultural preservation	Cahyani et al. (2023) showed that digital narratives are compelling in preserving and promoting local cultural heritage
6	Technology helps mitigate environmental impacts	Suanpang & Pothipassa (2024) exemplify how IoT sensors are used to integrate and reduce tourism impacts.

Table 3 presents various opportunities that arise from the implementation of digital transformation in the context of sustainable tourism village development. One of the main opportunities is to increase local community participation in decision-making. Rasoolimanesh and Jaafar (2019) emphasize that digitalization creates a participatory space for communities in destination planning and management, ultimately enhancing the legitimacy and sustainability of tourism policies. In addition, Mumtaz and Karmilah (2023) note that digital media-based promotion has successfully expanded the market reach for tourism villages, enabling local actors to reach tourists beyond their traditional reach.

Digital transformation also has an essential contribution to strengthening social inclusion in rural areas. The study by Visvizi and Lytras (2020) presents the concept of a smart village characterized by an increased sense of security, welfare, and social involvement among rural communities. This aligns with the findings of Zeqiri et al. (2025), who explained that

digital platforms, when implemented strategically, can accelerate the achievement of the Sustainable Development Goals (SDGs), particularly in the inclusive and resilient tourism sector. Thus, digitalization acts as an accelerator of more equitable and just socio-economic transformation.

Another significant opportunity relates to the preservation of cultural and environmental heritage. Cahyani et al. (2023) demonstrate that digital storytelling serves not only as a promotional medium but also as an educational tool that can creatively preserve local cultural narratives. On the other hand, Suanpang and Pothipassa (2024) describe how technologies such as IoT sensors are used to integrate potentially environmentally damaging tourism activities, enabling real-time mitigation of their impact. Overall, these findings underscore that digital transformation not only supports operational efficiency but also serves as a key driver for the development of socially, culturally, and ecologically sustainable village tourism.

Discussion

The discussion of the results from this literature review reveals that digital transformation in rural tourism villages has strategic dimensions and phases that are highly influenced by the local context and technological readiness. Bekele and Raj (2024) revealed that digital strategy is highly dependent on technological maturity and national policy support. Madzik et al. (2023) noted that digitalization occurs in a gradual phase, beginning with the digitalization of data, systems, and customer service. Saputra et al. (2024) emphasized managerial readiness as a crucial factor in implementing this strategy, particularly in the digitalization of tourism products. Meanwhile, Maquera et al. (2022) stressed the importance of community involvement from the digital platform design stage as a community-based technology adoption strategy. Suanpang and Pothipassa (2024) strengthened the argument by suggesting the integration of AI and IoT in creating innovative and efficient tourist destinations. Almeida et al. (2025) even developed the concept of a digital twin as a simulation and sustainable management tool.

However, the implementation of digital transformation also presents significant challenges. Kamutuezu et al. (2021) highlighted low digital literacy as a major obstacle to the implementation of technology in rural communities. Ferrari et al. (2021) added that limited infrastructure, such as internet and electricity, in remote areas is still a significant obstacle. Polukhina et al. (2025) demonstrated cultural resistance to digital systems among traditional actors, while Mutmainah et al. (2025) identified the pressure of inadequate training and capacity building as a cause of innovation stagnation. Ananda (2023) is concerned about the many tourist villages that adopt technology without adapting to their local context. Wu et al. (2024) highlighted the issues of privacy and data management that arise from the massive use of digital systems in tourism.

On the other hand, digital transformation offers excellent opportunities for sustainable tourism village development. Rasoolimanesh and Jaafar (2019) demonstrate that digitalization fosters community participation in decision-making. Mumtaz and Karmilah (2023) demonstrate how digital media enables tourism villages to reach a broader market. Visvizi and Lytras (2020) and Adamowicz and Zwolińska-Ligaj (2020) emphasize the application of digital technology in enhancing social inclusion and community welfare. Zeqiri et al. (2025) explain that digital technology accelerates the achievement of the Sustainable Development Goals (SDGs), while Cahyani et al. (2023) emphasize the role of digital storytelling in preserving local cultural heritage. Suanpang and Pothipassa (2024) demonstrate

that technologies such as IoT sensors can unite and mitigate the negative environmental impacts of tourism.

Furthermore, several studies highlight the integration of innovation and the role of management in ensuring the success of digital transformation. Cuevas Vargas et al. (2024) revealed that innovation mediates the relationship between digital strategy and desire in the SME sector. Melo et al. (2023) stated that digital transformation on a small and medium scale requires a systematic approach. Sukaris and Kirono (2025) confirmed that adaptive village policies can encourage digital transformation that focuses on community welfare. Sampetoding and Er (2024) emphasized the importance of a systematic approach to building a smart village. Rasyidah et al. (2023) and Rasyidah et al. (2023) reinforced the importance of reviewing a systematic approach in designing data-driven digital transformation. Lane (2009) and Navío-Marco et al. (2018) became the conceptual basis for viewing the evolution of digital technology in management practices.

Ultimately, the importance of acceptance and empowerment of residents in the digital village ecosystem is key to the success of this transformation. Megawati et al. (2025) show how empowerment factors in supporting sustainable tourism can moderate the Technology Acceptance model. Du et al. (2023) added a spatial approach as a data-based digital tourism planning strategy. The integration of all these findings confirms that digital transformation in tourist villages is not only about technology but also about social, cultural, managerial, and adaptive public policy readiness. The success of digital transformation requires a multidisciplinary and collaborative approach that involves local actors, government, academics, and industry players within the sustainable tourism ecosystem.

Conclusion

The results of a systematic review of the literature indicate that digital transformation in rural tourism villages is a multidimensional process influenced by technological readiness, managerial capacity, community participation, and public policy support. Digitalisation strategies evolve through various stages, from the digitalisation of data and systems to the application of advanced technologies, including AI, IoT, and digital twins. Although it offers excellent opportunities to increase community participation, promote cultural preservation, and achieve sustainable development goals (SDGs), the implementation of this transformation still faces significant challenges, including low digital literacy, limited infrastructure, and cultural resistance. Thus, the success of digital transformation in the context of tourism villages depends not only on technological aspects but also on social readiness, adaptive policies, and cross-actor collaboration in building an inclusive and sustainable tourism ecosystem.

Based on these findings, further research is recommended to explore the implementation of digital transformation case studies in tourism villages in greater depth using a mixed-methods approach to capture the socio-cultural and managerial dynamics that are not revealed through literature studies alone. Additionally, developing an evaluation framework based on village digital readiness indicators and local desire indexes is crucial for designing contextual and adaptive strategies. Future research can also focus on digital-based empowerment innovation models that bridge the technological gap and increase the active involvement of local communities in the digital ecosystem of tourism villages.

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