tourism and hospitality

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Review

Bibliometric Analysis of Smart Tourism Destination: Knowledge Structure and Research Evolution (2013–2025)

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Abstract

Smart tourism destinations, shaped by the integration of tourism and information technology, have become a central theme in international academic research. This study employs bibliometric methods using CiteSpace to conduct co-authorship, co-citation, keyword co-occurrence, and burst analyses, with the aim of mapping the knowledge structure and research evolution of the field. Drawing on 232 articles from the Web of Science Core Collection (2013–2025), the results reveal a shift from technology-centered approaches toward themes of visitor experience, collaborative governance, and sustainable development. The Universitat d'Alacant (Spain) and The Hong Kong Polytechnic University (China) have emerged as leading research hubs, with Ivars-Baidal and colleagues as major contributors. Foundational studies by Buhalis and Gretzel continue to shape the domain. Keyword trends highlight increasing attention to technological efficiency and sustainable ethics. Overall, the study traces the developmental trajectory of smart tourism destinations, proposes a systematic knowledge framework, and identifies future directions for theoretical integration and methodological innovation. The findings provide both conceptual insights for academic research and strategic guidance for destination governance and policy.

Keywords: smart tourism destinations; CiteSpace; bibliometric analysis; knowledge mapping; research evolution; knowledge framework

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Academic Editor: Lewis Ting On Cheung

Received: 26 August 2025
Revised: 23 September 2025
Accepted: 24 September 2025
Published: 30 September 2025

Citation: Yan, D., Marzuki, A. B., Yang, J., Zhou, J., & Tao, S. (2025). Bibliometric Analysis of Smart Tourism Destination: Knowledge Structure and Research Evolution (2013–2025). *Tourism and Hospitality*, *6*(4), 194. https://doi.org/10.3390/tourhosp6040194

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1. Introduction

As global tourism continues to expand, traditional destinations face unprecedented challenges, including intensifying market competition, mounting resource management pressures, and increasingly complex visitor expectations (Cimbaljević et al., 2019). To address these challenges, destinations need a systemic transformation through digitalization and intelligent technologies to sustain competitive advantage. Meanwhile, the ICT-led digital revolution has reshaped the tourism industry and given rise to the concepts of smart tourism and Smart Tourism Destination (STD) (Pencarelli, 2020). Smart Tourism Destination is a systemic tourism area that integrates information and communication technologies (ICT) with innovative management approaches to enhance visitor experiences, improve resource efficiency, and raise residents' quality of life (Jovicic, 2019).

The emergence of STDs is closely tied to advances in smart tourism and smart cities. Smart tourism is a technology-based form of tourism that integrates the tourism supply chain through intelligent technologies to deliver personalized, dynamic, and interactive

visitor experiences, while optimizing resource use and promoting sustainability (Gretzel et al., 2015a). Smart cities integrate innovative technologies to improve urban governance, optimize resource allocation, and enhance residents' quality of life, forming a key pathway to sustainable urban development (Albino et al., 2015). Situated at the intersection of the "smart city–smart tourism" logic, STDs inherit resident-oriented infrastructures from smart cities and reconfigure functions around visitor needs to improve satisfaction, engagement, and destination competitiveness (Cavalheiro et al., 2021).

Broadly, an STD is a technology-enabled, interconnected, and participatory tourism ecosystem built within the framework of a smart city through the adoption of advanced ICTs such as big data, the Internet of Things, artificial intelligence, and mobile communications (Gretzel et al., 2015b; Ivars-Baidal et al., 2021). Its purpose extends beyond optimizing tourism services and experiences to promoting sustainability across economic, social, and environmental dimensions (Samancioglu et al., 2024; Shafiee et al., 2019). Current research highlights its core characteristics as technological integration, resource sustainability, co-creation of visitor experience, and enhanced destination governance (Sorokina et al., 2022; Williams et al., 2020). Conceptually, the structure of an STD can be divided into three layers: a strategic relations layer, which involves collaborative governance among multiple stakeholders; a tools layer, focusing on ICT infrastructure and data-management capabilities; and an applications layer, emphasizing the implementation of smart service systems and visitor interaction mechanisms (Ivars-Baidal et al., 2021; Soares et al., 2022).

Driven by both policy initiatives and technological progress, STD are emerging as a key pathway for global tourism governance and transformation. For instance, Spain has advanced national smart tourism programs that enabled the digital transformation of cities such as Benidorm, making it a European frontrunner in this field (González-Reverté, 2019). Italy has promoted a "data-driven" regional tourism strategy in Apulia (Del Vecchio & Passiante, 2017). China was among the earliest to propose STD development, emphasizing the role of cloud computing, IoT, and intelligent services in shaping visitor experiences (D. Wang et al., 2013). During the COVID-19 pandemic, Korea effectively used smart-governance platforms to coordinate tourism and public safety (Choi et al., 2021). More recently, the European Union has launched the "Tourism Data Space" initiative to enhance cross-platform data sharing and improve resource-allocation efficiency (Ordóñez-Martínez et al., 2024).

Although recent reviews on STD have expanded significantly—covering themes such as technology integration (Aguirre Montero & López-Sánchez, 2021), sustainability (Shafiee et al., 2019), visitor experience enhancement (Panigrahy & Verma, 2025), and the application of AI and big data (Julio Guerrero & Dias, 2024)—the existing body of literature still presents several limitations.

First, most reviews rely on traditional systematic or narrative approaches and lack systematic studies that employ bibliometric tools to visualize the evolution, knowledge structures, and research frontiers of the field (Bastidas-Manzano et al., 2021; Palomo Santiago & Parra López, 2024).

Second, quantitative analyses of research distribution, knowledge networks, keyword evolution, and interdisciplinary collaboration remain scarce, making it difficult to capture knowledge gaps and emerging trends at a broader level (Gursoy et al., 2024).

Finally, many bibliometric studies focus primarily on macro-level topics such as "smart cities" or "smart tourism," while more precise analyses of the meso-level concept of "Smart Tourism Destinations" are limited (Alsharif et al., 2024). Even when attempts are made to construct network models, they often suffer from restricted datasets, incomplete time coverage, and narrow analytical dimensions, resulting in knowledge maps that lack systematic depth and practical guidance (Shafiee et al., 2021).

Accordingly, it is necessary to employ visual bibliometric tools such as CiteSpace, drawing on data from the Web of Science Core Collection, to systematically examine the evolution, knowledge base, research hotspots, and future trends of studies on STDs. This approach helps to address the methodological and structural gaps in the existing literature.

In this context, the present study focuses on STDs and applies CiteSpace to conduct bibliometric and visualization analyses with the following objectives:

(1) To build global collaboration networks at the levels of countries, institutions, and authors, thereby revealing the spatial distribution of research capacity and patterns of collaboration.
(2) To identify influential scholars, core journals, and seminal works through co-citation analysis, tracing the intellectual foundations and theoretical roots of the field.
(3) To uncover research hotspots and emerging themes through keyword co-occurrence and burst detection, and to project the likely trajectory of future research directions.
(4) To construct a comprehensive knowledge framework of STD research based on the above analyses, clarifying the key challenges and potential breakthroughs for the field.

The contributions of this study are threefold. Methodologically, it employs CiteSpace to integrate co-authorship, co-citation, and keyword analyses, thereby providing a multi-dimensional and visualized map of STDs research. Theoretically, it develops a comprehensive knowledge framework that identifies the field's core domains, intellectual foundations, and evolutionary trajectories, addressing gaps in knowledge integration and theoretical lineage building. Practically, it outlines the major challenges and future directions of STD research, offering valuable insights for scholars to define research priorities and for policymakers to design effective development strategies.

The structure of this paper is organized as follows: Section 2 presents the data collection process and analytical methods, including the functional modules and parameter settings of CiteSpace. Section 3 provides an empirical analysis from four perspectives—publication trends, collaboration networks, co-citation analysis, and keyword co-occurrence—offering a comprehensive view of the structural characteristics of Smart Tourism Destination research. Section 4 develops a knowledge framework based on the findings, highlighting key research challenges and future directions. Finally, Section 5 summarizes the main results, discusses the study's limitations, and outlines recommendations for future research.

2. Materials and Methods

2.1. Data Sources

To ensure the authority, representativeness, and reproducibility of the dataset, this study selected the Web of Science (WoS) Core Collection as its data source. Developed by Clarivate Analytics, WoS is one of the most widely used citation databases worldwide and is frequently employed in high-level bibliometric and visualization studies (Zupic & Čater, 2015). Compared with other databases such as Scopus or Google Scholar, WoS offers stricter standards for data selection, higher quality control of source journals, and more consistent citation information. These advantages make it particularly suitable for constructing high-quality citation networks and knowledge maps (Donthu et al., 2021).

For retrieval type, this study employed topic search. Unlike searches limited to titles or author keywords, topic search covers multiple fields, including titles, abstracts, author keywords, and Keywords Plus, which significantly improves the scope and recall rate of the dataset. This approach has become common practice in bibliometric studies (Caputo & Kargina, 2022). Furthermore, topic search results are better suited for subsequent analyses, such as keyword co-occurrence, co-citation networks, and clustering, thereby facilitating the construction of robust knowledge maps.

The search strategy was designed based on mainstream terminology in the field of Smart Tourism Destination (STD), while also accounting for common variations in the literature. The final search expression was therefore formulated as follows:

TS = ((“smart tourism destination*”) OR (“smart destination*”))

This strategy ensured both thematic focus and broader coverage by using wildcards to capture singular and plural forms, thereby maintaining relevance and consistency with Web of Science search logic and bibliometric research practices (Donthu et al., 2021). It should be noted that although “Smart Tourism Destination” is occasionally abbreviated as “STD” in some publications, this acronym more commonly refers to “Sustainable Tourism Development” in tourism studies and to “Sexually Transmitted Disease” in medical and public health fields. Moreover, the use of “STD” as shorthand for Smart Tourism Destination is rare in titles, abstracts, or keywords and lacks both structured field support and academic consensus. To avoid semantic ambiguity and the inclusion of irrelevant literature, “STD” was therefore excluded from the formal search strategy to ensure thematic accuracy and dataset reliability.

The search was conducted on 2 August 2025 in the WoS Core Collection. The initial query returned 312 records, with the earliest publication dating back to 2013. To further enhance the academic rigor and comparability of the dataset, the results were refined by document type and language, retaining only articles, review papers, and early access publications written in English. This process yielded a final dataset of 232 high-quality papers, which were exported in plain text format for subsequent analysis.

In bibliometric research, sample size is a key factor in ensuring the reliability of analysis, the stability of network structures, and the quality of visualizations. According to current practice, when using visualization tools such as CiteSpace or VOSviewer, a dataset of no fewer than 150–200 publications is generally considered the minimum requirement for conducting co-authorship, co-citation, and keyword co-occurrence analyses (Kemeç & Altınay, 2023). For instance, in CiteSpace, clustering, burst detection, and evolutionary path analysis all rely on sufficiently dense citation and keyword networks; when the sample size is too small, it becomes difficult to generate stable cluster structures (Zhang et al., 2024).

Several studies have successfully constructed systematic knowledge maps using datasets of around 200 papers. For example, Yu conducted a bibliometric study on tumor exosomes based on approximately 190 publications (Yu et al., 2024), while Cheng used 213 papers to produce a high-quality CiteSpace analysis of land-use change research (Cheng et al., 2021). Against this backdrop, the present study’s dataset of 232 publications meets and exceeds the methodological standards commonly applied in the field, thereby providing a robust basis for the analysis of collaboration networks, co-citation networks, and the evolution of research hotspots.

2.2. Technique and Tools

In examining the evolution of research themes, knowledge structures, and academic networks, bibliometric analysis has become a widely adopted systematic and quantitative approach to constructing knowledge maps in tourism research (Au & Tsang, 2024; S. Chen et al., 2022; Kalia et al., 2022; Özköse et al., 2023). This method applies statistical and visualization techniques to citation information, authorship, keywords, institutional affiliations, and other metadata retrieved from core academic databases. It enables the identification of research hotspots, collaboration networks, theoretical foundations, and emerging topics, thereby facilitating a comprehensive understanding of the field (C. Chen, 2017). The research process of this study is illustrated in Figure 1.

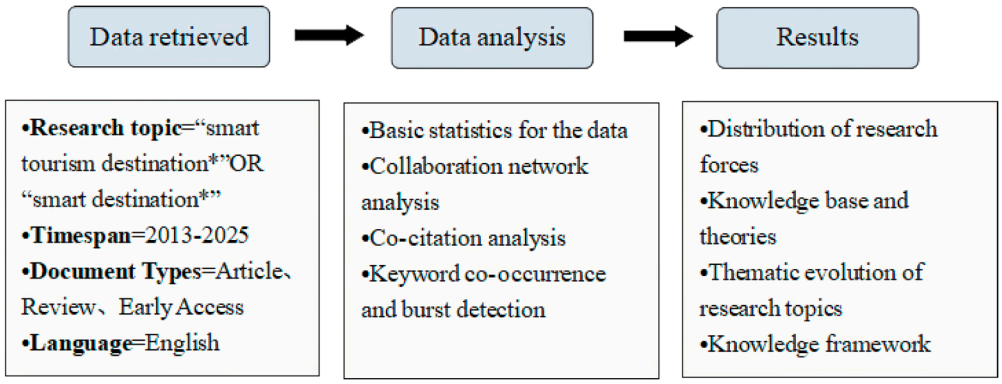

Figure 1. Research process.

Among the various bibliometric analysis tools—such as VOSviewer, BibExcel, HistCite, and SciMAT—CiteSpace stands out for its strengths in clustering, evolutionary path analysis, and burst detection, and has therefore been widely used in visualizing complex knowledge domains. Developed by Professor Chaomei Chen, CiteSpace is designed as a scientific knowledge-mapping tool that reveals the dynamic development and structural relationships of scientific knowledge through citation analysis. It is particularly well suited for exploring the evolution of research hotspots, theoretical structures, and frontier topics within a given field (Wu et al., 2019).

Compared with other tools, CiteSpace places greater emphasis on processing temporal information, offering functions such as burst detection, time-slicing, and path-dependency analysis that help trace the knowledge evolution of a given research theme (Zhang et al., 2024). For example, CiteSpace can generate time-evolution maps based on co-citation networks and quantitatively assess clustering structures using Modularity Q and Silhouette scores, ensuring both structural clarity and scientific validity of the results (Ji et al., 2023). In addition, the tool has unique strengths in identifying turning-point literature and nodes of betweenness centrality, making it widely applied in the construction of knowledge maps across disciplines such as management, environmental science, and tourism (Guo et al., 2024).

To ensure the scientific rigor of the dataset and the accuracy of the visualization results, this study employed the latest version of CiteSpace 6.4.R2 (64-bit Advanced) to construct knowledge maps and analyze evolutionary trends. The specific procedures and parameter settings are as follows:

First, a total of 232 English-language publications on Smart Tourism Destinations, exported from the Web of Science Core Collection (covering 2013–2025, including early-access articles), were imported into CiteSpace. During this stage, the built-in data-cleaning module was used to remove duplicates and standardize fields, thereby ensuring network stability and analytical validity.

Second, with respect to time parameters, the analysis period was defined as January 2013 to July 2025, with one-year time slices to capture annual changes and the evolutionary trajectory of the field.

Third, regarding text sources, the selected fields included Title, Abstract, Author Keywords, and Keywords Plus. This maximized semantic coverage and improved the accuracy of keyword clustering. For the selection criteria, the top 50 nodes per slice were chosen based on citation or co-occurrence frequency, striking a balance between representativeness and map readability.

To further improve computational efficiency and enhance the coherence of the maps, path pruning algorithms (Pathfinder and Pruning Sliced Networks) were applied to filter out weak links and highlight the backbone structure of the networks.

In terms of node types, different configurations were applied according to the research objectives: Authors, institutions, and countries were selected to generate collaboration networks, identifying major contributors and patterns of international cooperation. References, cited authors, and cited journals were analyzed to extract the intellectual base and reveal the core literature and theoretical roots of the field. Keywords were used to construct co-occurrence, timeline, and burst-detection maps, enabling the identification of research hotspots and the tracing of thematic evolution. Through this set of configurations and modular operations, the study produced a comprehensive knowledge-map system covering research structure, collaboration patterns, intellectual foundations, and emerging frontiers. This provides both reliable data support and visual evidence for building the theoretical framework and identifying future research directions.

3. Results

To capture the fundamental characteristics of Smart Tourism Destination (STD) research, this study first conducted basic statistical and descriptive analyses of the 232 core publications collected. This section examines annual publication trends, journal outlets, document types, and highly cited papers, thereby providing an overview of the field's overall development trajectory, the key actors involved, and the main channels of academic dissemination.

3.1. Basic Data Analysis

3.1.1. Annual Publication Analysis

As shown in the annual publication statistics for STD research (Figure 2), the field has experienced a clear evolution from its early stage to rapid growth. Between 2013 and 2017, the number of publications remained below 10 per year, with no outputs in 2014 and 2016, indicating that the research area had not yet developed a stable system or gained consistent scholarly attention.

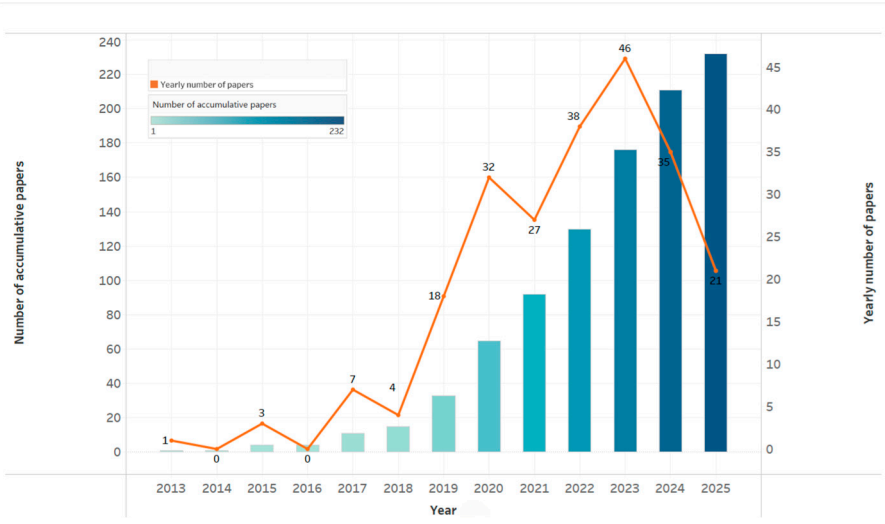

Figure 2. Annual Publication Statistics.

From 2018 onward, interest began to recover, and in 2019 the annual output exceeded 10 for the first time, reaching 18 papers (7.76%). Growth continued in 2020 and 2021, with 32 (13.79%) and 27 (11.64%) papers, respectively, reflecting the increasing scholarly focus on smart tourism against the backdrop of global digital transformation. The field peaked in 2023 with 46 publications (19.83%), marking its entry into a high-output phase. The 2023

peak reflects the combined influence of policy support for digital transformation, advances in AI and big data, and the pandemic's impact on reshaping tourism research priorities.

In 2024, output stabilized at a relatively high level. This trend appears closely linked to the implementation of smart-city strategies in major tourism destinations and the growing application of AI and data technologies in tourism management. Although data for 2025 cover only the first seven months, 21 publications (9.05%) had already been recorded, suggesting that annual output will remain high. This indicates that the field has developed into a stable and sustained research ecosystem and is likely moving toward a more mature stage of academic development.

3.1.2. Journal Publication Analysis

Table 1 presents the top 10 journals publishing research on STD. Sustainability ranks first with 30 papers, highlighting the strong alignment of this field with sustainability issues. This stands in contrast to the other leading outlets, which are primarily focused on tourism management and destination marketing. Together, the top 10 journals account for 121 papers, representing 52.16% of the total sample. This concentration pattern reflects the principles of Lotka's Law and Bradford's distribution, which emphasize the unequal distribution of scholarly output across journals (Donthu et al., 2021).

Table 1. Top 10 publications by number of articles published.

Rank	Journal	Count	Percentage
1	Sustainability	30	12.93%
2	Current Issues in Tourism	16	6.90%
3	Journal of Destination Marketing Management	16	6.90%
4	Worldwide Hospitality and Tourism Themes	10	4.31%
5	Tourism Review	9	3.88%
6	Journal of Hospitality and Tourism Technology	8	3.45%
7	Asia Pacific Journal of Tourism Research	7	3.02%
8	Tourism Management Perspectives	7	3.02%
9	International Journal of Tourism Cities	5	2.16%
10	Journal of Tourism Futures	5	2.16%

These findings suggest that STD research is anchored in two disciplinary cores: tourism studies and sustainability research. Notably, sustainability journals not only provide interdisciplinary support but also lead in publication volume, underscoring the agenda-setting role of sustainable development in the field. Overall, the publication landscape of STD research demonstrates two key features: (1) tourism management journals remain the main platform, complemented by the prominent role of sustainability journals, and (2) research output is concentrated within a small set of high-yield, interdisciplinary outlets. Together, these trends have contributed to the structural consolidation and global dissemination of STD research.

3.1.3. Based on Web of Science Category Analysis

According to the Web of Science classification system, research on STD is dominated by the category Hospitality, Leisure, Sport & Tourism, which accounts for 57.76%, underscoring its close integration within the core field of tourism studies. This is followed by Management (18.10%), Environmental Studies (15.09%), and Green & Sustainable Science & Technology (14.66%), reflecting the field's strong focus on governance effectiveness and sustainability.

Technical disciplines such as Computer Science, Information Systems (4.31%) and Engineering, Electrical & Electronic (3.02%) also represent a notable share, highlighting the

role of digital technologies and engineering approaches in smart destination research. The inclusion of categories such as Business and Economics further indicates an extension of the discussion toward economic benefits and business models (Table 2).

Table 2. Top 10 Journal Categories.

Rank	Web of Science Categories	Count	Percentage
1	Hospitality Leisure Sport Tourism	134	57.76%
2	Management	42	18.10%
3	Environmental Studies	35	15.09%
4	Green Sustainable Science Technology	34	14.66%
5	Environmental Sciences	32	13.79%
6	Computer Science Information Systems	10	4.31%
7	Business	9	3.88%
8	Engineering Electrical Electronic	7	3.02%
9	Telecommunications	6	2.59%
10	Economics	5	2.16%

Overall, the field demonstrates an interdisciplinary pattern centered on "tourism + management" while expanding toward "technology + sustainability + business." This integration provides a diverse foundation for developing both the theoretical underpinnings and practical pathways of STD.

3.1.4. Highly Cited Literature Analysis

Based on citation counts from the WOS database, Table 3 presents the ten most frequently cited publications in the field of STD. The most cited work is by Buhalis and Foerste, SoCoMo marketing for travel and tourism: Empowering co-creation of value, which established the theoretical foundation of value co-creation in smart tourism through the SoCoMo model (Buhalis & Foerste, 2015). Pencarelli, approaching the subject from the dual perspectives of "Tourism 4.0" and "Smart Tourism," emphasized the integration of digital transformation and sustainability (Pencarelli, 2020).

Table 3. Top 10 Most-Cited Articles.

Rank	Article	Citations
1	SoCoMo marketing for travel and tourism: Empowering co-creation of value; Buhalis, D and Foerste, M; 2015;	308
2	The digital revolution in the travel and tourism industry; Pencarelli, T; 2020;	302
3	Tourism analytics with massive user-generated content: A case study of Barcelona; Marine-Roig, E and Clavé, SA; 2015;	234
4	Tourists' Experiences with Smart Tourism Technology at Smart Destinations and Their Behavior Intentions; Jeong, M and Shin, HH; 2020;	232
5	Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure; Del Chiappa, G and Baggio, R; 2015;	225
6	Creating value from Social Big Data: Implications for Smart Tourism Destinations; Del Vecchio, P; Mele, et al., 2018;	224
7	China's "smart tourism destination" initiative: A taste of the service-dominant logic; Wang, D; Li, X and Li, YP; 2013;	213
8	Smart destinations and the evolution of ICTs: a new scenario for destination management?; Ivars-Baidal, JA; Celdrán-Bernabeu, MA et al., 2019;	203
9	From the traditional understanding of tourism destination to the smart tourism destination; Jovicic, DZ; 2019;	168
10	Developing a model for sustainable smart tourism destinations: A systematic review; Shafiee, S; Ghatari, AR; 2019;	141

Marine-Roig and Clavé demonstrated the critical role of big-data analytics in extracting business intelligence and shaping destination branding by analyzing more than 100,000 items of user-generated content (UGC), thereby offering empirical evidence for strategic development in smart tourism cities (Marine-Roig & Anton Clavé, 2015). Other highly cited works have focused on tourists' behavioral intentions (Jeong & Shin, 2020), knowledge-transfer networks (Del Chiappa & Baggio, 2015), and the application of social big data (Vecchio et al., 2018).

Notably, these highly cited studies were primarily published in Journal of Destination Marketing & Management and Current Issues in Tourism, underscoring a field trajectory centered on destination management and technological innovation in tourism.

3.2. Collaboration Analysis

To achieve Research Objective 1, this study conducted a systematic analysis of collaboration patterns within the sample literature. Scientific collaboration is not only a key driver of knowledge innovation but also reflects the distribution of research resources and the degree of concentration of core actors (Donthu et al., 2021). Given that STD represent a highly interdisciplinary topic, their development relies on multi-actor, cross-regional cooperation. By constructing and visualizing collaboration networks at the levels of authors, institutions, and countries, this study identifies the major research forces, central hubs of cooperation, and patterns of geographic expansion, thereby providing a foundation for understanding the field's knowledge production structure and international collaboration dynamics.

3.2.1. Author Collaboration Network Analysis

An author collaboration network analysis provides valuable insights into the leading scholars and collaboration patterns in STD research. Table 4 lists the top 10 collaborative authors. Among them, Josep A. Ivars-Baidal stands out as the most frequent collaborator, with seven recorded collaborations, underscoring his organizational role and influence in advancing this field. Francisco Femenia-Serra and Marco A. Celdrán-Bernabeu follow closely, each with six collaborations. These three scholars were especially active around 2019, marking a peak period of collaborative activity within the Spanish research community on smart destinations.

Table 4. Top 10 collaborative authors.

Rank	Count	Year	Author
1	7	2019	Ivars-baidal, Josep A
2	6	2019	Femenia-serra, Francisco
3	6	2019	Celdran-bernabeu, Marco A
4	3	2023	Banos-pino, Jose Francisco
5	3	2019	Ghatari, Ali Rajabzadeh
6	3	2019	Hasanzadeh, Alireza
7	3	2019	Jahanyan, Saeed
8	3	2018	Gonzalez-reverte, Francesc
9	3	2017	Del vecchio, Pasquale
10	2	2024	Suanpang, Pannee

In addition, emerging scholars such as Jose Francisco Banos-Pino represent new nodes of collaboration. Although their frequency of collaboration is relatively lower, their presence signals the gradual emergence of new research forces within the field.

Figure 3 illustrates the co-authorship network in STD research, comprising 214 nodes and 135 links, with a density of 0.0059. This indicates that overall author connections remain sparse. Nevertheless, two prominent academic clusters can be identified: one led by

Ivars-Baidal, the most prolific scholar in the field, and another more recent cluster emerging in the past three years, represented by Baños-Pino and Sustacha.

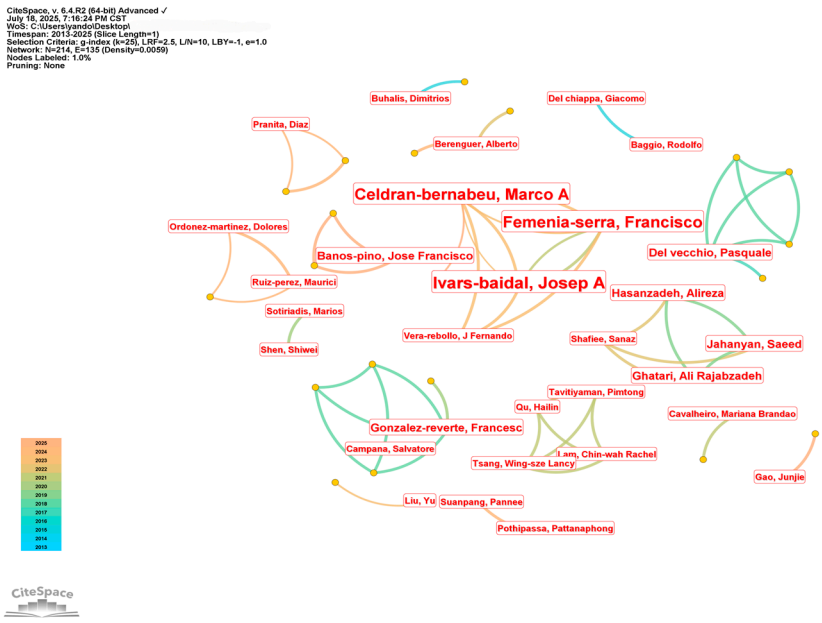

Figure 3. Author collaboration network.

The Ivars-Baidal group, in close collaboration with scholars such as Femenia-Serra and Celdrán-Bernabeu, has established a long-term, stable partnership. Their research emphasizes the relationship between smart destinations and sustainability, with a particular focus on constructing and measuring smart tourism indicator systems and exploring how ICT influences millennial tourists' experiences and destination management practices (Femenia-Serra et al., 2019b; Ivars-Baidal et al., 2019, 2021; Ivars-Baidal et al., 2023a). By contrast, the Baños-Pino and Sustacha cluster concentrates on how information and communication technologies (ICT) can enhance the competitiveness, visitor experience, and brand equity of smart destinations, highlighting the role of ICT applications in improving destination productivity (Baños-Pino et al., 2025; Sustacha et al., 2024).

Overall, while a degree of collaborative structure has formed among authors in this field, cooperation remains relatively fragmented, with limited depth and cross-regional integration. Moving forward, greater efforts should be directed toward fostering stronger linkages among scholars, institutions, and regions. Such collaboration will not only enhance knowledge sharing and theoretical integration but also promote the advancement of Smart Tourism Destination research toward higher quality and greater global reach.

3.2.2. Institutional Collaboration Network Analysis

Table 5 presents the top 10 collaborative institutions, showing that STD research is structured around a small number of high-output institutions within a relatively "decentralized" collaboration pattern. Leading the list is Universitat d'Alacant (Spain), with 16 recorded collaborations, underscoring its strong research leadership in the field. Together with scholars such as Femenia-Serra and Ivars-Baidal, this institution has formed a stable and influential research cluster focusing on smart governance, data platforms, and destination management models.

The Hong Kong Polytechnic University ranks second, having engaged in systematic research since 2013 on smart tourism system architectures and tourist behavior analysis, which highlights its academic influence in East Asia (D. Wang et al., 2013). Other institutions—such as the Universidad de Malaga (Spain), Tarbiat Modares University (Iran),

Kyung Hee University (Korea), and Parthenope University Naples (Italy)—represent the diverse regional forces contributing to global research on smart tourism. These examples illustrate the growing participation of institutions across Europe, Asia, and the Middle East in generating knowledge in this field.

Table 5. Top 10 collaborative institutions.

Rank	Count	Year	Institution
1	16	2019	Universitat d'Alacant
2	12	2013	Hong Kong Polytechnic University
3	5	2020	Universidad de Malaga
4	5	2019	Tarbiat Modares University
5	4	2019	University of Isfahan
6	4	2017	Kyung Hee University
7	3	2022	Sisaket Rajabhat University
8	3	2019	Parthenope University Naples
9	3	2022	Kookmin University
10	3	2022	Universidad Nacional de Educacion a Distancia (UNED)

At the same time, however, cross-institutional collaboration has yet to develop into a tightly coupled cooperative structure. Knowledge flows remain largely confined to internal teams or loosely connected regional partnerships, pointing to the need for stronger international linkages to advance the field.

Figure 4 depicts the institutional collaboration network in STD research, consisting of 184 nodes and 118 links, with a density of 0.007. Although the overall density is low, several regionally representative collaboration centers can be identified. Among them, Universitat d'Alacant (Spain), The Hong Kong Polytechnic University (Hong Kong, China), and Tarbiat Modares University (Iran) emerge as highly connected and productive hubs.

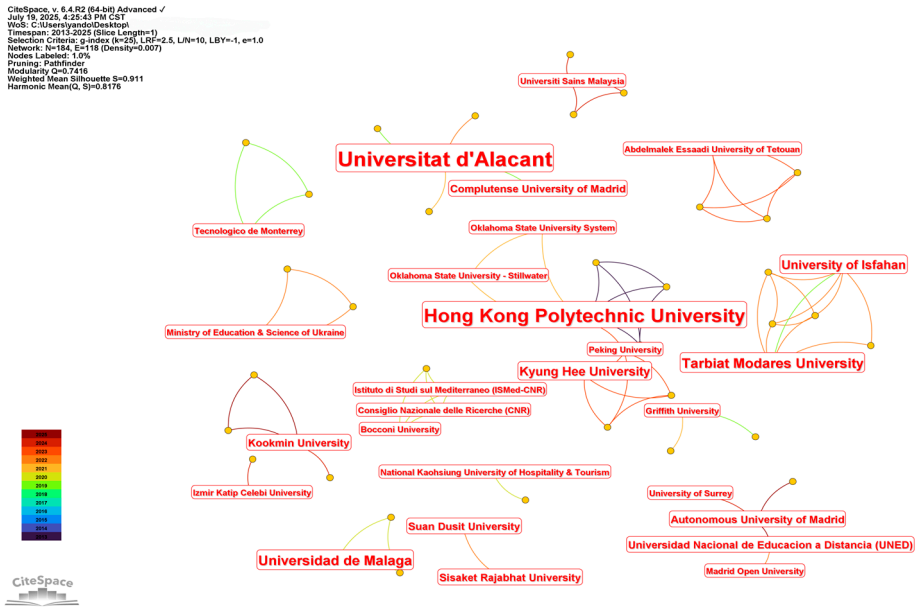

Figure 4. Institutional collaboration network.

At Universitat d'Alacant, collaborative activity was most prominent between 2019 and 2022. Its network is centered on Spanish institutions but also extends to Spanish-speaking countries such as Argentina, illustrating how language and cultural communities can

facilitate cross-national academic collaboration. This structure has supported the regional dissemination of knowledge related to smart tourism and sustainable destinations.

By contrast, Tarbiat Modares University exhibits a more regionally cohesive collaboration pattern, with nearly all partners based in Iran (Shafiee et al., 2021). Its peak period of collaboration also occurred between 2019 and 2022. This network structure highlights the institution's role in shaping a localized knowledge base on smart tourism within the Middle East, while also reflecting the opportunities and challenges faced by emerging research regions in building autonomous academic communities (Gursoy et al., 2024).

Meanwhile, The Hong Kong Polytechnic University demonstrates a more globalized model of collaboration, spanning from 2013 to 2023. Its partners include the University of Nottingham, Sage Software, Oklahoma State University, Kyung Hee University, the University of South Carolina, Peking University, and the University of Macau, among others (Park et al., 2023; Shin et al., 2023; Tavitiyaman et al., 2021b; Tung et al., 2020; D. Wang et al., 2013). This wide-ranging collaboration underscores its international influence as a hub for smart tourism research in East Asia and its strong cross-cultural adaptability. Such intercontinental partnerships also bring methodological and theoretical diversity to the field, fostering global dialogue and innovation.

In summary, these three universities exemplify distinct collaboration models within STD research: a regional cultural-homogeneity network (e.g., Spain–Latin America), a localized collaborative network (e.g., Iran), and a global cross-regional network (e.g., Hong Kong). Together, they reflect the multiple pathways through which institutions contribute to advancing knowledge in this field.

3.2.3. Country Collaboration Network Analysis

Figure 5 highlights the top 10 most collaborative countries in STD research. Spain leads with 66 publications and the highest centrality (0.50), underscoring its role as both the most prolific contributor and a key intermediary in the global network, largely driven by Ivars-Baidal and Universitat d'Alacant. China follows with 31 papers (centrality 0.41), while Italy and the United States each contribute 19; notably, the U.S. shows greater structural importance (centrality 0.34) than Italy (0.28), reflecting stronger international collaborations. England also demonstrates significant embeddedness (0.26). Other countries, including Brazil, South Korea, Turkey, Portugal, and Iran, have smaller outputs (8–11 papers) but show growing participation. Turkey's rise in 2023 (centrality 0.10) illustrates the increasing involvement of emerging research regions. Overall, the results reveal a geographically diverse yet uneven landscape, where Spain and China dominate in productivity, while the United States and England play pivotal bridging roles in global collaboration.

Figure 6 shows the national collaboration network in STD research, consisting of 67 nodes and 91 links, with a network density of 0.412. Over the past decade, the field has developed into a multi-centered, interconnected structure with Spain, China, the United States, and England as the core nodes.

Spain stands out as both the most productive country (66 papers) and the most central (0.50), forming dense collaborative ties with Italy, Portugal, Brazil, and Morocco. These linkages illustrate how language, geographic proximity, and cultural communities (e.g., the Iberian linguistic sphere) foster research resonance and reinforce Spain's leadership role.

China (including mainland and Hong Kong) has established a "radiating" collaboration network centered on itself and extending to South Korea, Malaysia, India, Australia, and the United States. This structure reflects both its rapid accumulation of research output and its use of international cooperation to strengthen its global influence, supported by national policies on smart cities and digital tourism.

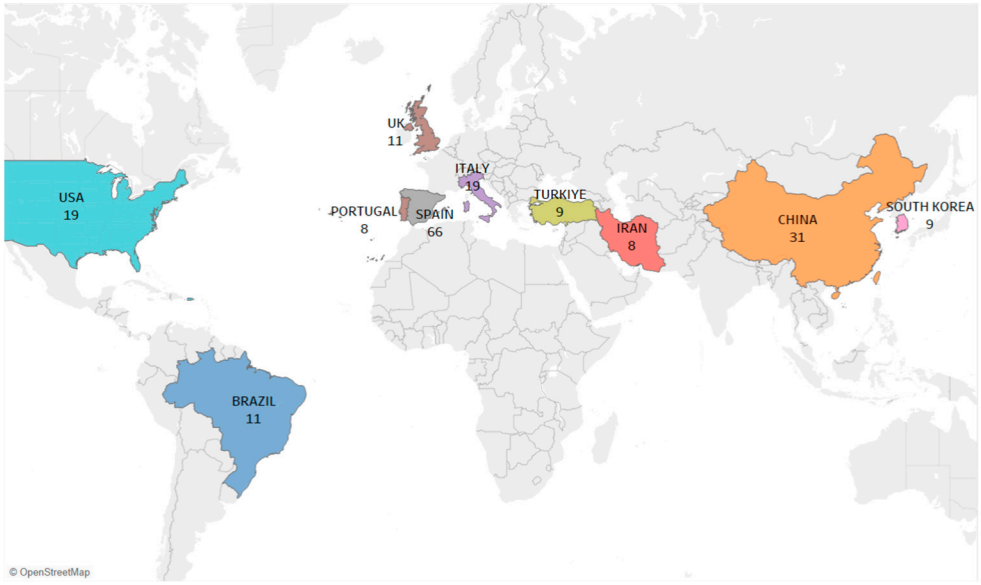

Figure 5. Top 10 most collaborative countries.

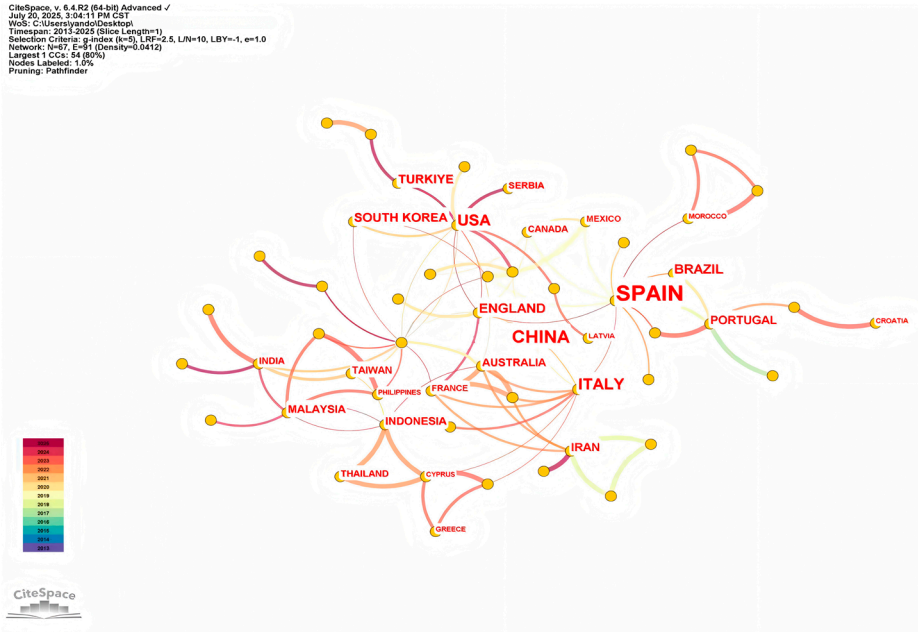

Figure 6. National collaboration network.

Other regional clusters are also evident: the U.S.–Canada–UK axis, the Iran–Greece–Cyprus group in the Middle East–Mediterranean, and an India–Malaysia–Indonesia–Thailand cluster in South and Southeast Asia, showing the gradual involvement of emerging economies. The color gradient of the timeline indicates that most collaborations were active between 2019 and 2023, with newer links—particularly in Asia (e.g., Malaysia, India, the Philippines)—forming in the past two years, pointing to strong latecomer potential in the region.

Despite these developments, the overall network density remains low. Several countries, such as Brazil, Turkey, and South Africa, appear at the periphery with limited connections, suggesting the lack of robust hubs to integrate them into the global network. Going forward, advancing STD research will require stronger North–South partnerships, greater regional integration, and enhanced global knowledge sharing to foster theoretical innovation and policy collaboration (Donthu et al., 2021).

3.3. Co-Citation Analysis

To achieve Research Objective 2, this study conducted a co-citation analysis of the STD literature. In scientometric research, co-citation analysis is a widely used network-based method for uncovering the intellectual structure and thematic linkages within a field. The basic principle is that when two units of literature—such as authors, journals, or references—are cited together in a third or subsequent paper, they are considered to share a "co-citation" relationship, which reflects their semantic or thematic association in the academic context (C. Chen, 2017). By systematically analyzing these relationships, it becomes possible to identify the core works, scholarly communities, and evolutionary pathways that shape the knowledge base of a research domain (Zupic & Čater, 2015).

3.3.1. Author Co-Citation Analysis

Author Co-citation Analysis is an important method for revealing the intellectual foundations and network structure of a research field. By analyzing how often different authors are cited together in other works, Author Co-citation Analysis reflects the strength of their intellectual linkages and thematic proximity within a knowledge map (White & Griffith, 1981). In the case of Smart Tourism Destinations, the analysis identified several core scholars.

Table 6 lists the top 10 most co-cited authors. Buhalis D., with 171 co-citations, ranks first and is widely recognized as a foundational figure, particularly through the concept of the smart tourism ecosystem (Buhalis & Amaranggana, 2013). Gretzel U. follows with 167 co-citations, reflecting her strong influence in the application of smart technologies and the design of tourism experiences (Gretzel et al., 2015b). Boes K. ranks third with 125 co-citations, and although his frequency is lower, his centrality score (0.14) indicates a significant bridging role across different thematic clusters.

Table 6. Top 10 most co-cited authors.

Rank	Count	Centrality	Year	Cited Author
1	171	0.04	2015	BUHALIS D
2	167	0.01	2017	GRETZEL U
3	125	0.14	2015	BOES K
4	97	0.03	2019	IVARS-BAIDAL JA
5	82	0.03	2019	FEMENIA-SERRA F
6	79	0.04	2015	WANG D
7	79	0.05	2015	XIANG Z
8	69	0.03	2019	JOVICIC DZ
9	59	0.05	2018	NEUHOFER B
10	55	0.09	2017	DEL CHIAPPAG

Recent influential authors such as Ivars-Baidal J.A., Femenia-Serra F., and Shafiee S. are emerging as a new group of contributors, focusing on governance structures, urban case studies, and evaluation models for smart destinations (Ivars-Baidal et al., 2019). Meanwhile, Buonincontri P. (centrality 0.15) and Baggio R. (centrality 0.13) also demonstrate strong intermediary positions, linking research on tourist participation with studies of big data and tourism network systems.

Overall, the Author Co-citation Analysis results show that while most core authors are frequently co-cited, their centrality values remain relatively low. This suggests that the knowledge network in STD research is not yet characterized by highly integrated bridging nodes. Instead, author linkages tend to form dense local clusters rather than cross-thematic connections, reflecting the field's partial rather than fully consolidated intellectual structure (Zupic & Čater, 2015).

Figure 7 presents the author co-citation clustering structure, which identified eight major clusters (#0–#7) consisting of 465 nodes and 1225 links, with a network density of 0.0114. The average silhouette score (0.8235) and modularity (0.6407) indicate strong internal consistency and high clustering quality.

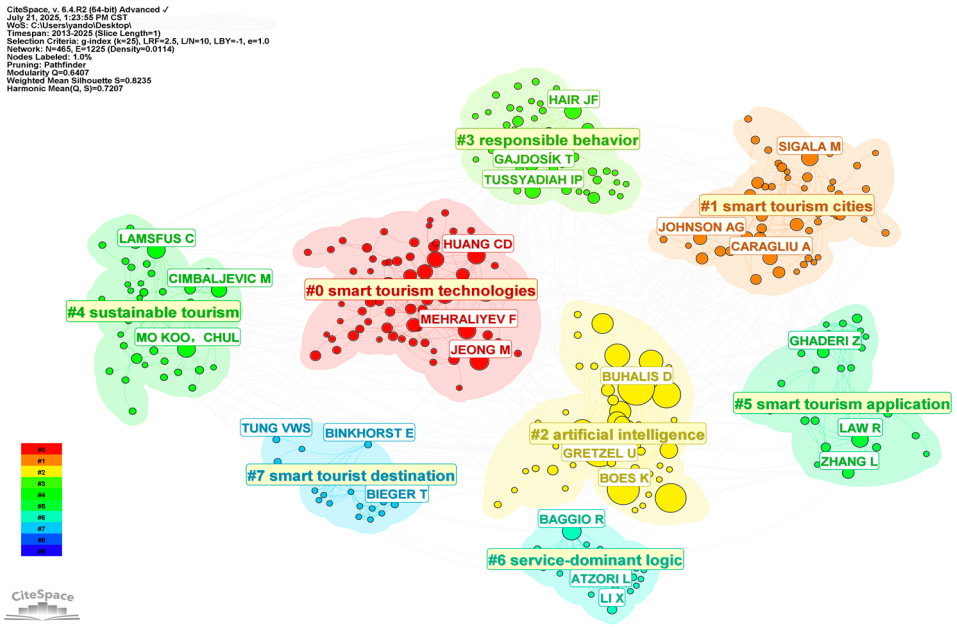

Figure 7. Author co-citation network.

Cluster #0 "Smart Tourism Technologies" is the largest, focusing on the development of smart tourism technologies and user perception. Huang C.D. is a frequently co-cited author in this area, examining the application of ICT in tourism management and service innovation (Huang et al., 2017). Jeong M. and Mehraliyev F. contribute studies on user perceptions of platform ecosystems and information quality in smart tourism (Jeong & Shin, 2020; Mehraliyev et al., 2020). This cluster highlights a shift in research from information system construction toward user experience and perceived value.

Cluster #1 "Smart Tourism Cities" addresses urban governance, digital infrastructure, and tourism development within smart city contexts. Sigala M. emphasizes the transformative role of technology in tourism (Sigala, 2018), while Caragliu A. and Johnson A.G. explore definitions, evaluation criteria, and the impacts of smart cities on urban attractiveness and residents' well-being (Caragliu et al., 2011). This reflects the growing integration of smart tourism with sustainable governance and data-driven urban strategies.

Cluster #2 "Artificial Intelligence" reveals the deep integration of AI in smart tourism. This cluster contains several highly co-cited nodes with larger diameters, indicating significant knowledge contributions and influence. Buhalis D. is a leading scholar, introducing the concept of the smart tourism ecosystem and highlighting the role of AI in personalized services, the experience economy, and platform interactions (Buhalis & Amaranggana, 2015). Gretzel U. discusses data-driven decision-making and algorithmic ethics in tourism platforms (Gretzel et al., 2015a), while Boes K. examines how technology adoption transforms destinations and tourism organizations within ecosystem-based competitiveness frameworks (Boes et al., 2016). Together, this cluster illustrates the ongoing technological transformation through AI.

In addition, Cluster #3 "Responsible Behavior" emphasizes issues of ethical tourist behavior and digital literacy, led by authors such as TUSSYADIAH I.P. and HAIR J.F., reflecting a growing trend toward behavioral governance in smart tourism; Cluster #4

"Sustainable Tourism," involving authors like LAMSFUS C. and MO KOO CHUL, is closely tied to environmental sustainability and green development paths within smart tourism; Cluster #5 "Smart Tourism Application" focuses on case-based studies of technological implementation; Cluster #6 "Service-Dominant Logic" and Cluster #7 "Smart Tourist Destination" represent new research directions concerning shifts in marketing logic and destination development strategies, respectively.

3.3.2. Journal Co-Citation Analysis

Table 7 presents the top 10 most frequently co-cited journals in STD research. Co-citation between journals refers to instances where two journals are cited together in the same publication, reflecting the intellectual linkages among outlets. Notably, most of the top 10 journals have a five-year impact factor above 6 (seven out of ten), underscoring their central role in shaping this field.

Table 7. Top 10 most co-cited Journals.

Rank	Count	Centrality	Year	5-Year IF	Cited Journal
1	179	0.01	2015	13.6	TOURISM MANAGE
2	164	0.02	2015	9.2	J DESTIN MARK MANAGE
3	158	0.01	2015	6.3	CURR ISSUES TOUR
4	140	0.01	2019	3.6	SUSTAINABILITY-BASEL
5	137	0.05	2013	9.8	J TRAVEL RES
6	136	0.02	2017	10	ELECTRON MARK
7	130	0.02	2015	11.1	ANN TOURISM RES
8	125	0.01	2015	N/A	INFORM COMMUNICATION
9	119	0.03	2017	3.0	INT J TOUR CITIES
10	113	0.01	2019	8.3	TOUR MANAG PERSPECT

High-impact journals dominate the co-citation landscape. Tourism Management ranks first with 179 co-citations and a five-year impact factor of 13.6, followed by Journal of Destination Marketing & Management (164 co-citations, IF 9.2) and Current Issues in Tourism (158 co-citations, IF 6.3). Journal of Travel Research shows the highest centrality (0.05), highlighting its bridging role in the citation network, while journals such as Annals of Tourism Research further reinforce its influence, particularly in studies on smart technologies and destination innovation.

The relatively small differences in co-citation counts among the top 10 journals suggest that the intellectual base is distributed fairly evenly across key outlets, reflecting the interdisciplinary and inclusive nature of STD research.

The journal set spans multiple disciplinary orientations. Core tourism management outlets (Tourism Management, Journal of Travel Research), destination marketing and urban-focused journals (Journal of Destination Marketing & Management, International Journal of Tourism Cities), sustainability-oriented journals (Sustainability-Basel), and cross-disciplinary outlets (Electronic Markets, Tourism, Culture & Communication) together reflect the fusion of tourism studies with technology, sustainability, and societal issues.

Lower-impact journals can still be highly co-cited. For instance, Sustainability-Basel (IF 3.6, 140 co-citations) and the International Journal of Tourism Cities (IF 3.0, 119 co-citations) both appear in the top 10. The prominence of Sustainability-Basel reflects MDPI's open-access, high-output publishing model, while the International Journal of Tourism Cities benefits from its close thematic alignment with urban tourism and smart destinations, attracting substantial attention within the field.

Figure 8 illustrates the journal co-citation network in STD research, which comprises nine major clusters, each representing a distinct thematic focus. The network includes 468 nodes and 1227 links, with a density of 0.0112, modularity Q = 0.6124, and an average silhouette value S = 0.8369, indicating a clear structure and high clustering quality. Nodes represent journals, node size reflects citation frequency, and links indicate co-citation relationships. The color gradient from blue (earlier years) to red (recent years) shows the temporal evolution of research.

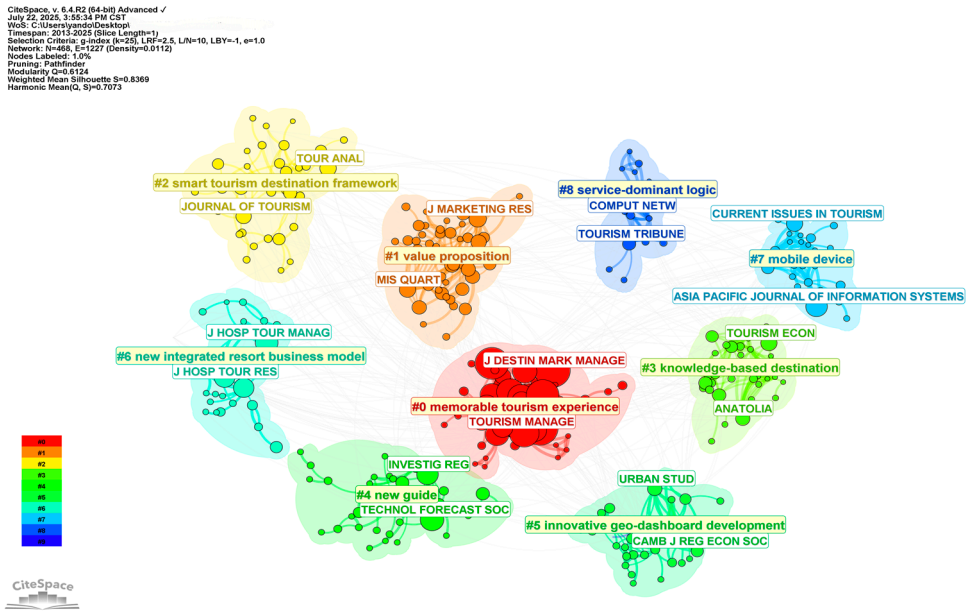

Figure 8. Journal co-citation network.

Cluster #0: Memorable Tourism Experiences. This is the largest cluster, marked mainly by red nodes, highlighting memorable tourism experiences as a central theme in STD research. It emphasizes how technology enhances tourists' sensory and emotional engagement. The top two co-cited journals are Tourism Management and the Journal of Destination Marketing & Management. The former, as a leading tourism journal, has recently published studies on the application of new technologies and their impact on visitor experiences (Bai et al., 2025; Jiang et al., 2025; J. Wang et al., 2025). The latter focuses on destination marketing and management, particularly in relation to smart tourism marketing and experiences (Singh et al., 2025; Yawised & Apasrawirote, 2025).

Cluster #1: Value Proposition. This cluster focuses on the role of value propositions in smart tourism, especially through information systems and technology-driven value creation. The top two co-cited journals are MIS Quarterly and the Journal of Marketing Research. As a leading outlet in information systems, MIS Quarterly features research on how smart technologies, big data, and social media enhance tourism value propositions. Journal of Marketing Research emphasizes the role of value propositions in marketing (Luri et al., 2024). Together, these journals illustrate the close coupling of tourism, information systems, and marketing research.

Cluster #2: Smart Tourism Destination Frameworks. This cluster highlights theoretical framework development in STD research, with a focus on sustainability and technology integration. The top two co-cited journals are the Journal of Tourism (to be clearly specified in the reference) and Tourism Analysis.

Overall, the analysis shows that the journal co-citation network has formed several subsystems along the lines of "economic forecasting–regional governance–smart platforms–service innovation." Frequent co-citations among journals such as Tourism Economics,

Technological Forecasting and Social Change, Journal of Hospitality and Tourism Research, and Urban Studies reveal an increasing cross-disciplinary convergence of tourism with information systems, urban science, and service design, leading to a multi-level and multi-method knowledge integration system.

3.3.3. Reference Co-Citation Analysis

Table 8 presents the top 10 most co-cited references, highlighting the intellectual core of STD research. These highly cited works revolve around conceptual definitions, ecosystem frameworks, and technology applications, collectively shaping the intellectual map of the field. The top three represent foundational contributions that moved the field from basic theory to ecosystem perspectives.

Table 8. Top 10 most co-cited references.

Rank	Count	Centrality	Year	Cited References
1	125	0.02	2015	Gretzel U, 2015, ELECTRON MARK, V25, P179, Smart tourism: foundations and developments
2	92	0.09	2016	Boes K, 2016, INT J TOUR CITIES, V2, P108, Smart tourism destinations: ecosystems for destination competitiveness
3	79	0.01	2015	Gretzel U, 2015, COMPUT HUM BEHAV, V50, P558, Conceptual foundations for understanding smart tourism ecosystems
4	71	0.02	2019	Ivars-Baidal JA, 2019, CURR ISSUES TOUR, V22, P1581, Smart destinations and the evolution of ICTs: a new scenario for destination management?
5	62	0.05	2015	Buhalis D, 2015, INFORMATION AND COMMUNICATION TECHNOLOGIES IN TOURISM 2015, V0, P0, Smart Tourism Destinations Enhancing Tourism Experience Through Personalisation of Services
6	60	0.03	2013	Wang D, 2013, J DESTIN MARK MANAGE, V2, P59, China's "smart tourism destination" initiative: A taste of the service-dominant logic
7	57	0.04	2013	Buhalis D, 2013, INFORM COMMUNICATION, V0, PP553, Smart Tourism Destinations
8	56	0.06	2015	Boes K, 2015, INFORMATION AND COMMUNICATION TECHNOLOGIES IN TOURISM, V0, P0, Conceptualising Smart Tourism Destination Dimensions
9	53	0.02	2015	Del Chiappa G, 2015, J DESTIN MARK MANAGE, V4, P145, Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure
10	46	0.12	2016	Buonincontri P, 2016, INF TECHNOL TOUR, V16, P285, The experience co-creation in smart tourism destinations: a multiple case analysis of European destinations

The most frequently co-cited article is Gretzel, cited 125 times and published in Electronic Markets (Gretzel et al., 2015a). It systematically outlines the foundations and development of smart tourism, emphasizing the integration of IoT, cloud computing, and big data. Ranked second is Boes in the International Journal of Tourism Cities (count = 92, centrality = 0.09), which developed the smart tourism destination ecosystem framework and examined how collaboration enhances competitiveness (Boes et al., 2016). Its relatively high centrality underscores its bridging role between theory and urban practice, particularly in European and Asian contexts. The third, Gretzel in Computers in Human Behavior (count = 79), provides the conceptual basis of the smart tourism ecosystem, focusing on human–computer interaction and behavioral impacts (Gretzel et al., 2015b).

References ranked 4–10 extend these foundations by exploring ICT development (Ivars-Baidal et al., 2019), personalized services (Buhalis & Amaranggana, 2015), service-

dominant logic (D. Wang et al., 2013), destination dimensions (Boes et al., 2015; Buhalis & Amaranggana, 2013), knowledge transfer (Del Chiappa & Baggio, 2015), and co-creation of experiences (Buonincontri & Micera, 2016). Together, they demonstrate the field's evolution from conceptual introduction (2013) to empirical expansion (2019). Notably, works with higher centrality, such as Buonincontri & Micera (centrality = 0.12), highlight the bridging role of emerging themes like experience co-creation.

In sum, the co-citation network reveals the knowledge base of STD research, centered on the contributions of scholars such as Gretzel, Boes, and Buhalis, whose work collectively established the intellectual structure spanning conceptual frameworks to practical applications.

Figure 9 presents the reference co-citation network, comprising 431 nodes and 1129 links (density = 0.0121). The modularity (Q = 0.6261) and average silhouette score (S = 0.8222) confirm strong clustering quality and internal cohesion. Ten major clusters (#0–#9) were identified, illustrating the intellectual structure of Smart Tourism Destination research.

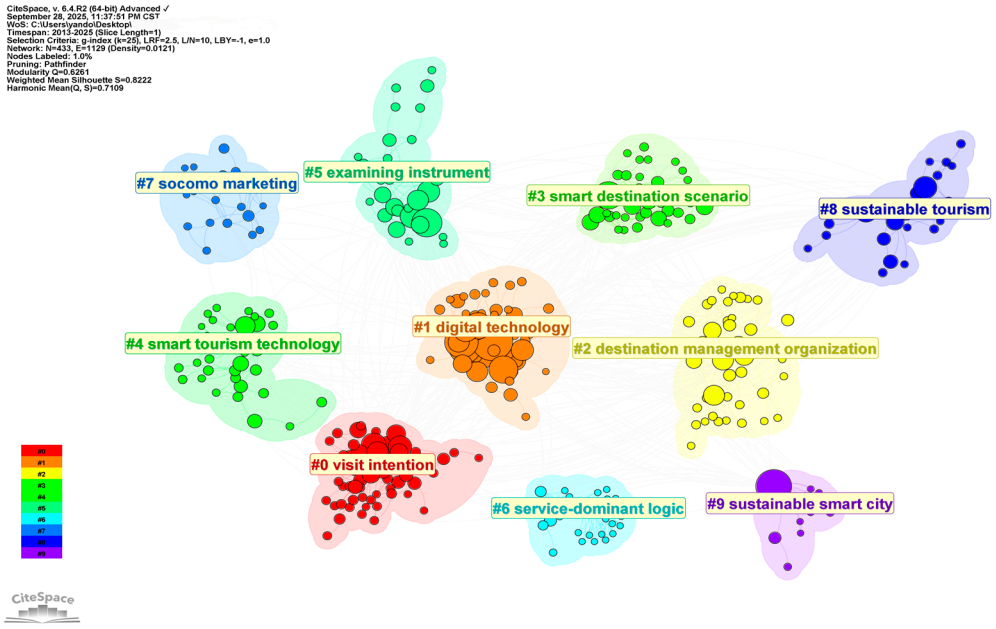

Figure 9. Reference co-citation network.

Cluster #0 "Visit Intentions." Positioned at the network core, this cluster highlights how smart tourism technologies shape visitor intentions such as revisits and recommendations, integrating psychological and experiential factors. Key studies include Jeong on technology experience and its effects on satisfaction and intentions, highlighting informativeness, interactivity, and personalization with privacy and security as moderators (Jeong & Shin, 2020); Huang et al. on mobile technology adoption, underscoring usability and privacy in shaping travel intentions (Huang et al., 2017); and Mehraliyev et al. on smart tourism, emphasizing the need for integrative framework (Mehraliyev et al., 2020). Together, these studies reveal how technology attributes enhance tourist experience and loyalty, contributing to the advancement of empirical research.

Cluster #1 "Digital Technologies." This cluster focuses on the foundational role of ICT in the smart tourism ecosystem, dominated by mid-to-recent publications. Core works include Gretzel et al., which defined the technological pillars of smart tourism (Gretzel et al., 2015a; Gretzel et al., 2015b), and Ivars-Baidal et al., which analyzed ICT evolution in destination management and proposed new governance and stakeholder collaboration models (Ivars-Baidal et al., 2019).

Cluster #2 "Destination Management Organizations." This cluster addresses organizational strategies within smart tourism, such as competitiveness and policymaking. Representative works include Buhalis on technology-driven ecosystem innovation (Buhalis, 2020), Lamsfus et al., on cloud-based mobile applications for mobility analysis (Lamsfus et al., 2015), and Cavalheiro & Joia on planning and policy implications (Cavalheiro et al., 2021). Together, these contributions link ecosystem development with organizational adaptation, underscoring the importance of governance innovation.

Other clusters expand the thematic scope: #3 Smart Destination Scenarios, #4 Smart Tourism Technologies, #5 Methodological Tools, #6 Service-Dominant Logic, #7 Social Marketing, #8 Sustainable Tourism, and #9 Sustainable Smart Cities. These clusters collectively trace the evolution from foundational technologies to integrated applications.

In summary, the reference co-citation map outlines the knowledge landscape of Smart Tourism Destination research, with Clusters #0–#2 anchored in the seminal contributions of Gretzel et al. and Buhalis while integrating newer empirical insights from Jeong, Huang, and Ivars-Baidal. The field is evolving toward user-oriented, data-driven, and sustainability-focused innovation, providing a solid basis for future theoretical and practical advances.

3.4. Co-Occurrence Analysis and Research Evolution

To achieve Research Objective 3, this study employs keyword co-occurrence analysis as the core method, using CiteSpace to visualize the knowledge structure and dynamic evolution of STD research (C. Chen, 2017). The timezone view traces the temporal distribution of keywords from 2013 to 2025, allowing us to observe shifts in thematic focus over time. In addition, burst detection is applied to identify emerging keywords, capturing the transition of research frontiers and highlighting changes in scholarly attention.

3.4.1. Keyword Co-Occurrence Analysis

Figure 10 illustrates the thematic structure of Smart Tourism Destination research, mapping high-frequency keywords into an interconnected network of 268 nodes and 895 links (density = 0.025). The modularity (Q = 0.5622) and silhouette score (S = 0.8109) indicate strong cohesion and well-defined clusters. Overall, the clusters highlight the field's progression from technological foundations to sustainability-oriented applications, with notable intersections among terms such as smart tourism destination, big data, artificial intelligence, and sustainable tourism. This reflects a shift from conceptual exploration toward empirical validation. Below, the two largest clusters are examined in more detail.

Cluster #0 "Extended UTAUT Model." Located at the network's center and dominated by red nodes, this cluster focuses on extensions of the Unified Theory of Acceptance and Use of Technology (UTAUT) in smart tourism. It emphasizes the moderating roles of privacy and security risks and the integration of psychological mechanisms into behavioral intention models. Keywords such as satisfaction, adoption, behavior, and attitudes show strong linkages, highlighting the mediating role of user cognition in destination technology adoption. Representative studies include Omar on privacy and security-modulated UTAUT (Omar et al., 2025), Santos-Junior on sustainability and residents' quality of life (Santos-Júnior et al., 2020), Gonzalez-Reverte on mobile device risk perceptions in coastal tourism (González-Reverté, 2019), Wang on the mediating role of arousal in revisit intentions (J. Wang et al., 2020), and Tavitiyaman on applying Theory of Mind (ToM) to millennial tourist cognition (Tavitiyaman et al., 2021a). Together, these works illustrate how UTAUT has evolved from static acceptance models toward dynamic frameworks that incorporate risk, sustainability, and ecological contexts.

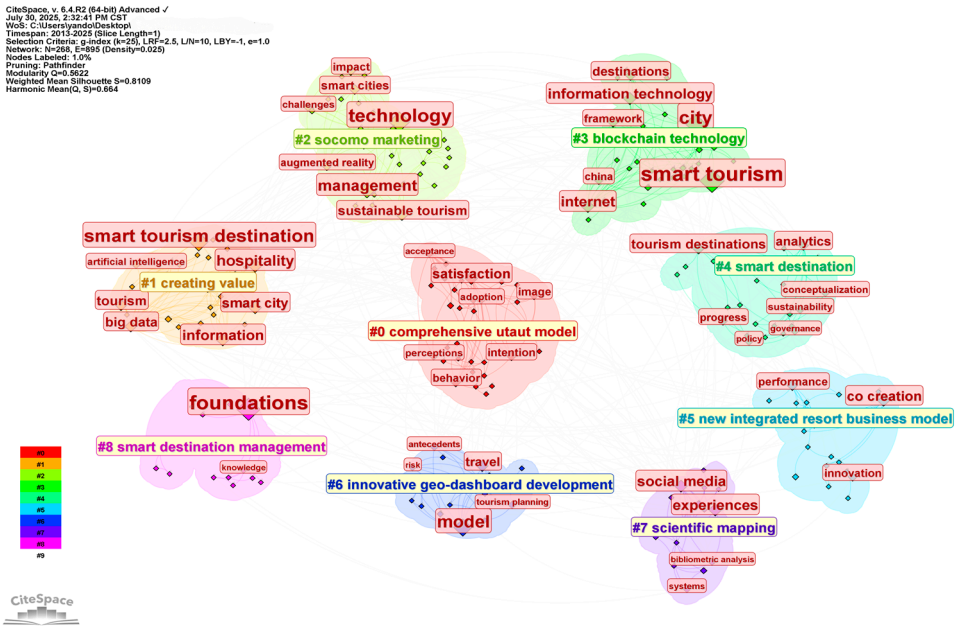

Figure 10. Keyword co-occurrence network.

Cluster #1 (Value Creation). This cluster explores the role of big data and social media in value co-creation, with strong linkages among keywords such as big data, information, and artificial intelligence. It highlights the shift from information processing to data-driven strategic decision-making and the network effects of stakeholder collaboration. Key contributions include Ozkose on value-creation trends (Özköse et al., 2023), Vecchio on the role of social big data in destination value (Vecchio et al., 2018), Marine-Roig on large-scale user-generated content in Barcelona (Marine-Roig & Anton Clavé, 2015), Diaz-Gonzalez on automated frameworks for destination quality classification (Díaz-González et al., 2022), and Shafiee on systematic reviews of value-creation practices (Shafiee et al., 2021). Together, these works mark a shift toward more integrated and technology-based approaches to value creation in smart tourism. Together, these works trace the evolution of value from technical tools to ecosystem dynamics, with an emphasis on the intersections of data privacy and sustainability. They also signal a methodological transition from descriptive studies to predictive models in destination management.

Cluster #2 (SoCoMo Marketing). This cluster examines the integration of social, community, and mobile marketing, with strong linkages among keywords such as augmented reality, management, and technology. It reflects the convergence of urban marketing and tourism and emphasizes the shift from traditional promotion to digital interaction, highlighting the mediating role of policy instruments in sustainable planning. Representative works include Ivars-Baidal on planning tools and perceived impacts in Spanish smart cities, highlighting their role in enhancing competitiveness (Ivars-Baidal et al., 2023a); Sorokina on a destination marketing organization framework (Sorokina et al., 2022); Buhalis on the SoCoMo model of value co-creation through social media empowerment (Buhalis & Foerste, 2015); Wider on digital tourism trends and sustainable indicators identified through co-citation and co-word analysis (Wider et al., 2023); and Marchesani on the moderating role of airports in shaping urban tourist flows (Marchesani et al., 2023). Together, these studies reflect the multidimensional evolution of smart tourism, integrating planning, marketing, co-creation, sustainability, and mobility perspectives. Together, these studies reveal an evolution of marketing from one-way promotion to interactive ecosystems, with particular emphasis on the synergy between infrastructure and behavioral intentions, especially in the post-pandemic recovery period.

Cluster #3 (Blockchain Technology). This cluster focuses on the application of blockchain in smart tourism, with strong connections among internet, information technology, and smart tourism. Its central theme lies in the transformative role of decentralized technologies in enhancing data security and transparency. Key contributions include Ozkose on blockchain trends and their potential in smart ecosystems (Özköse et al., 2023), Femenia-Serra on the gap between millennials' technological expectations and the reality of blockchain-enabled interactions (Femenia-Serra et al., 2019b), Del Chiappa on network structures and knowledge transfer in blockchain-supported collaboration (Del Chiappa & Baggio, 2015), Encalada on digital footprints and points of interest linked to enhanced data privacy (Encalada et al., 2017), and Mandic on ICT's role in destination attractiveness and blockchain's contribution to sustainable development (Mandić & Garbin Praničević, 2019). Collectively, these works highlight the transition from conceptual validation to practical application, underscoring the inherent tension between security and sustainability.

Cluster #4 (Smart Destinations). This cluster addresses the planning and management of smart destinations, with strong connections among analytics, tourism destination, and progress. It emphasizes the integration of policy tools and impact assessment. Examples include Soares on new planning approaches and management paradigms (Soares et al., 2022), Ivars-Baidal on the perceived impacts of Spanish smart-destination planning tools (Ivars-Baidal et al., 2023a), Sustacha on visualization technologies examined through bibliometric analysis (Sustacha et al., 2024), Fernandez-Diaz on digital accessibility and inclusivity in relation to the UN 2030 agenda for reducing inequalities (Fernández-Díaz et al., 2023). Collectively, these studies illustrate the growing diversity of approaches to smart destination planning and management, ranging from conceptual debates to applied strategies in different regional contexts. Collectively, this cluster underscores the shift from theoretical models to empirical validation, highlighting intersections between sustainability and equity in the planning of smart destinations.

Cluster #5 (New Business Models for Integrated Resorts). This cluster focuses on innovative models for integrated resorts, with strong connections among the keywords co-creation, performance, and innovation. It highlights dynamic models of value co-creation and repeat visitation. For instance, Tham proposed a new business model analyzing gamification in resorts (Tham & Huang, 2019); Ndou developed a framework for the Adriatic region, stressing methodological contributions to sustainable development (Ndou et al., 2023); Chakraborty conducted a longitudinal study on the impact of digital technologies on revisit intentions (Chakraborty et al., 2023); Correa examined inclusive design from the perspective of tourists with disabilities (Corrêa & Gosling, 2021); Sun explored how digitalization and infrastructure drive growth toward smart destinations (Sun et al., 2025); and Diaz reviewed value co-creation in smart ecosystems, identifying past trends and future directions (Díaz et al., 2023). Collectively, these works reveal a shift from traditional to smart models, underlining the interdependence of economic stability and technological innovation.

Cluster #6 (Innovative Development of Geographic Dashboards). This cluster addresses the use of geographic dashboards in tourism research, with model, travel, and tourism planning as central keywords. It emphasizes the role of data visualization in supporting decision-making. Ordoñez-Martínez introduced the Tourism Data Space framework, innovating in dashboard development and management (Ordóñez-Martínez et al., 2024); Femenia-Serra analyzed the gap between technological tourists' expectations and reality, advocating for dashboards aligned with user needs (Femenia-Serra et al., 2019b); Liu applied dashboards to longitudinal market segmentation and destination strategies (Liu et al., 2021); Jeong tested the effects of smart technologies on intentions, underscoring dashboards in experience assessment (Jeong & Shin, 2020); and Nieves-Pavon examined the

role of emotions in loyalty, integrating dashboards into destination management (Nieves-Pavón et al., 2024). These studies illustrate a transition from static to dynamic models, particularly through the integration of geographic data and emotional factors.

Cluster #7 (Scientific Mapping). This cluster highlights bibliometric mapping of smart tourism, strongly linking social media and bibliometric analysis. It stresses methodological innovation and trend identification, moving from descriptive assessments toward predictive insights and revealing macro-level patterns of field evolution. Representative works include Ozkose, who used content analysis to map the state of smart tourism and identify gaps (Özköse et al., 2023); Femenia-Serra, who conceptualized the smart tourist role and its practical implications (Femenia-Serra et al., 2019a); Mandic, who assessed ICT's role in destination attractiveness and the methodological meaning of mapping (Mandić & Garbin Praničević, 2019); Kalia, who conducted a bibliometric review of digital tourism over three decades to decode emerging trends (Kalia et al., 2022); and Femenia-Serra, who compared technological expectations with reality, exploring mapping's application potential (Femenia-Serra et al., 2019b). Together, these works demonstrate the evolution of scientific mapping from single methods to integrated frameworks, highlighting its importance in identifying recovery paths after COVID-19.

Cluster #8 (Smart Destination Management). This cluster, dominated by blue nodes, centers on foundations as the key keyword, reflecting its focus on the theoretical and practical frameworks of smart destination management. Kim applied mixed text-mining methods to analyze tourists' negative perceptions of destinations, identifying drivers of dissatisfaction and providing evidence for managerial interventions (Kim et al., 2017); Au proposed a smart-oriented conceptualization of destination management, emphasizing the foundational role of data-driven decision-making (Au & Tsang, 2022). The co-occurrence patterns reveal the evolution of smart destination management from theoretical foundations toward integrated smart frameworks.

The keyword co-occurrence clustering analysis outlines the dynamic landscape of STD research, spanning from the psychological mechanisms of UTAUT (#0) to ecosystems of value creation (#1) and further to innovations in marketing and blockchain (#2–#3). It extends into themes of planning, management, and sustainability (#4–#8). The clusters reflect the intersection of technology and society, characterized by a progression from conceptual foundations around 2015 to empirical validations by 2025. Together, they reveal a post-pandemic trend that integrates data-driven approaches with inclusivity.

3.4.2. Evolution of Research Themes

Figure 11 illustrates the keyword co-occurrence timezone in STD research, where each node (keyword) is positioned according to the year of its first appearance. This temporal evolution map clearly traces the thematic development of the field between 2013 and 2025. Overall, three phases can be identified: the foundation and technology introduction stage (2013–2017), the expansion and application stage (2018–2021), and the reflection and integration stage (2022–2025).

During the foundation and technology introduction stage (2013–2017), the digital infrastructure was laid. Early keywords such as smart tourism and social media (2013) marked the emergence of the concept, which expanded to include smart city, big data, and information technology between 2015 and 2017, reflecting the initial convergence of smart-city ideas with technological frameworks (Gretzel et al., 2015a). Terms like destinations and framework supported more systematic research, signaling the transition from conceptual ideas to technology-driven models across a relatively long exploratory period.

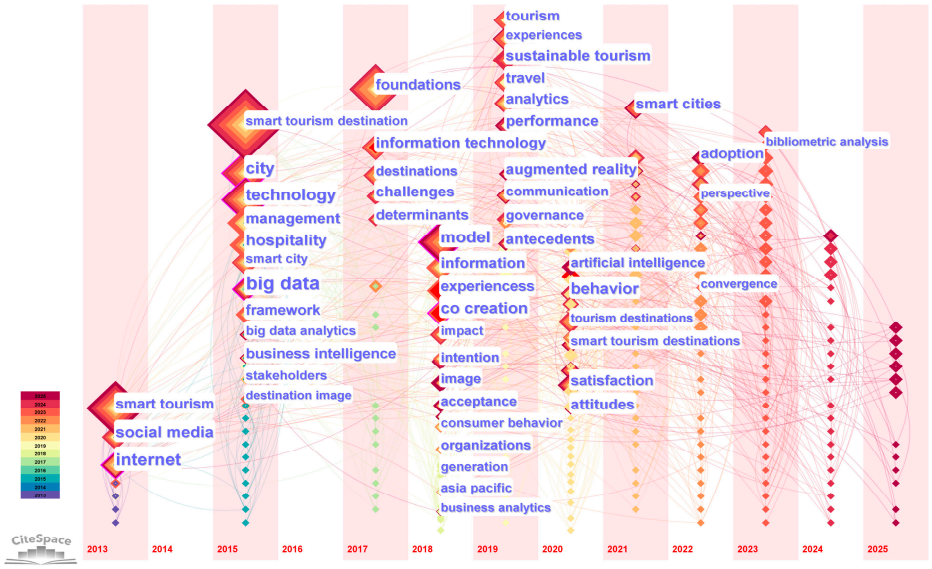

Figure 11. Keyword time zone.

The expansion and application stage (2018–2021) marked a shift toward empirical validation and interaction paradigms. Keywords such as model, experiences, and co-creation appeared in 2018, followed by sustainable tourism and augmented reality in 2019. By 2020–2021, the COVID-19 pandemic redirected attention toward satisfaction, behavior, and attitudes, indicating a move from static acceptance models to dynamic, user-oriented applications (Stylos et al., 2021). This four-year span reflects the rapid iteration of empirical model building, regional engagement, and pandemic responses.

The reflection and integration stage (2022–2025) emphasizes adoption and interdisciplinary convergence. The emergence of adoption and convergence in 2022, along with bibliometric analysis in 2023, laid the groundwork for broader synthesis. By 2024–2025, the focus shifted to sustainable governance and efficiency optimization, addressing issues such as trust in smart destinations and the integration of advanced technologies (Anjum & Ali, 2025; Omar et al., 2025). This phase highlights the field's movement toward holistic, cross-disciplinary approaches linking technology, governance, and sustainability.

3.4.3. Keyword Burst Analysis

To complement the timezone analysis, which outlines the long-term trajectory of STD research, it is necessary to capture short-term shifts where certain topics rapidly gain scholarly attention. For this reason, this study applies CiteSpace's burst detection algorithm to identify keywords with significant citation bursts between 2013 and 2025, thereby highlighting stage-specific research hotspots.

The analysis identified four keywords with notable burst strength: information technology (2017–2019, strength = 3.95), co-creation (2018–2021, strength = 3.08), experiences (2018–2021, strength = 3.07), and perceptions (2020–2021, strength = 2.71) (see Figure 12).

The burst of "information technology" marks the entry of the field into a technology-driven phase. With the highest strength (3.95), it underscores the role of IoT, big data, and AI as core infrastructures. This reflects the shift from conceptual discussions to applied frameworks, emphasizing technology's role in enhancing connectivity and personalization in destinations (Almobaideen et al., 2017; Mandić & Garbin Praničević, 2019). At the same time, it highlights early neglect of user interaction.

The bursts of "co-creation" and "experiences" illustrate the evolution from passive to active visitor participation, reflecting a shift toward tourist–destination interaction. Their peak intensity coincides with pre- and post-pandemic trends in collaborative innovation,

such as immersive experience design through AR/VR (Yung & Khoo-Lattimore, 2019). This transition from one-way service delivery to value co-creation highlights the integration of inclusivity and sustainability.



Figure 12. Keywords with strong bursts.

The burst of "perceptions" signals a post-pandemic turn toward sensitivity to risk and cognition, emphasizing tourists' subjective assessments of privacy, technological usability, and sustainability. Although its strength is lower and duration shorter, concentrated at the pandemic's peak, it reveals the field's progression from technology-oriented models to a balance with human-centered risk perspectives (Afolabi et al., 2021; Tavitiyaman et al., 2021b). This suggests that future attention may further shift toward psychological models and behavioral prediction.

4. Discussion

4.1. Knowledge Framework

Based on CiteSpace-based bibliometric and visualization analyses, this study integrates basic information analysis, collaboration analysis, co-citation analysis, and keyword co-occurrence with evolutionary perspectives to construct a systematic knowledge framework of Smart Tourism Destination (STD) research(As shown in Figure 13). The framework is structured across four dimensions—basic structure, network structure, citation structure, and dynamic structure—which together reveal the field's progression from technological foundations to sustainable governance and user orientation, providing both theoretical insight and practical guidance (C. Chen, 2017).

Basic structure: From 2013 to 2025, a total of 232 publications were identified, covering three phases, the emerging stage (2013–2017), rapid growth stage (2018–2023), and stable transition stage (2024–2025). Sustainability, Current Issues in Tourism, and the Journal of Destination Marketing & Management dominate as key publication outlets. Journals in Hospitality, Leisure, Sport & Tourism, Management, and Environmental Studies are the most prominent categories. The inclusion of technical categories such as Computer Science, Information Systems reflects the growing penetration of digital technologies.

Network structure: Collaboration analysis shows that Ivars-Baidal, Femenia-Serra, and Celdrán-Bernabeu are the most active co-authors, with newer teams led by Baños-Pino emerging in recent years. At the institutional level, the most collaborative organizations are the Universitat d'Alacant and Hong Kong Polytechnic University, followed by the Universidad de Málaga. At the national level, Spain, China, and the United States form the most frequent and influential hubs of collaboration.

Citation structure: Co-citation analysis highlights the intellectual foundations of the field. Influential co-cited authors include Buhalis D., Gretzel U., and Boes K. Highly co-cited journals are Tourism Management, Journal of Destination Marketing & Management, and Current Issues in Tourism. The most frequently co-cited works are Gretzel et al.'s "Smart tourism: foundations and developments," "Conceptual foundations for understanding smart tourism ecosystems," and Boes et al.'s "Smart tourism destinations: ecosystems for destination competitiveness," which collectively established the conceptual and theoretical bases for STD research.

Dynamic structure: The temporal evolution of keywords reveals thematic shifts and emerging research frontiers. Core themes include "smart tourism destinations," "smart tourism," and "foundations." More recent topics highlight the Unified Theory of Acceptance and Use of Technology (UTAUT), mobile banking, and trust, while high-impact keywords such as "information technology," "co-creation," and "experiences" underscore the integration of technology, user engagement, and sustainability as central concerns.

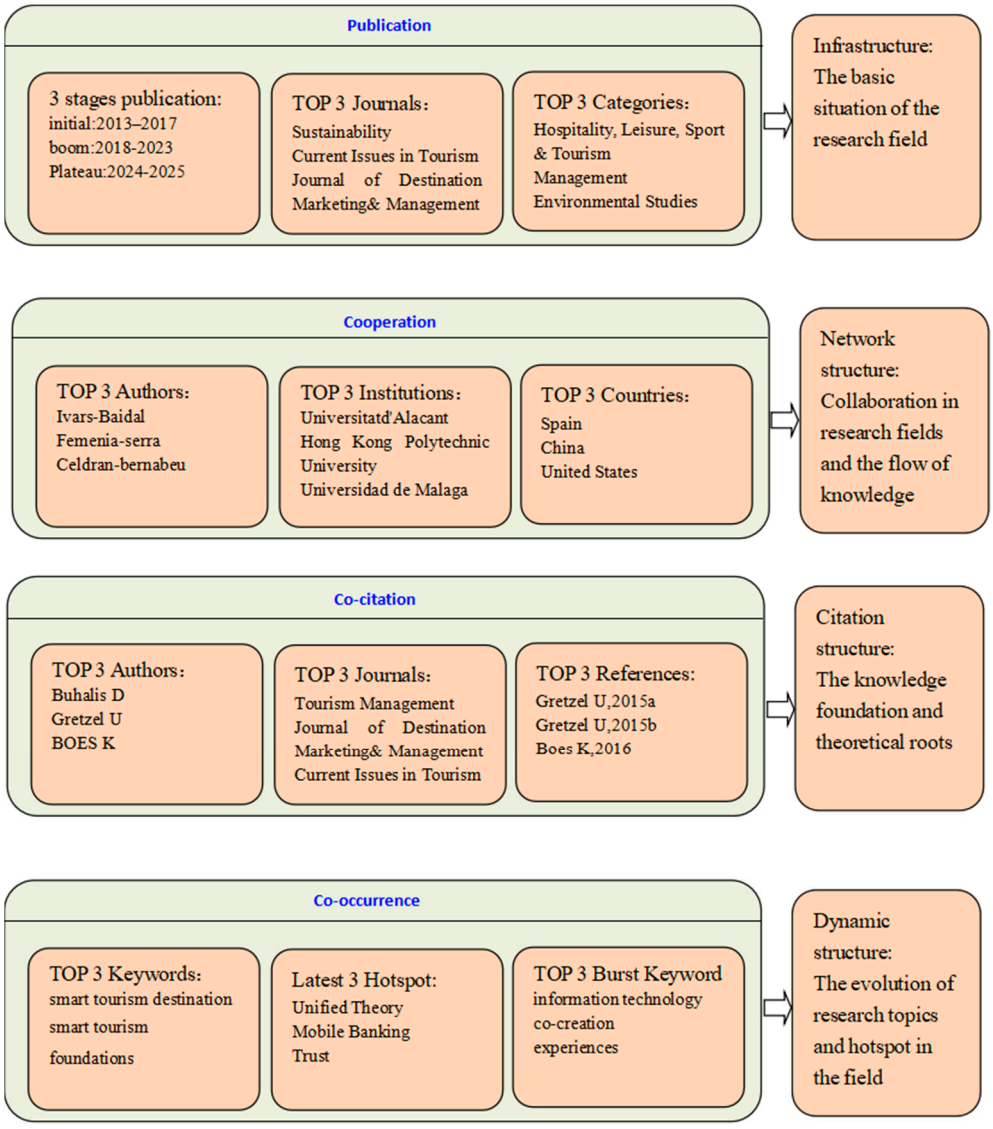

Figure 13. Knowledge framework.

4.2. Current Challenges

Although STDs have made notable progress, several pressing challenges remain. To further advance both theoretical development and practical application, it is essential to critically review and reflect on these key issues.

Technology dominance and indicator bias. Research and funding often prioritize quantifiable and deployable ICT outputs, with platforms and vendors supplying visible hardware and algorithms. This has led to a long-standing equation of "smartness" with intensive ICT integration, leaving human and governance dimensions underexplored. As a result, evaluation systems lean heavily on technical performance indicators, lacking more holistic measures (Boes et al., 2016). While operational indicator frameworks, maturity assessments, and sustainability metrics have emerged at the destination level,

cross-dimensional weighting and contextual adaptation require further refinement (Ivars-Baidal et al., 2023b).

Limited cross-regional collaboration and knowledge flows. Differences in language, database accessibility, and institutional environments increase the costs of cross-lingual citation and data sharing, reinforcing regional "self-circulation." This reflects conclusions in smart city and destination governance research, where contextual and institutional differences fragment standards and hinder transferability (Meijer & Bolívar, 2016; Ruhlandt, 2018). Consequently, the field has developed around two loosely connected poles—Spain and China—where terms and indicators are not easily harmonized, knowledge transfer is constrained, and the costs of cross-border policy and technology migration remain high.

Generational bias in samples and research tools. Studies relying on online recruitment and mobile-based surveys naturally overrepresent younger participants, keeping the focus on "millennial tourists" and their technology acceptance. In contrast, systematic evidence is lacking for older cohorts, such as the post-1970s generation now nearing age 60, who have also been shaped by the internet. Empirical studies confirm that informativeness, interactivity, and personalization enhance experiences and behavioral intentions (Jeong & Shin, 2020), while mainstream technology adoption theories suggest age is a significant moderating factor. This highlights the need for rigorous validation of middle-aged and older groups in STD contexts (Tamilmani et al., 2021).

Insufficient empirical evidence on multi-stakeholder collaboration. STDs involve diverse actors, including DMOs, platforms, businesses, residents, and tourists. Yet data silos, inconsistent standards, and fragmented responsibilities persist. Key process data are dispersed across government and platform systems, restricted by privacy and contractual barriers, making sharing difficult and limiting longitudinal or causal research designs. As a result, most collaborative evidence remains conceptual rather than empirical (Meijer & Bolívar, 2016; Ruhlandt, 2018), which risks reinforcing a reliance on readily available technology output metrics rather than public value or experiential outcomes.

Underestimation of contextual heterogeneity. Policy and funding pilots are often concentrated in cities and established regions with advanced information infrastructures, high data openness, and visible outcomes, which also shape the research sample. Yet destinations vary significantly by type and scale, with distinct mechanisms and priorities. Simply extending urban-based models to small-scale or heritage destinations may generate high costs, low returns, and community resistance (Ivars-Baidal et al., 2023b).

4.3. Future Research Directions

Although research on STD has expanded rapidly, with increasing diversification and cross-fertilization of themes and methods, it remains an emerging field. Scholars continue to debate its definition, and most existing studies approach STDs from a single perspective (Cerdá-Mansilla et al., 2024). Therefore, it is important for researchers to develop a comprehensive understanding of the field. Based on the knowledge framework constructed in this study and a critical assessment of current challenges, we suggest that future research may focus on the following directions:

First, future studies should integrate new technologies—such as generative AI, service robots, and IoT convergence—into a holistic framework that simultaneously considers technological performance, governance coordination, visitor experience, efficiency, and safety. Mixed-method approaches across different destination types and scales are needed to validate net effects. This would not only counter the assumption that "smartness" equals intensive ICT integration, but also incorporate both the benefits and risks of automation into a common evaluative framework. Destination-level indicators and sustainability metrics

may serve as practical tools, but their weights should be contextually calibrated to avoid one-size-fits-all applications.

Second, future research should organize cross-regional longitudinal projects using comparable samples and consistent measures. Shared protocols and long-term tracking would reduce the costs of cross-border policy and technology transfer, minimize duplication, and provide more reliable evidence for cross-cultural innovation.

Third, generational differences require closer attention. Developing age-friendly scales and testing them through multi-group SEM and field interventions could assess whether enhancing transparency and perceived control significantly improves adoption, satisfaction, and loyalty among populations aged 60 and above. Such efforts would directly contribute to inclusive governance and product strategies tailored to aging societies.

Fourth, governance models for STDs should be empirically tested using structural equation modeling or agent-based simulations. Research should start by mapping stakeholders at the destination level—DMOs, platforms, businesses, residents, and tourists—and clarifying their relationships. Based on this mapping, common indicators and datasets should be co-developed, with explicit governance rules for data use, privacy, and benefit distribution. Only then can empirical methods, such as multi-level or multi-group models, be applied to verify collaboration outcomes, shifting the focus of "smartness" from technological accumulation to verifiable coordination and governance.

Finally, future studies should conduct comparative analyses across destination types, developing scalable frameworks that account for differences in size, culture, and economic context. A destination-type/scale matrix could help identify dominant mechanisms and weightings, with contextual recalibration of existing indicators and sustainability frameworks. Such matrix-based evaluation would prevent the inappropriate transfer of urban solutions to smaller or heritage destinations, where it may lead to high costs, limited benefits, and community resistance.

5. Conclusions

This study employed bibliometric and visualization analyses using CiteSpace to systematically examine the evolving landscape of Smart Tourism Destination (STD) research. Drawing on 232 high-quality publications from the Web of Science Core Collection (2013–2025), the basic analysis shows that research on STDs began in 2013, entered a phase of rapid growth in 2018, and peaked in 2023. The journals involved are concentrated in tourism management, destination marketing, and sustainability. In line with our first objective, the analysis of global collaboration networks at the levels of countries, institutions, and authors reveals a concentrated yet expanding research ecosystem. Spain and China emerge as the leading forces, highlighting regional synergies and the pivotal role of institutions such as Universitat d'Alacant and scholars such as Ivars-Baidal, J. A. The field is developing toward more international and interdisciplinary collaboration, although opportunities remain for deeper cross-regional integration.

For the second objective, co-citation analysis identified the intellectual foundations of the field, including highly cited authors (e.g., Buhalis, D., with 171 citations) and journals (e.g., Tourism Management, with 179 citations), as well as seminal references such as Gretzel et al., which collectively trace the theoretical evolution from ICT integration to ecosystem frameworks. Addressing the third objective, keyword co-occurrence and burst analyses highlighted key research areas—such as tourist acceptance of smart technologies, smart marketing, value co-creation, and smart technologies—and predicted future shifts toward efficiency and ethical governance. Building on these insights, and in line with the fourth objective, this study constructs a comprehensive knowledge framework encompassing

structural, network, citation, and dynamic dimensions, providing robust support for theoretical development and policy guidance in this evolving field.

In addition, the CiteSpace analysis identified five key challenges in STD research: technology dominance and indicator bias, limited cross-regional collaboration, generational bias in samples and tools, weak multi-stakeholder coordination, and underestimated contextual heterogeneity. These challenges explain why "smartness" has often been reduced to intensive ICT integration, with insufficient evidence on governance, public participation, and sustainability performance. In response, this study proposes a set of future research agendas corresponding to each challenge.

Theoretically, this study develops a systematic knowledge framework for STDs, delineating core domains, intellectual foundations, and evolutionary trajectories. It demonstrates a shift from "technology-centered" approaches toward multidimensional logics of experience, governance, and sustainability, thereby providing a shared reference for theoretical integration and agenda setting. Practically, it outlines context-specific development pathways and evaluation approaches centered on multi-stakeholder governance, data ethics, efficiency, and safety, while extending the research focus beyond "millennial tourists" to the "silver digital generation." These insights offer actionable directions for product design, service accessibility, risk and privacy management, and policy alignment.

The study's innovations lie in two areas. First, in terms of temporal coverage, this analysis incorporates recent findings from 2024–2025, capturing emerging themes and burst trends, in contrast to earlier reviews that largely stopped at 2023 (Ercan, 2023; Palomo Santiago & Parra López, 2024). Second, in terms of knowledge organization, it integrates four strands of evidence—basic structure, network structure, citation structure, and dynamic structure—into a reusable knowledge framework. This elevates fragmented visualizations of collaboration networks, co-citation patterns, and keyword evolution into an interpretable structural map, from which future research agendas and context-sensitive comparative approaches can be derived.

The study also has limitations. First, the reliance on a single data source may restrict coverage. While the Web of Science Core Collection offers authority and citation consistency, it may exclude relevant publications indexed in Scopus, Google Scholar, or other databases. Second, limitations in sample size and temporal scope remain. Although 232 publications meet the basic requirements for bibliometric analysis, the sample is relatively small, which may affect the robustness of clustering and burst detection. Moreover, the 2025 data only cover the first seven months, making it impossible to capture the full-year dynamics.

Future research could integrate multiple databases (e.g., Scopus, CNKI) and include multilingual publications (particularly Chinese) to enable comparative analyses of Western and Chinese scholarship. Expanding the sample size, employing dynamic data collection, and adopting mixed methods to explore emerging themes would help build a more comprehensive knowledge framework and strengthen the relevance of findings for policy and practice.

Author Contributions: Conceptualization, D.Y. and A.B.M.; methodology, D.Y. and A.B.M.; software, D.Y.; validation, J.Z.; data curation, J.Y. and S.T.; writing—original draft preparation, D.Y.; writing—review and editing, J.Z.; visualization, D.Y. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: All literature data analysed in this study can be obtained from WOS. Further inquiries can be directed to the corresponding author.

Acknowledgments: During the writing of this manuscript, the authors used the literature visualization tool CITESPACE 6.4 R2 to perform a visual quantitative analysis of the literature and utilised DEEPL to edit the text (translation, grammar, structure, spelling). The authors have reviewed and edited the output and take full responsibility for the content of this publication.

Conflicts of Interest: The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Abbreviations

The following abbreviations are used in this manuscript:

STDs	Smart Tourism Destinations
ICT	Information and Communication Technologies
WoS	Web of Science
DMOs	Destination Management Organizations
SEM	Structural Equation Modeling
UTAUT	Unified Theory of Acceptance and Use of Technology
IoT	Internet of Things
AI	artificial intelligence

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