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Reconceptualizing Smart Tourism Governance Beyond the City: A Bibliometric Analysis of Rural and Ecological Perspectives

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Abstract
Purpose: This study maps the knowledge structure and thematic evolution of smart and rural tourism research, focusing on governance's role in sustainability-oriented rural contexts. This addresses the conceptual imbalance in the literature, which remains largely urban-centric and technology-driven.
Research Methodology: A bibliometric analysis was conducted on 114 articles indexed in the Scopus database using VOSviewer, including keyword co-occurrence, thematic clustering, and overlay visualization to identify major themes and research trends.
Results: The findings indicate a rapid growth in smart tourism research; however, the literature is still dominated by technology-oriented and smart city perspectives. Seven thematic clusters were identified, revealing a fragmented knowledge structure in which rural, ecological, and community-based tourism remain peripheral to the core. Although governance and sustainability have gained increasing attention, their integration with core smart tourism concepts remains limited.
Conclusions: This study proposes a rural-ecological governance perspective that positions governance as a mediating mechanism linking digital transformation, community participation, and ecological sustainability in rural tourism.
Limitations: The analysis was limited to Scopus-indexed publications and did not incorporate empirical field-based evidence.
Contributions: This study clarifies the intellectual structure of smart tourism research and offers a conceptual direction for future research and policy development in sustainable smart tourism.

Keywords: *Bibliometric Analysis, Rural Tourism, Smart Tourism, Sustainability, Tourism Governance*

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1. Introduction

Digital transformation has emerged as a key driver of the global tourism industry. The rapid advancement of information and communication technologies, such as destination information systems, the Internet of Things, big data, and artificial intelligence, has fundamentally transformed how destinations are managed and how tourists plan, experience, and assess their journeys (Celdrán-Bernabeu, Mazón, Ivars-Baidal, & Fernando Vera-Rebollo, 2018; Gajdošík, 2020; García, Dos Santos, & Hosseini, 2022; Ivars-Baidal, Celdrán-Bernabeu, Mazón, & Perles-Ivars, 2019; I. Koo, Zaman, Ha, & Nawaz, 2025). In this context, smart tourism has emerged as a dominant research paradigm that

emphasizes the strategic use of digital technologies to enhance destination management efficiency, service quality, and tourist experiences (Corrêa & Gosling, 2021; Gretzel, 2022).

Alongside the growing prominence of smart tourism, tourism scholarship has increasingly engaged with sustainability and rural development issues. Rural tourism is widely recognized as a key mechanism for promoting local economic development, preserving cultural heritage, and supporting environmental sustainability in nonurban areas (Peng, Yang, Dong, & Sun, 2024; Sustacha, Baños-Pino, & Del Valle, 2024). However, rural tourism destinations are characterized by distinctive socio-ecological conditions, such as strong dependence on natural resources, community-based social structures, and limited institutional and technological capacities. These characteristics require governance and management approaches that differ fundamentally from those commonly applied in urban destinations (Gajić et al., 2025; Oetomo, Sugandini, Nusanto, Yodhatama, & Pamuji, 2025).

Despite the parallel growth of smart and rural tourism research, their conceptual integration remains limited. The smart tourism literature continues to be dominated by urban-centric and technology-driven perspectives that are largely informed by assumptions derived from the smart city paradigm (Azis, Amin, Chan, & Aprilia, 2020; Chen, Luo, & Gao, 2025). In contrast, rural tourism studies tend to emphasize sustainability, community empowerment, and environmental conservation, while only marginally engaging with digital transformation and smart technologies (Chi et al., 2025; Peng et al., 2024; Tran & Thi Van Hanh, 2025). This imbalance has resulted in a fragmented body of knowledge in which digital innovation and rural sustainability evolve as largely disconnected research streams (Aransyah, Hermanto, Muftiadi, & Oktadiana, 2025; Yan, Marzuki, Yang, Zhou, & Tao, 2025).

Within this fragmented landscape, governance has emerged as a critical, yet under-theorized, dimension. Governance plays a central role in structuring stakeholder relationships, coordinating decision-making processes, and managing resource allocation at tourism destinations (Errichiello & Micera, 2021; Hall & Ram, 2020; Lukita, Pangilinan, Chakim, & Saputra, 2023). However, in much of the smart tourism literature, governance is treated primarily as a managerial or administrative function rather than as an integrative mechanism that links digital technologies with the social and ecological dynamics of destinations, particularly in rural contexts (Gajdošík, 2020; Ivars-Baidal, Celdrán-Bernabeu, Femenia-Serra, Perles-Ribes, & Giner-Sánchez, 2021; Mandić & Kennell, 2021). Consequently, the potential of governance to mediate between digital transformation and sustainable rural tourism development remains insufficiently explored.

These limitations highlight the need for research that systematically examines the intersection of smart tourism, governance, and rural sustainability within the existing body of knowledge. Bibliometric approaches offer a robust and objective means of mapping research landscapes, identifying dominant themes, and revealing structural gaps and emerging trends within a field (Aransyah et al., 2025; Rejeb et al., 2022; Yan, Marzuki, Wang, & Yang, 2025). Nevertheless, bibliometric studies that explicitly focus on the interplay between smart tourism governance and rural or ecological contexts remain scarce (Zainol & Roslan, 2025).

Against this backdrop, this study aims to map the knowledge structure and thematic evolution of smart and rural tourism literature through a bibliometric analysis, with particular attention to the role of governance in rural and sustainability-oriented contexts. Specifically, this study seeks to analyze publication trends and research dynamics in smart and rural tourism, identify thematic clusters and structural fragmentation within the literature, and formulate a conceptual reconceptualization of smart tourism governance that moves beyond urban-centric assumptions toward a rural and ecological governance perspective.

2. Literature Review

2.1 Bibliometric Analysis in Tourism Research

The bibliometric approach has developed into an increasingly important analysis method in tourism studies, especially in mapping the structure of knowledge and the dynamics of the development of a field of study. In contrast to conventional literature reviews that tend to be narrative and selective,

bibliometric analysis allows for a more systematic and data-driven exploration of scientific publications through the processing of metadata, such as citations, keywords, and author affiliations (Aransyah et al., 2025; Rejeb et al., 2022). In the context of tourism, this method has become relevant as the complexity of issues involving the interaction between technology, economics, society, and the environment increases.

In recent years, the application of bibliometric analysis in tourism research has shown an increasing trend, especially in examining rapidly growing topics such as smart, sustainable, and digital transformation. Previous studies have utilized techniques such as citation analysis to identify influential works, co-authorship analysis to map networks of scholarly collaboration, and co-word analysis to uncover the conceptual structure and relationships between research themes (Madeira, Rodrigues, & Gomez-Suarez, 2023; Yan, Marzuki, Wang, et al., 2025). This approach allows researchers to understand not only "what is being researched", but also "how that knowledge develops" in a field.

However, the use of bibliometrics in tourism studies is subject to several methodological limitations. Most studies still focus on descriptive mapping without being followed by in-depth conceptual interpretation, so the results of the analysis often stop at the identification of trends without explaining the theoretical implications (Ning, Yim, & Khuntia, 2021). In addition, reliance on certain databases, such as Scopus, has the potential to result in representation bias, especially against publications from regions or journals that are less indexed internationally. This condition becomes even more important when the study is directed at contextual issues such as rural tourism or sustainability, which often develop in the local context.

However, the development of software such as VOSviewer and Bibliometrix has expanded the capacity of bibliometric analysis, not only as a visualization tool but also as an instrument for identifying complex patterns of relationships in knowledge networks (Fiore et al., 2016; Van Huy et al., 2024). By mapping networks of keywords and thematic clusters, researchers can observe how a concept develops, shifts, or even fragments in the scientific literature. In smart tourism studies, for example, this kind of analysis shows the dominance of technology-based themes that are often not strongly connected to social and environmental issues (Amir, Dura, Yusof, Nakamura, & Nong, 2020; Madeira et al., 2023).

Furthermore, the bibliometric approach also allows the identification of research gaps that are not always visible through manual reading. By analyzing the distribution of keywords, relationships between clusters, and temporal dynamics of publications, researchers can uncover areas that are still underexplored or have not been conceptually integrated. In the context of tourism, this is crucial because the development of this field is determined not only by technological innovation but also by cross-disciplinary changes in social practices, policies, and environmental dynamics (Coca-Stefaniak, 2020).

Nonetheless, it is important to note that the results of bibliometric analysis are highly dependent on the methodological decisions made, including keyword selection, time constraints, and data normalization techniques. These decisions directly affect the resulting network structure and the interpretations drawn from the analyses. Therefore, transparency in data collection and processing is an important aspect of ensuring the validity and replicability of bibliometric research in tourism studies (Rejeb et al., 2022; Yan, Marzuki, Yang, et al., 2025).

2.2 Evolution of Smart Tourism Research

The evolution of the smart tourism concept is closely linked to the progress of information and communication technologies, which have progressively transformed destination management practices and shaped tourist experiences. In its initial phase, smart tourism was primarily viewed as an extension of destination information systems, emphasizing the delivery of digital information to travelers. The main emphasis in this phase is the use of technologies such as big data and information systems to improve operational efficiency and service quality at tourist destinations (García-Hernández, Ivars-Baidal, & Mendoza de Miguel, 2019). This approach shows a strong orientation toward technology as the main instrument for creating value in tourism.

Along with the increasing complexity of tourist needs and industry dynamics, the concept of smart tourism is shifting towards a more systemic approach. The literature has begun to articulate smart tourism as an ecosystem that involves interactions between various actors, including governments, industry players, local communities, and tourists themselves (Gretzel, 2022; C. Koo, Shin, Gretzel, & Xiang, 2025). Within this framework, technology is no longer positioned as the end goal, but rather as an enabler of data integration, stakeholder coordination, and more adaptive decision-making. This change reflects an effort to overcome the limitations of the previous approach, which focused too much on the technical aspect.

However, this development direction does not completely eliminate the dominance of the smart city paradigm in smart tourism research. Many studies still adopt the assumption that technology-based management models that work in urban contexts can be applied directly to tourist destinations (Brandt, Bendler, & Neumann, 2017). Consequently, smart tourism is often reduced to digital infrastructure and technological innovation, without adequately considering the social, cultural, and ecological dimensions inherent in destinations, especially outside urban areas.

Recent developments have seen efforts to integrate sustainability and governance perspectives into the smart tourism framework. Research no longer focuses only on how technology is used, but also on how it interacts with institutional structures, social practices, and long-term development goals (Errichiello & Micera, 2021; Madeira et al., 2023). The emergence of issues such as smart governance, community participation, and environmental sustainability shows that smart tourism is increasingly understood as a complex socio-technical phenomenon and not just a digital-based innovation.

However, the integration of technological and non-technological dimensions in smart tourism still shows an imbalance. Recent studies indicate that technological aspects continue to dominate the knowledge structure in this field, while social and ecological dimensions often emerge as peripheral themes that have not been strongly connected to the core of the discourse (Yan, Marzuki, Yang, et al., 2025). This condition reflects conceptual fragmentation, indicating that the evolution of smart tourism has not fully reached a mature integration stage, especially when faced with more diverse contexts such as rural destinations or regions with limited digital infrastructure.

2.3 Rural Tourism and Sustainability Perspective

The study of tourism activities based on non-urban areas developed in response to the dominance of the mass tourism model, which tends to be centralized and oriented towards economic growth alone. In contrast to urban destinations supported by modern infrastructure and large investments, tourism development in rural areas relies on the potential of the natural environment and socio-cultural practices of local communities (Peng et al., 2024; Sustacha, Baños-Pino, & Del Valle, 2023; Sustacha et al., 2024). This character makes tourism activities function not only as a source of income but also as a medium related to the preservation of local values and the sustainability of resources.

Several studies emphasize that the contribution of tourism activities in non-urban areas goes beyond the economic aspect alone by encompassing a broader social and ecological dimension. Community involvement in destination management is often seen as a key element in ensuring a more equitable distribution of benefits while maintaining a region's inherent cultural identity (Ristanović, Budić, & Marinac, 2025). This community-based approach shows fundamental differences from conventional development patterns, which are generally driven by external actors and market logic.

However, the structural conditions in rural areas present complex challenges. Dependence on natural resources increases the risk of environmental pressure if tourism activities develop without adequate management. However, limited institutional capacity and access to supporting infrastructure often limit the ability to adapt to change, including responding to the demands of innovation and modernization (Gajić et al., 2025; Oetomo et al., 2025). This situation shows that the dynamics of development are influenced not only by the potential they have but also by the institutional ability to manage change.

The development of the current discourse shows a shift towards a more integrative approach, where economic, social, and environmental dimensions are considered simultaneously within the framework of long-term development. Several studies have begun to underline the importance of innovation that not only increases the competitiveness of destinations but also remains in tune with the characteristics and needs of local communities (Cai, 2022; Tran & Thi Van Hanh, 2025). This perspective opens up space to see the development process as dynamic and contextual, rather than just the application of a universal model.

Despite these developments, the relationship between digital transformation and tourism practices in rural areas remains complex. The use of technology offers opportunities to expand market access and improve management efficiency, but its implementation does not always go in line with social conditions and the readiness of human resources at the local level (Azmadi, Abdul Hamid, Hanafiah, Hariani, & Mior Shariffuddin, 2023; Oetomo et al., 2025). This inconsistency indicates that the integration of digital innovation and sustainable development principles requires a more context-sensitive approach rather than simply adopting a model developed in regions with higher levels of technological readiness.

2.4 Governance in Tourism and Smart Tourism

The discussion of governance in tourism studies is gaining more attention as the complexity of the interactions between various actors, interests, and resources in destination development increases. The concept of tourism governance is no longer understood simply as an administrative function but as a mechanism that regulates the process of coordination, distribution of power, and decision-making among the government, industry players, and the community (Errichiello & Micera, 2021; Hall & Ram, 2020). In this context, governance plays a role in determining the direction of destination development, including how economic, social, and environmental priorities are negotiated.

In the literature, the approach to governance shows a shift from a hierarchical model to a more collaborative and network-based governance pattern. This transformation reflects the need for more flexible cross-sector coordination, especially in the face of global dynamics such as digitalization and changing tourist preferences (Gómez-Ceballos, Menoya-Zayas, & Vázquez-Loaiza, 2023; Soares, Domareski Ruiz, & Ivars Baidal, 2022). However, although the concept of collaboration is increasingly being raised, its implementation at the destination level often faces capacity imbalances between actors and differences in interests that are not easily aligned.

The inclusion of the digital dimension in tourism also affects how governance is understood and carried out. In the framework of smart tourism, governance is often associated with the ability of institutions to leverage technology to improve efficiency, transparency, and policy responsiveness (Ivars-Baidal et al., 2021; C. Koo et al., 2025). The use of real-time data, integrated information systems, and digital platforms enables faster and evidence-based decision-making processes. However, an excessive focus on technology has the potential to obscure the role of social and political dimensions in destination governance.

Several studies have shown that in many cases, governance in smart tourism is still positioned as a managerial instrument that supports the implementation of technology rather than as a conceptual framework that connects the various dimensions of destination development (Gajdošík, 2020; Mandić & Kennell, 2021). This approach tends to put technology in the limelight, while aspects such as community participation, benefit distribution, and environmental sustainability are less likely to get a balanced portion. Consequently, the potential of governance as an integrative mechanism that bridges diverse interests has not been fully realized.

However, the emergence of the discourse on smart governance is starting to open up space to understand governance in a more contextual way, especially in relation to the characteristics of different destinations. Several studies have highlighted the importance of adapting governance approaches to social conditions, institutional capacity, and the level of technological readiness in each region (Gajić et al., 2025; Hartman & Heslinga, 2023). This challenges the assumption that governance models

developed in environments with advanced infrastructure can be directly applied to resource-constrained contexts.

The integration of governance, technology, and socio-ecological dimensions in smart tourism remains imbalanced in the literature. The relationship between these three elements is often discussed separately, making it difficult to understand how they interact in destination management practices. This shows that the discussion of governance in smart tourism is still in a stage of development that has not been fully conceptually articulated, especially when faced with contexts outside urban areas that have more complex and diverse characteristics.

2.5 Fragmentation Between Smart and Rural Tourism

The development of *smart tourism* studies and tourism based on non-urban areas shows dynamics that do not always go in the same direction. Although both develop within the larger framework of the transformation of the tourism sector, the literature shows that these two fields tend to grow as relatively separate streams of study. Research on smart tourism is dominated by a focus on technological innovation, information systems, and digital-based tourism experience optimization, whereas studies on rural destinations emphasize sustainability, community involvement, and environmental preservation (Brandt et al., 2017; Peng et al., 2024). This difference in orientation creates a considerable conceptual gap between the two.

Such inconsistencies are evident not only in the thematic focus but also in the basic assumptions used in each approach. The literature on smart tourism often departs from the logic of efficiency, innovation, and increasing competitiveness through technology, which is heavily influenced by the smart city framework (Antonio, Correia, & Ribeiro, 2020; C. Koo, Park, & Hunter, 2023). In contrast, studies of rural areas prioritize the balance between economic activity and socio-ecological sustainability. This difference suggests that the two domains operate under a paradigm that is not fully compatible.

In several recent studies, this fragmentation is also reflected in the structure of knowledge formed through bibliometric analysis. Themes related to digital technologies, such as big data, the Internet of Things, and information systems, tend to form separate clusters of topics related to communities, ecosystems, and natural resource management (El Archi et al., 2023; Madeira et al., 2023). This pattern indicates that the linkage between digital innovation and the socio-ecological dimension has not developed strongly in the academic discourse.

In addition, the limitations of integration between these two fields are influenced by differences in the empirical context that is the focus of the research. Many smart tourism studies depart from the case of destinations with high levels of technological readiness; therefore, the resulting approach is often difficult to apply to areas with limited infrastructure and institutional capacity (Gajić et al., 2025; Zainol & Roslan, 2025). However, research that focuses on rural areas rarely adopts an in-depth digital perspective; therefore, the potential for the use of technology to support destination management has not been fully explored.

This condition is reinforced by the tendency of the literature to address each topic separately without adequate efforts to connect them into a whole conceptual framework. Studies on digital innovation often ignore social and ecological complexity, while community-based studies tend to pay less attention to the role of technology in building management capacity (Yan, Marzuki, Wang, et al., 2025). Consequently, knowledge development in the two fields occurs in parallel without producing a synthesis capable of comprehensively explaining the relationship between them.

From a governance perspective, this fragmentation becomes increasingly relevant because of the absence of a framework that can bridge the interaction between technology, society, and the environment in the context of diverse destinations. Without an approach that integrates these dimensions, the implementation of the concept of smart tourism risks remaining trapped in a technological orientation that is less sensitive to the characteristics of non-urban areas, while the

development of community-based destinations has the potential to lag behind in taking advantage of the opportunities offered by digital transformation.

2.6 Emerging Themes in Smart Tourism Research

The development of smart tourism research in recent years shows a significant shift in focus, no longer limited to the exploration of technology as the main instrument, but has begun to penetrate broader and multidimensional issues. Several studies have highlighted the emergence of new themes related to sustainability, destination management, and the involvement of various actors in the tourism ecosystem (El Archi et al., 2023; Madeira et al., 2023). These changes reflect efforts to respond to the complexity of the challenges facing the tourism sector, especially in the face of increasingly intense environmental and social dynamics.

One prominent direction of development is the increasing attention to the relationship between digital transformation and sustainability practices. Research no longer only emphasizes operational efficiency or improving the traveler experience but also begins to question how technology can contribute to more responsible resource management (Coca-Stefaniak, 2019; Florido-Benítez & Coca-Stefaniak, 2025). In this context, concepts such as smart sustainability and responsible innovation are starting to gain traction in academic discourse, although their implementation still shows considerable variation across destinations.

In addition, the involvement of local communities is increasingly being discussed as an important element in the development of smart tourism. Several studies indicate that the success of the application of technology is determined not only by the sophistication of the systems used but also by the level of participation and acceptance from the local community (Oetomo et al., 2025; Sustacha et al., 2024). This perspective shifts the focus from a top-down approach to a more inclusive model, where people are not only beneficiaries but also actors involved in the decision-making process.

On the other hand, the development of disruptive technologies such as blockchain, the Internet of Things (IoT), and artificial intelligence is beginning to be introduced in the literature as part of innovations that have the potential to change the structure of the tourism industry (I. Koo et al., 2025; Sharma, 2022). However, studies on this technology still tend to focus on its potential and technical applications, while its social, institutional, and ethical implications have not been discussed in depth. This shows that there is a gap between technological development and understanding its impact in a broader context.

Furthermore, themes related to governance and policies are beginning to emerge as part of efforts to integrate various dimensions of smart tourism. Research has begun to link the use of technology to the need for coordination between actors, transparency, and accountability in destination management (Gomes, Lopes, & Ferreira, 2024; Ivars-Baidal et al., 2021). However, the relationship between institutional aspects and digital innovation is often still partially discussed, so it is not yet fully possible to explain how the two affect each other in practice.

The emergence of these themes shows that the knowledge structure in smart tourism is increasingly diverse, but at the same time it also shows a tendency for fragmentation between topics. The linkages between technology, society, and the environment have not been fully integrated into a single coherent analytical framework; therefore, the development of literature tends to move in parallel paths without many clear common points (Madeira et al., 2023; Yan, Marzuki, Yang, et al., 2025).

2.7 Research Gap and Conceptual Positioning

Although the literature on smart tourism and non-urban area-based tourism shows considerable progress, several conceptual limitations are still visible in the way the two fields are understood and analyzed. Many studies tend to place digital innovation at the center of attention without balancing it with an adequate exploration of the social and ecological dimensions inherent in destinations (El Archi et al., 2023; Madeira et al., 2023). In contrast, studies that focus on rural areas highlight more aspects of sustainability and community empowerment but lack in-depth integration of digital transformation

perspectives (Peng et al., 2024; Sustacha et al., 2024). This inequality shows that there is a conceptual separation that has not been fully bridged in the literature to date.

Another limitation is the dominance of an approach oriented toward the urban context in the development of the concept of smart tourism. Many of the analytical frameworks used in the study adopt assumptions derived from the smart city paradigm; therefore, they tend to ignore the characteristics of regions with different social, economic, and institutional conditions (Aransyah et al., 2025; Brandt et al., 2017). As a result, the application of such concepts in non-urban contexts often does not consider the limitations of capacity or the complexity of stronger social relations at the local level.

In relation to governance, although this topic is beginning to gain attention in academic discourse, its role is still often positioned in a limited way as an instrument of coordination or administrative arrangement. This approach has not been able to fully explained how governance can function as a mechanism that connects digital innovation with social dynamics and environmental sustainability (Errichiello & Micera, 2021; Mandić & Kennell, 2021). Some studies have begun to link governance to participation and collaboration issues, but these relationships are often partially discussed without an integrative conceptual framework.

In addition, existing bibliometric analyses are generally global and aggregative, so they pay less attention to geographical variations and regional contexts in knowledge development. The distribution of research shows a concentration of contributions from certain regions with different institutional characteristics and levels of technology adoption (Aransyah et al., 2025; Yan, Marzuki, Yang, et al., 2025). This lack of a comparative approach limits our understanding of how research dynamics develop in diverse contexts, including the differences between the Asian and European regions.

Based on these conditions, an approach is needed that not only maps research trends but is also able to interpret the relationships between themes in more depth. This study places itself in an effort to bridge these gaps by combining the perspectives of smart tourism, governance, and socio-ecological dimensions in a single analytical framework. Through a bibliometric approach that focuses on knowledge structures and thematic dynamics, this study seeks to identify how these three dimensions interact in the literature while opening up space for a more contextual conceptual development of the characteristics of destinations outside the urban area.

3. Methodology

3.1 Research Design

This study adopts a bibliometric approach to map the development, knowledge structure, and thematic dynamics of smart tourism research, with particular attention to rural tourism, its governance, and sustainability. The bibliometric method was selected because it enables an objective and systematic examination of the research landscape based on scientific publication data while empirically identifying thematic clusters and research gaps through keyword network analysis.

3.2 Data Source and Search Strategy

The data source for this study was the Scopus database, which was selected because of its extensive coverage of reputable international journals and its consistency in providing standardized bibliographic metadata suitable for bibliometric analysis. Literature retrieval was conducted through Scopus using a multi-stage, tiered thematic search strategy designed to comprehensively capture the discourse on smart tourism governance in rural and sustainability contexts.

In the initial stage, a broad search was conducted to map the general research landscape using the following query:

TITLE-ABS-KEY ("smart tourism" OR "rural tourism")

This query was applied to the title, abstract, and keyword fields and restricted to journal articles (article) and review papers (review) to obtain an overall overview of the development and structure of smart and rural tourism literature.
Subsequently, to capture studies that more explicitly address governance dimensions within rural and sustainability contexts, a set of more focused thematic queries was applied.

1. TITLE-ABS-KEY ("smart tourism governance")
2. TITLE-ABS-KEY ("smart tourism governance" AND "rural")
3. TITLE-ABS-KEY ("smart tourism governance" AND "rural community")
4. TITLE-ABS-KEY ("smart tourism governance" AND "rural sustainability")

These queries were designed to identify literature that explicitly links smart tourism to governance issues, rural contexts, community participation, and sustainability.

All search results from the respective queries were merged, and duplicate records were removed to create a single final dataset. This aggregative approach ensured that the analyzed literature not only reflected general smart tourism governance perspectives but also explicitly incorporated rural, community-based, and sustainability dimensions. The final dataset consisted of 114 documents that were subsequently used in all stages of the bibliometric analysis.

To ensure the relevance and quality of the analyzed documents, the search was restricted to peer-reviewed journal articles and review papers and limited to specific publication periods aligned with the study's temporal objectives. This restriction ensured that the dataset represented scholarly contributions that had undergone rigorous peer review and reflected the evolving dynamics of the research field.

In addition, two-time intervals were employed for different analytical purposes. The period 2015–2025 was used as the primary interval to comprehensively map the literature's long-term evolution and structure. The period 2020–2026 was used for complementary analysis, applying the following query:

TITLE-ABS-KEY ("smart tourism" AND "rural tourism")

This complementary analysis aimed to examine more explicitly the level of conceptual integration between smart and rural tourism in recent literature. The dual-interval approach allows for a balanced understanding of long-term research dynamics and emerging themes.
All bibliographic data were exported from Scopus in a format compatible with bibliometric analysis software for subsequent analysis.

3.3 Bibliometric Analysis Techniques

Bibliometric analysis was conducted using VOSviewer, a widely applied tool in science mapping studies because of its ability to construct and visualize bibliometric networks in an intuitive and robust manner. This study employed a keyword co-occurrence analysis to identify conceptual relationships among research topics based on the joint appearance of keywords in scientific publications.

The unit of analysis consisted of author keywords, as these keywords directly represent the primary thematic focus intended by the authors of each study. This approach is considered more appropriate for conceptual structure analysis than automatically indexed keywords.

The fractional counting method was applied to calculate the relationships among keywords. This method assigns proportional weights to keyword occurrences based on the total number of keywords in each document, thereby reducing bias from publications that list an unusually high number of keywords. Fractional counting produces a more balanced and representative network structure.

3.4 Threshold Setting and Keyword Selection

In the initial stage, 713 unique keywords were identified across the dataset. To ensure that the analysis focused on conceptually meaningful topics, a minimum occurrence threshold of three was applied to all keywords. This threshold was selected to balance the thematic representativeness and network interpretability.

Based on this criterion, 82 keywords met the threshold and were included in the subsequent analyses. All qualifying keywords were retained without further elimination to avoid subjective data selection and preserve thematic diversity within the literature.
The strength of the relationships between keywords was calculated using the total link strength measure, which reflects the intensity of the connections between a given keyword and other keywords in the network.

3.5 Network Mapping and Thematic Clustering
Keyword co-occurrence network mapping and clustering were performed using the association strength normalization algorithm embedded in the VOSviewer. This algorithm groups keywords into clusters based on relational proximity and the strength of the connections among nodes in the network.

The clustering process resulted in seven major thematic clusters, representing the knowledge structure of smart tourism research from multiple perspectives, including digital technologies, information systems, destination governance, sustainability and rural–ecological contexts. Each cluster is interpreted as a set of conceptually related topics that form distinct streams of discourse within the literature.

In addition to network visualization, overlay visualization was used to examine the temporal distribution of keywords. This approach enables the identification of early-stage topics and more recent or emerging themes, providing insights into shifts in the research focus over time.

3.6 Analytical Procedure and Interpretive Validity
The bibliometric results were interpreted by integrating network visualization analysis, cluster composition, and temporal keyword distribution. Each cluster was thematically examined to identify its core focus, inter-cluster relationships, and fragmentation areas within the literature. To ensure interpretive validity, bibliometric findings were not interpreted in isolation but contextualized within relevant theoretical perspectives and empirical developments in tourism studies. This approach ensures that the bibliometric results are not merely descriptive but provide a robust analytical foundation for conceptual implications and future research.

4. Results and Discussions
4.1 Results
4.1.1 Publication Trends in Smart Tourism and Rural Tourism Research
The query was applied to the title, abstract, and keyword fields, with restrictions on document types limited to journal articles (articles) and review papers (reviews). This approach was intended to comprehensively capture publications addressing smart and rural tourism, either as primary research themes or as part of broader discussions within tourism studies.

Based on this query, 3,699 documents were identified for the period 2015–2025, indicating a significant upward trend in the number of publications over time. During the initial period (2015–2017), publication output was limited, reflecting an early conceptual exploration phase in which smart tourism research was predominantly shaped by urban-oriented technological approaches and destination information systems.

From 2018 to 2020, the number of publications increased steadily, coinciding with the wider adoption of digital technologies such as the Internet of Things, big data, and smart platforms in destination management (Figure 1). This period marks a transition from predominantly technology-focused discourse to more applied discussions related to destination management practices.

A more pronounced increase in publications was observed during the 2021–2025 period (Figure 2), indicating an acceleration in research activity. In this phase, the literature expanded quantitatively and thematically, with growing attention to issues of governance, sustainability, and non-urban contexts. This pattern suggests that smart tourism has evolved into a more mature research field, while

simultaneously opening space for integrating rural tourism perspectives within contemporary scholarly discourse.

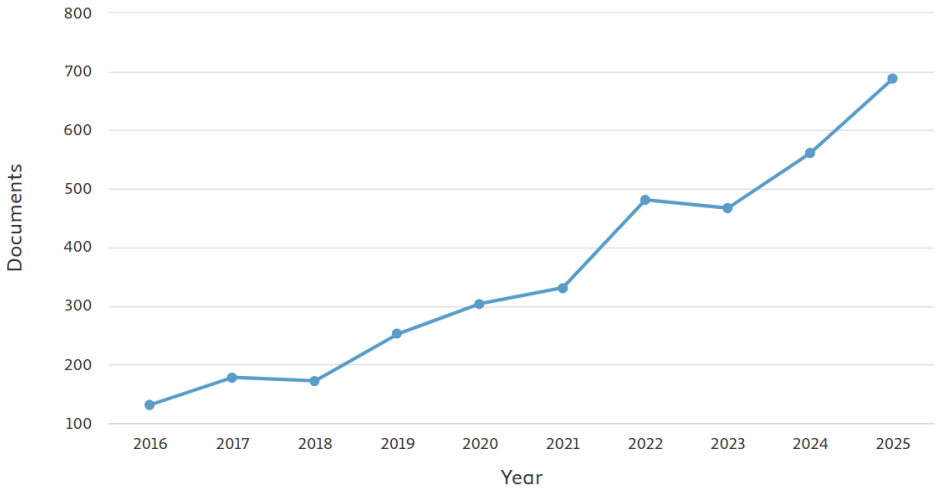

Figure 1. Publication trends in smart tourism and rural tourism (2016–2025)

This finding suggests that, despite the rapid overall growth of smart tourism research, the explicit integration of smart tourism and rural contexts remains relatively underexplored in the academic literature. This pattern reflects a thematic gap in digital tourism studies, particularly regarding the development of smart tourism frameworks that are sensitive to rural characteristics, local governance, and ecological sustainability.

As a complementary analysis, a more focused literature search was conducted to identify the explicit intersection between smart and rural tourism. This search employed the following query was used:

TITLE-ABS-KEY ("smart tourism" AND "rural tourism") AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (DOCTYPE (ar) OR DOCTYPE (re))

The query was applied to the title, abstract, and keyword fields and restricted to journal articles (articles) and review papers (reviews). The results for the 2020–2026 period indicate a relatively limited number of publications (23 documents).

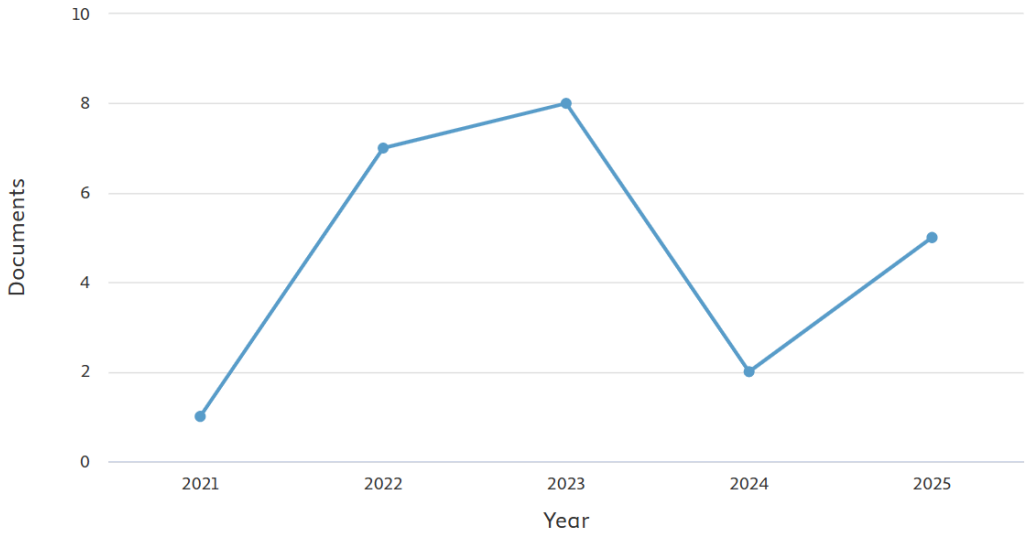

Figure 2. Publication trends in smart tourism and rural tourism (2020–2025)

Overall, the analysis of publication trends confirms that research on smart tourism has developed progressively and become increasingly complex, yet remains largely dominated by urban-centric and technology-driven perspectives. The limited number of publications at the intersection of smart and

rural tourism further underscores the urgency of this study to map the knowledge structure and identify opportunities for developing more contextual conceptual frameworks oriented toward sustainable rural tourism governance.

4.1.2 Thematic Cluster Mapping Based on Keyword Co-occurrence Analysis

The keyword co-occurrence analysis conducted using VOSviewer identified seven thematic clusters representing the knowledge structure of smart and rural tourism literature. A summary of the clusters, their main themes, and dominant keywords is presented in Table 1, and the network visualization of keyword relationships is shown in Figure 3.

Table 1. Summary of Thematic Clusters, Main Themes, and Dominant Keywords

Cluster	Main Cluster Theme	Dominant Keywords
Cluster 1	Rural, Ecological, and Community-Based Tourism	biodiversity; community-based; community-based tourism; conservation; deforestation; ecosystem service; ecotourism; environmental protection; environmental technology; forest ecosystem; historic preservation; lake district; rural tourism; rural tourisms; socio-economic development; sustainable resource management; tourism policy; tourist destination
Cluster 2	Data, Information Systems, and Decision-Making	artificial intelligence; big data; competition; decision making; information systems; information use; service delivery; smart tourism; sustainable development; sustainable tourism; technology
Cluster 3	Digital Transformation and Rural Development Context	digital transformation; emerging economies; government data processing; rural areas; rural community; rural development; rural municipalities; smart village index; tourism development
Cluster 4	Smart Tourism Governance and Destination Sustainability	destination governance; innovation; knowledge management; management; smart governance; smart tourism destination; sustainability
Cluster 5	Information Management and Urban-Centric Tourism Systems	information and communication; information management; smart city; tourism; tourism destination
Cluster 6	Governance Approaches and Destination Management	destination management; governance; governance approach; smart destination; tourism management
Cluster 7	Disruptive Digital Technologies in the Tourism Industry	blockchain; disruptive technologies; Internet of Things (IoT); tourism industry

The keyword co-occurrence network visualizations generated using VOSviewer (Figures 3 and 4) illustrate the proximity and interrelationships among the identified themes. In these network maps, the node size represents the frequency of keyword occurrence, while the link thickness indicates the strength of the relationships between keywords within the literature.

4.1.3 Temporal Evolution of Research Themes Based on Overlay Visualization

To complement the thematic cluster mapping, this study employed overlay visualization in VOSviewer to analyze the temporal dynamics of research themes in the smart and rural tourism literature. Overlay visualization enables the identification of shifts in research focus over time by using node colors to represent each keyword's average publication year.

The visualization results indicate that keywords appearing earlier in the literature, represented by darker colors, are predominantly associated with themes such as smart cities, information systems, technology,

and tourism destinations. This pattern suggests that the early phase of smart tourism research was strongly aligned with urban-oriented paradigms and technology-centric approaches, with primary attention directed toward developing digital infrastructure and destination information systems.

In subsequent periods, a shift toward themes related to management and governance became apparent, including keywords such as destination management, governance, service delivery, and decision making. The emergence of these keywords reflects an expansion of the research scope from technology adoption alone to the utilization of digital technologies to support decision-making processes and more structured destination management practices.

More recent themes, indicated by lighter colors in the overlay visualization, include keywords such as rural tourism, rural development, rural community, sustainability, ecosystem services, and smart village indices. The appearance of these themes signals growing scholarly attention to nonurban contexts and sustainability dimensions. However, their connections to core smart tourism themes remain relatively limited compared to technology-based clusters.

Furthermore, the overlay visualization shows that disruptive technologies, such as blockchain and the Internet of Things (IoT), tend to emerge in later phases but remain positioned at the periphery of the network. This suggests that although these technologies are increasingly being explored in tourism research, their integration with governance issues and rural development agendas has yet to be systematically developed in the existing literature. Overall, the temporal evolution analysis revealed a gradual shift from urban- and technology-centric research toward a more diverse thematic landscape encompassing governance, sustainability, and rural contexts. Nevertheless, the visual separation between core smart tourism themes and rural–ecological themes indicates that conceptual integration between these domains remains in its early stages.

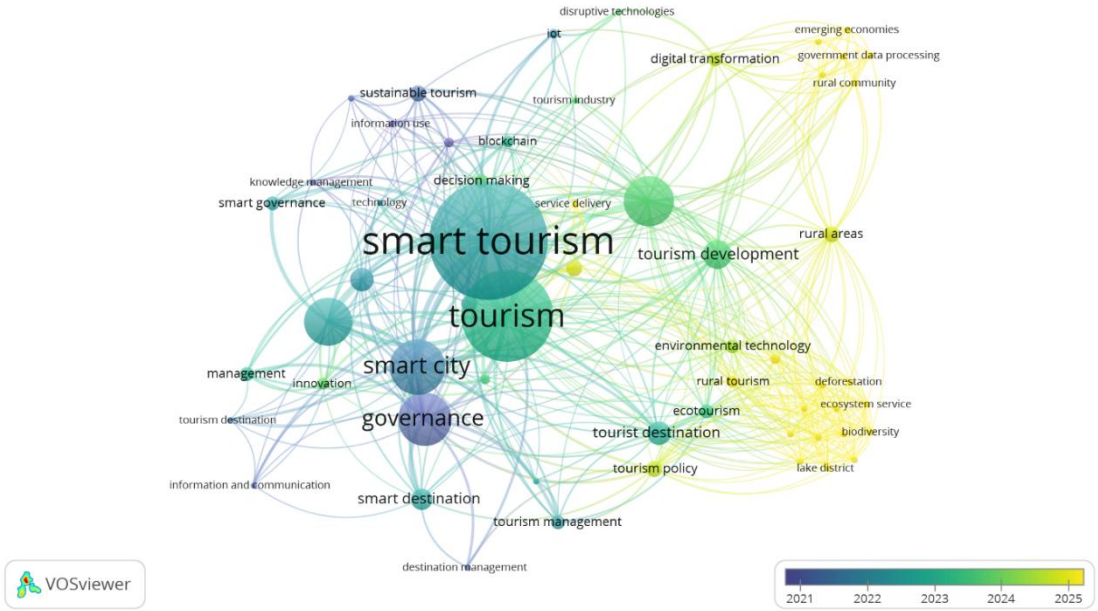

Figure 3. Overlay visualization

4.2 Discussion

The bibliometric findings demonstrate that smart tourism research has experienced substantial growth over the past decade in terms of publication volume and thematic diversity (Aransyah et al., 2025; Yan, Marzuki, Wang, et al., 2025). This expansion reflects the increasing scholarly attention to digital transformation, destination management, and sustainability challenges in tourism studies (Chen et al., 2025; Madeira et al., 2023). However, the results also reveal that this growth has not been accompanied by a corresponding level of conceptual integration across emerging thematic domains, particularly regarding rural and ecological contexts (Azkia & Jajarmi, 2023).

The thematic cluster analysis indicates that the knowledge structure of smart tourism research is fragmented. Technology- and information systems–oriented clusters continue to dominate the field, reinforcing a research trajectory strongly influenced by the smart city paradigm (Gajdošík, 2020; Sharma, 2022). In contrast, clusters emphasizing rural tourism, ecological sustainability, and community-based approaches appear to be more recent and peripheral developments (Alhomaid & Bel Hadj, 2025; Cidrás, Lois-González, & Paül, 2018). This structural separation suggests that digital innovation and rural sustainability have largely evolved as parallel research streams rather than as integrated components of a unified smart tourism framework (Arbidane, Puzule, Znotina, Narkuniene, & Daubariene, 2023; Ballina, 2022; Bingöl & Yang, 2025).

Governance occupies an intermediate position in this fragmented landscape. While governance-related keywords and clusters have gained visibility, they have not yet functioned as effective conceptual bridges between digital technologies and the socio-ecological realities of rural destinations (Gearey & Gilchrist, 2019; Luo, Ye, Zhou, & Zhao, 2024; Zhou, Zhang, Deng, Wang, & Zhang, 2025). Existing studies tend to frame governance primarily in managerial or institutional terms, focusing on coordination efficiency and stakeholder alignment, while paying limited attention to how governance mediates technology adoption within contexts characterized by ecological vulnerability and strong community dependence (Aransyah et al., 2025; Brown, 2021; Cerdá-Mansilla, Tussyadiah, Campo, & Rubio, 2024).

Temporal evolution analysis further reinforces this interpretation. Early smart tourism research was predominantly oriented toward urban destinations, information systems, and technological infrastructure (Bingöl & Yang, 2025; Cavalheiro, Joia, Cavalheiro, & Mayer, 2021; Eichelberger, Peters, Pikkemaat, & Chan, 2020). Recent literature has gradually incorporated themes related to governance, sustainability, and rural development. Nevertheless, these themes remain weakly connected to the core smart tourism discourse, indicating that the field has expanded thematically without achieving theoretical consolidation (Alzua-Sorzabal, Herasimovich, Guereño-Omil, & Thiel-Ellul, 2025; Anand, Arya, Suresh, & Sharma, 2023; Auzina, Zvirbule, & Jankova, 2023). This pattern suggests that the integration of smart and rural tourism is still at an early stage of conceptual development rather than representing a mature or dominant research stream.

Taken together, these findings challenge the implicit assumption within much of the smart tourism literature that governance models and digital solutions developed in urban contexts are readily transferable to rural destinations (Gomis-López & González-Reverté, 2020; Gretzel, 2018; Jasrotia & Gangotia, 2023). Rural tourism systems operate under fundamentally different socio-ecological conditions, including limited institutional capacity, strong reliance on natural resources, and deeply embedded community relationships (Kusumawardhani, Hilmiana, Widianto, & Azis, 2024; Liu & Wang, 2024; Mazibuko & Thebe, 2025). Consequently, smart tourism governance in rural areas cannot be reduced to the replication of urban-centric technological or managerial models.

4.2.1 Conceptual Implications and Novelty

Building on this critical assessment, this study advances a conceptual reconceptualization of smart tourism governance that shifts the analytical focus from urban-centric efficiency to rural and ecological sustainability. Rather than treating governance as a secondary managerial function, the proposed perspective positions governance as an integrative mechanism that mediates the interaction between digital transformation, local community participation, and ecological sustainability (Behera, 2022; Bollenbach, Rebholz, & Keller, 2025; Dong, Xu, & Cha, 2021).

Within this rural and ecological governance perspective, digital technologies are understood as enabling instruments whose value depends on their alignment with local capacities, institutional arrangements and environmental constraints (Hartman & Heslinga, 2023; Oetomo et al., 2025). This approach departs from dominant smart tourism narratives that prioritize technological sophistication and performance optimization and instead emphasizes the role of governance in managing socio-ecological relationships within rural tourism systems (Alzua-Sorzabal et al., 2025; Behera, 2022; Chaoying & Aziz, 2025).

The conceptual novelty of this study lies in its articulation of smart tourism governance as a context-sensitive construct rather than a universal model. By foregrounding rural and ecological considerations, this framework explains why the integration of smart and rural tourism remains limited in the existing literature. The absence of governance models attuned to rural realities constrains the meaningful adoption of smart technologies in rural destinations and risks reinforcing urban biases in smart tourism development (Ballina, 2022; Zainol & Roslan, 2025; Zhu et al., 2021).

Accordingly, this reconceptualization extends the smart tourism literature by reframing governance as a central analytical lens through which digital transformation, community empowerment and environmental sustainability can be examined simultaneously. This study also contributes to rural tourism scholarship by incorporating digital governance as a relevant but subordinate dimension that supports, rather than dominates, sustainability-oriented development objectives (Bi & Yang, 2023; Ślawska, 2024; Zainol & Roslan, 2025).

Figure 4 visualizes the proposed rural and ecological smart tourism governance framework by positioning governance as the central mediating mechanism among digital transformation, local community participation, and ecological sustainability. The framework emphasizes that smart technologies do not directly generate sustainability outcomes in rural destinations but instead operate through governance processes that align technological adoption with local institutional capacities, community values, and ecological constraints.

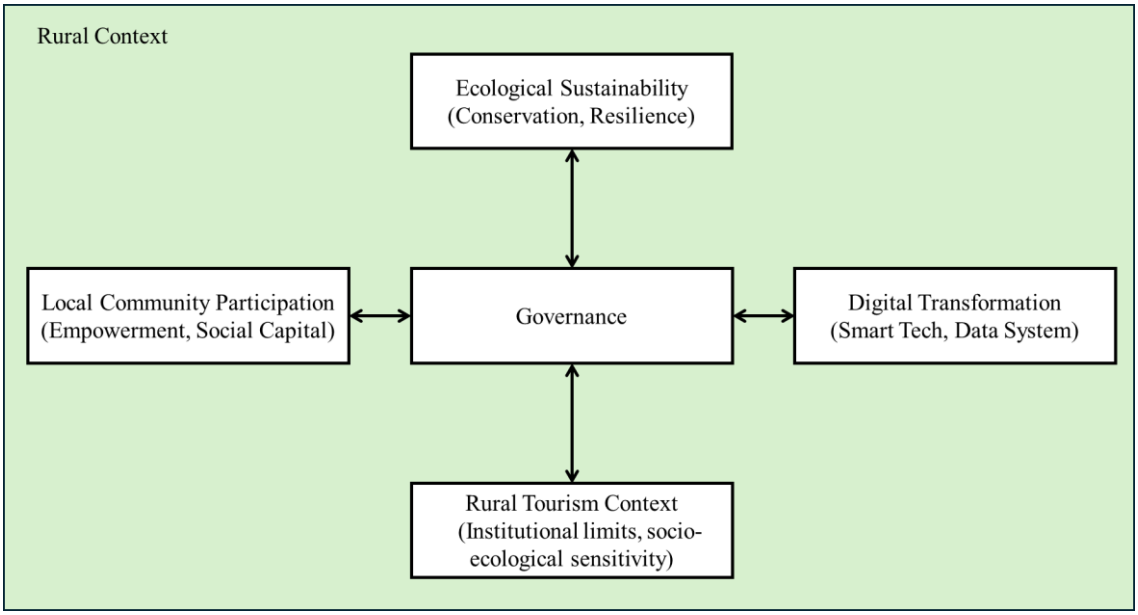

Figure 4. Rural–ecological smart tourism governance framework

4.2.2 Theoretical Implications

The findings and conceptual novelty of this study offer several important theoretical implications for developing smart tourism literature. First, this study extends the understanding of smart tourism governance by positioning it not merely as a derivative of the smart city paradigm but as a governance framework that must be adapted to the social, institutional, and ecological contexts of destinations (Hielscher & Rohde, 2025; Mo, Li, Ai, Shang, & Li, 2025; Qu, Zhao, Zhan, Cui, & Li, 2025). Accordingly, smart tourism governance should no longer be interpreted as a universal model but rather as a contextual construct that depends on territorial characteristics, particularly the distinctions between urban and rural destinations.

Second, the rural–ecological smart tourism governance approach proposed in this study integrates three domains that have traditionally been treated separately in the literature: digital technologies, community participation, and ecological sustainability. This integration provides a theoretical contribution by demonstrating that technology adoption in rural tourism cannot be adequately explained solely through

technological or managerial perspectives but requires a broader understanding of the social relations and ecological constraints that shape rural tourism systems.

Third, this study contributes to the rural tourism literature by introducing digital governance as a relevant, but not dominant, analytical dimension. Within this framework, technology is positioned as an enabler that supports sustainability goals and community empowerment rather than as an end goal of tourism development. This perspective enriches the theoretical discourse by shifting attention away from efficiency and technological innovation toward the holistic sustainability of tourism systems.

5. Conclusions

5.1 Conclusion

This study provides comprehensive bibliometric mapping of the development and knowledge structure of smart and rural tourism research. The analysis demonstrates that despite the rapid growth of smart tourism scholarship over the past decade, the literature remains structurally fragmented. Technology- and information systems-oriented perspectives continue to dominate, while rural, ecological, and community-based themes occupy peripheral positions within the knowledge structure. Although governance has gained increasing attention, it has not yet systematically functioned as an integrative mechanism linking digital transformation with the socio-ecological characteristics of rural tourism destinations.

In response to this structural gap, this study advances a conceptual reconceptualization of smart tourism governance that moves beyond urban-centric assumptions toward rural and ecological governance perspectives. By positioning governance as a mediating mechanism connecting digital transformation, local community participation, and ecological sustainability, the proposed framework offers a context-sensitive alternative to the dominant smart tourism models. This contribution is synthesized in the rural and ecological smart tourism governance framework presented in Figure 4, which visually integrates key theoretical insights derived from the bibliometric findings.

This study contributes to the literature by shifting the analytical focus from technology-led efficiency to governance-mediated sustainability in rural tourism contexts. Rather than treating smart technologies as inherently transformative, the framework highlights the importance of governance capacity in aligning technological adoption with local institutional conditions, community values and ecological constraints. This study provides a theoretical foundation for future empirical research and policy-oriented analyses that seek to advance more inclusive and sustainable smart tourism development in rural areas.

5.2 Research Limitations

This study provides a bibliometric overview of the development of smart and rural tourism research, with a particular focus on governance and sustainability perspectives. However, several limitations of this study should be acknowledged. First, the dataset used in this study was limited to publications indexed in Scopus. Although Scopus offers extensive coverage of peer-reviewed international journals, relevant studies indexed in other databases, such as Web of Science, Google Scholar, or regional academic repositories, were not included. Future research should integrate multiple databases to obtain a more comprehensive representation of the research landscape.

Second, this study exclusively relied on bibliometric techniques to map the knowledge structure and thematic evolution of the literature. While bibliometric analysis is effective in identifying patterns, clusters, and research trends, it does not provide an in-depth qualitative interpretation of individual studies. Subsequent studies may complement bibliometric approaches with systematic literature reviews or meta-analyses to deepen the theoretical understanding and contextual interpretation.

Third, this study focuses on conceptual mapping rather than empirical validation. The proposed rural–ecological smart tourism governance framework has not yet been empirically tested in real-world tourism destinations. Future research should employ empirical approaches, such as surveys, case studies, and Structural Equation Modeling (SEM), to examine how governance capacity, digital

transformation, community participation, and ecological sustainability interact in rural tourism development. Further investigation across different regional contexts and levels of digital readiness may also enrich our understanding of how smart tourism governance operates in diverse rural environments.

5.3 Suggestions and Directions for Future Research

Based on the bibliometric findings and proposed conceptual novelty, this study opens several avenues for future research. Subsequent empirical studies may test the rural–ecological smart tourism governance framework using quantitative approaches, for instance, by examining how local stakeholders' perceptions of digital technologies, destination governance capacity, and sustainability orientation influence the adoption and successful implementation of smart tourism in rural areas. Structural Equation Modeling (SEM) can be employed to simultaneously examine the relationships among these constructs.

Future research may also explore variations in rural contexts, such as differences in levels of digital readiness, local institutional structures, and ecological sensitivity, to better understand how smart tourism governance frameworks operate under diverse conditions. Comparative studies across regions or between developing and developed countries would further enrich insights into the transferability and contextual adaptability of rural–ecological smart tourism governance concepts.

From a practical perspective, the findings of this study have important implications for policymakers and rural tourism destination managers. The development of smart tourism in rural areas should prioritize strengthening local governance, enhancing community capacity, and protecting ecosystems rather than focusing solely on the adoption of digital technologies. Tourism policies that emphasize the integration of technology, community participation, and environmental sustainability are more likely to foster inclusive and sustainable rural tourism development in the long term.

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Author Contributions

AY conceptualized and designed the study, conducted the data analysis, and was responsible for drafting the manuscript. RS contributed to the study's methodology and the interpretation of the results. MM assisted in the data collection process and reviewed the manuscript for accuracy and consistency. MIAI provided critical revisions to the manuscript and supervised the overall research process. All authors approved the final manuscript for publication.

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