



INVESTIGATING THE EVOLUTION OF SMART TOURISM TECHNOLOGY AND TOURISM DESTINATION IMAGE: A BIBLIOMETRIC ANALYSIS

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Abstract. This study investigates the development of smart tourism technology (STT) and tourism destination image (TDI), identifying trends and research gaps in relation to STT and TDI. The article employs a rigorous PRISMA Statement methodology to curate a dataset of 4,371 of the most reliable articles from two databases: Scopus and Web of Science, spanning from 1986 to 2024. This paper employs mixed methods, primarily quantitative bibliometric methods utilizing the Biblioshiny tool. Findings reveal that the annual scientific output on STT and TDI peaked at 666 articles in 2023, with a projected upward trend. The integration of emerging technologies such as metaverse, gamification, digital twin, smart media, augmented reality, and virtual reality with TDI gives rise to exciting research gaps. This study is unique and valuable since it divided the time period into four different slices, from 1986 to 2024, and used the Biblioshiny to create a longitudinal thematic analysis map. This research presents emerging topics, targeting key trends in STT and TDI.

Keywords: Smart tourism technology, Smart tourism, Tourism destination image, Bibliometric, Biblioshiny

1 Introduction

It can be seen that in the Fourth Industrial Revolution, the application of technology in the tourism industry has led to the emergence of a new concept called smart tourism [1]. Smart tourism refers to the use of information and communication technology (ICT) to enhance tourism products, services, and experiences [2–4]. Smart tourism is a comprehensive approach to providing tourism information and related services conveniently to tourists through information technology devices [5, 6].

Smart tourism technology (STT) is the application of ICT in physical systems [7, 8], to explain the use of technology for tourism service providers and organizations to provide better experiences for tourists and enhance the competitiveness of destinations [9–12]. STT is an advanced technological tool that, in the context of tourism, can add value to tourists by providing interaction, co-creation, and personalization, thus leading to improved tourism experiences

[13–15]. Specific manifestations of STT include devices, Internet of Things (IoT) technology, and sensor networks to collect and analyze data, improve the efficiency of public tourism services [16, 17], virtual reality, and blockchain technology to enhance tourism experiences and create more efficient and sustainable experiences [18–20]. Or using advanced mobile technology, such as recommendation systems, to provide high-quality and personalized tourism experiences [2, 21]. It is also artificial intelligence (AI), sensor networks, and data analysis [22, 23]. Tourism-related websites and social media [24], chat boxes [25–27]. Today, smart tourism (ST) is also supported by more modern technologies, including Metaverse, Digital Twin, Gamification, 5G [28–30], and blockchain of things [31], to transmit and process data efficiently.

The concept of tourism destination image (TDI) is diverse, encompassing both objective knowledge and subjective impressions [32–34]. This is an important component of destination attractiveness, influencing tourists' decision-making and behavior [35]. Effective image management is essential for positioning and promoting a destination [36]. Some authors believe that TDI is of great importance as it influences both the decision-making behavior of potential tourists and satisfaction with the tourism experience. It is also a determining factor in tourists' destination choice [35, 36].

ICT has significantly transformed the tourism ecosystem, including the distribution and marketing of tourism products, with STT potentially having a direct impact on TDI. Perceptions of STT, such as e-commerce systems and smart transportation systems, can enhance TDI and influence tourists' behavioral intentions. These tools can improve the positive image of the destination and encourage the intention to recommend the destination to friends and family members in the future [37–39]. Therefore, combining the two topics of STT and TDI also creates interest for researchers. Although the aforementioned studies have applied qualitative and quantitative methods to analyze STT and TDI, there is still limited research on the development and trends of STT and TDI. Moreover, recent studies also lack comprehensive quantitative bibliometric analysis of STT and TDI research areas. This study applies a mixed-methods approach to explore issues related to STT and TDI that the authors have previously laid the groundwork for in the previous article [40]. Specifically, this study aims to answer the following questions: (1) How has the development of STT and TDI progressed since the issue first appeared in the two databases found (1986) until the time of the study (June 2024)? (2) "What trends and research gaps are identified related to STT and TDI?"

2 Research Methodology

The exponential increase in the number of scientific publications in various research fields requires special methods to create a comprehensive understanding of these fields by identifying key scientific contributors, reliable sources, research models, new trends, and promising topics

for future investigations. Bibliometrics is a set of quantitative methods used to explore a research field through article metadata provided in the bibliographic database [41, 42].

Bibliometric analysis involves using bibliographic analysis methods to analyze data from scientific publications on a specific topic [43]. These are bibliographic databases containing bibliographic information such as title, author, publisher, year of publication, number of pages, abstract, and keywords of different types of documents and formats. The main advantage of bibliometric analysis is its ability to ensure objectivity, minimizing subjectivity in authors' arguments [44, 45]. The research is conducted in two main steps.

In the first step, the search string or "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA Statement) [46] will be used. This leads to more transparent, complete, and accurate reporting of systematic reviews, facilitating evidence-based decision-making. This is the process of searching for and processing relevant articles on the research topic through three stages: (1) data collection, (2) document screening, and (3) data standardization.

(1) Data collection: The research sources were collected by the authors from two academic databases, namely Web of Science (WoS) from Clarivate and Scopus from Elsevier. A key finding in the data collection process shows that WoS has a stronger research base on TDI, while the larger STT database is found in Scopus journals. This result demonstrates the need to combine both databases to obtain a complete dataset, representing the full perspective and reliability of the database. In total, 30,447 related articles were collected. Of which WoS has 8,689 articles and Scopus has 21,760 articles. To ensure data comprehensiveness while maintaining reliability and persuasiveness of the bibliometric research [47, 48], the research team limited the selection of 11 criteria in Table 1. The sample size obtained was 5,273 articles. The search yielded 4,371 publications.

(2) Document screening: This step involves manual screening to determine the final number of documents included in the analysis. This process will eliminate irrelevant publications based on title and abstract. Bibliometric analysis is conducted to assess the sources of documents according to two indicators, co-cited and co-occurrence. The entire screening process follows PRISMA guidelines [34]. Of the total 5,273 articles, 2,088 documents were taken from Scopus and 3,175 documents were taken from WoS. After merging the two data sources of Scopus and WoS using R software, there were 902 duplicate documents. The result is 4,371 articles (Diagram 1).

(3) Data standardization: Data standardization is a very important step in bibliometric analysis. To ensure data quality, we standardized the terms of the fields: author (AU), citation (CR), source (SO), and keyword (DE and ID). The data will be cleaned and standardized before analysis using "Text Editing" in the Biblioshiny function.

Table 1. Summary of data source and selection

No.	Category	Specific standard requirements
1	Time	April, 2024
2	Research database	Web of Science, Scopus
3	Citation indexes (WoS)	SSCI, SCIE
4	Categories (WoS)	Hospitality Leisure Sport Tourism, Environmental Sciences, Environmental Studies, Green Sustainable Services, Economic
5	Subject area (Scopus)	Social Sciences, Environmental Sciences, Economics, Econometrics and Finance
6	Searching period	1986-2024
7	Language	English
8	Searching keywords	Key 1: "Smart tourism" OR "Smart tourism technology" OR "Destination image". Key 2: ("Augmented Reality*" OR "Augmented Reality Technology" OR "Virtual and Augmented Reality" OR "Augmented Reality Mobile Applications" OR "Augmented Reality Application*" OR "Mobile Technology*" OR "3D Model*" OR "Mobile Application*" OR "Blockchain" OR icts OR "Information And Communication Technology*" OR iot OR "Internet Of Thing" OR "Internet Of Things (IoT)" OR "Digital Platform" OR gis OR "Virtual Tourism" OR " Virtual Service" OR "Digital Game*" "Digital Technology*" OR "Mixed Reality*" OR metaverse* OR "Digital Twin*" OR "Gamification*" OR "Gamification Techniques" OR "Digital Media" OR " smart media") AND tourism.
9	Document types	Article
10	Data extraction	Export with full records and cited references in plain text format (WoS); full records and cited references in Bibtex format (Scopus).
11	Sample size	5.273 articles

Source: Authors, 2024

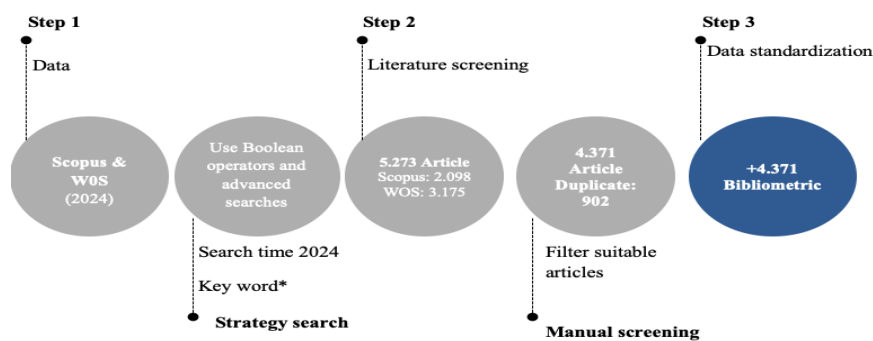


Diagram 1. Data search process according to the PRISMA method

Source: Authors, 2024

In the second stage, data analysis is performed. In this study, the authors used a mixed-methods approach, primarily applying quantitative bibliometric analysis methods. This method was chosen to enhance the reliability and accuracy of the research findings. The authors considered and analyzed the selection of AI tools and types of analysis, input, and output data to answer two research questions (Table 2). The Biblioshiny tool was chosen to conduct the analysis based on the large data with 4,371 related research articles. Biblioshiny is a web interface that uses the functions of the Bibliometrix R tool introduced by Aria and Cuccurullo [49]. It maps the thematic development and trending topics of the STT and TDI research fields.

3 Results

3.1 Analysis of the Development Process of STT and TDI

Figure 1 illustrates the increasing research trend on STT and TDI, indicating a growing interest among researchers in this topic. This is evident in the significant increase, particularly in recent years.

Meanwhile, Figure 2 on thematic evolution in time slices of the aforementioned periods shows the emergence of typical keywords. These keywords also clearly reflect specific stages of

Table 2. Research questions, the adopted tools, and outputs for the bibliometric analysis

Research questions	Type of analysis	Input	Tool	Output
RQ1. The evolution of STT and TDI research	Co-occurrence/ thematic evolution	Keywords	Biblioshiny	Conceptual knowledge structures
RQ2. Trends and gaps in STT and TDI research	Co-occurrence	Keywords	Biblioshiny	Trend topic

Source: Authors, 2024

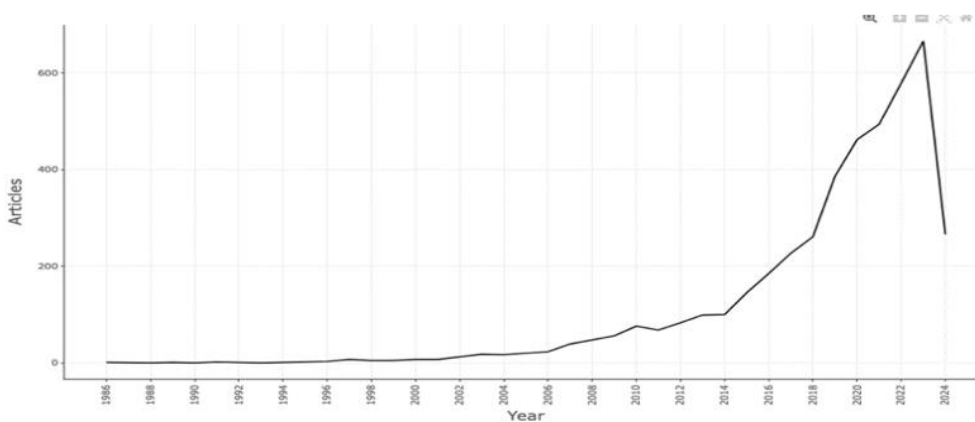


Figure 1. Number of articles published in the period from 1986 to 2023 on STT and TDI

Source: Authors, 2024

the topic; in particular, the STT factor appears in the research context, as technology is increasingly applied in tourism in many countries, regions, and destinations. More importantly, the number of technology-related studies has also increased over time.

The above information serves as the basis for the authors to divide the research process into four time slices (1986-2002, 2003-2014, 2015-2023, 2024) and analyze the thematic evolution using Biblioshiny software from 1986 to 2024. The reason the research team chose the 1986 milestone is that when searching for the aforementioned keywords in the Scopus and WoS databases, the first document appeared in 1986.

A total of 300 keywords were considered in the analysis (Figure 2). Clusters with a frequency of at least five labels were assigned to each cluster, representing the main topics in that cluster, and the label size for each cluster was set to 0.3 to represent the prominence of the labels in the map MES; 4 time slices were selected for analysis. Each time slice will introduce prominent studies, feature authors, and create prominent topics, as shown in Table 3.

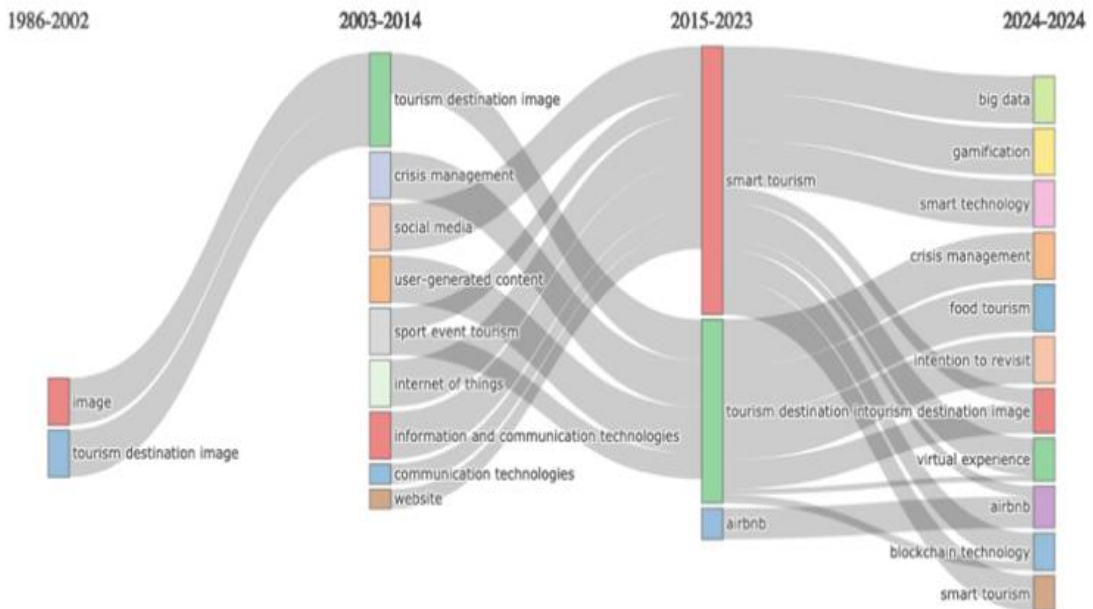


Figure 2. Thematic evolution of trending topics from 1986 to 2024

Source: Authors, 2024

Table 3. Some prominent themes in the periods from 1986 to 2024

Stage/Topic	Authors	Title	Year	Total Citation	Tcper Year
1986-2002: (54 articles)					
Destination image	Baloglu, S.; Mcclary, K.	A model of destination image formation.	1999	1807	69,5
	Gartner, W.	Image formation process.	1994	1531	49,387
	Gallarza, M.; Saura, I.; García, H.	Destination image towards a conceptual framework.	2002	985	42,826
	Echtner, C. M., & Ritchie, J. B.	The meaning and measurement of destination image.	1991	2970	54,832
	Echtner, C. M., & Ritchie, J. B.	The meaning and measurement of destination image: [Reprint of original article published in v. 2, no. 2, 1991: 2-12.]	2023	1924	39,342
2003-2014: (646 articles)					
Smart tourism technology	Guttentag, D.	Virtual reality applications and implications for tourism.	2010	667	44,467
	Govers, R.; Go, F.; Kumar, K.	Virtual destination image a new measurement approach.	2007	130	7,222
Destination image	Tasci, A.	Assessment of factors influencing destination image using a multiple regression model.	2007	30	1,667
	Tasci, A.	Visit impact on destination image	2006	28	1,474
2015-2023: (3.405 articles)					
Smart tourism technology	Min, S.; So, K.; Jeong, M.	Consumer adoption of the Uber mobile application insights from the diffusion of innovation theory and technology acceptance model.	2019	211	35,167
	Nyns, S.; Schmitz, S.	Using mobile data to evaluate unobserved tourist overnight stays.	2022	9	3
Destination image	Lalicic, L.; Marine-Roig, E.; Ferrer-Rosell, B.; Martin-Fuentes, E.	Destination image analytics for tourism design an approach through Airbnb reviews.	2021	40	10
	Jiang, Q.; Chan, C.; Eichelberger, S.; Ma, H.; Pikkemaat, B.	Sentiment analysis of online destination image of Hong Kong held by mainland Chinese tourists.	2021	23	5,75
2024: (266 articles)					

Stage/Topic	Authors	Title	Year	Total Citation	Tcper Year
Smart tourism technology	Jafar, R.; Ahmad, W.	Tourist loyalty in the metaverse the role of immersive tourism experience and cognitive perceptions.	2024	13	13
	Cham, T.; Tan, G.; Aw, E.; Ooi, K.; Jee, T.; Pek, C.	Virtual reality in tourism adoption skepticism and resistance.	2024	8	8
	Choe, J.; Si, T. C.	Tourist consumption values and perceived risks of using smart technologies a market segmentation approach.	2024	0	0
Destination image	Hautbois, C.; Biscaia, R.; Djaballah, M.	Athletes as destination ambassadors understand the role of athlete attachment and sports involvement in country of origin image and intention to visit.	2024	0	0
Smart tourism technology and Destination image	Cai, Y.; Li, X.; Shi, W.	Does gamification affect knowledge-sharing behavior the mediating role of intrinsic satisfaction needs.	2024	0	0
	Zheng, K.; Kumar, J.; Kunasekaran, P.; Valeri, M.	Role of smart technology use behavior in enhancing tourist revisit intention the theory of planned behavior perspective.	2024	25	25

Source: Authors, 2024

The individual research topics are visualized in each time slice diagram (Figure 3) and represented as a two-dimensional diagram divided into four quadrants based on density and centrality [50, 51]. Studies by Della Corte., V. et al., Garcia-Buendia, N. et al., Mohamed B. and Marzouk M., [50, 51] have shown that keywords from documents in each period are categorized into topics and labeled based on the most frequent keywords in each field, while the size of the label indicates the total frequency of all keywords. These labels are represented in 2D form using two axes representing centrality and density in what is called a "strategic diagram." Centrality refers to the relevance of a topic within a specific research field, while frequency refers to how a topic is developed and categorized [48, 49], where:

(1) Upper right quadrant: This quadrant represents keywords with high centrality and density, indicating their importance and influence in the field. These keywords correspond to important and well-established supporting topics in the research area.

(2) Upper left quadrant: Keywords in this quadrant exhibit high density but low centrality, indicating niche topics with limited importance in the broader context of the thematic area.

(3) Lower left quadrant: Keywords in this quadrant have low centrality and density, indicating emerging or disappearing topics. In other words, these keywords represent areas that are currently attracting attention or are losing relevance in the research area.

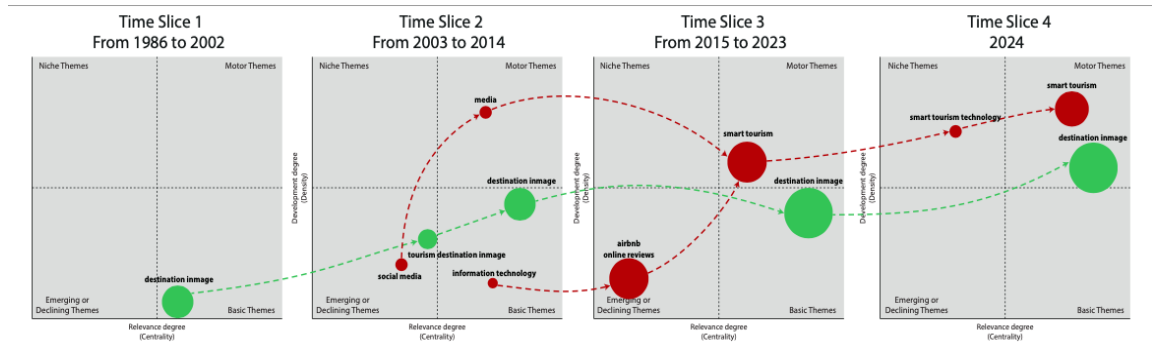


Figure 3. Time slice: Strategic diagram from 1986 to 2024

Source: Authors, 2024

(4) Lower right quadrant: This quadrant includes keywords with high centrality but low density. These keywords represent the main topics that are fundamental to the scientific field being studied.

They can serve as foundational concepts or core research areas.

With four time slices obtained from the thematic evolution analysis using Biblioshiny, the research team created a new time slice that shows the synthesis of the evolution of research topics from 1986 to 2024, from time slices 1, 2, 3, and 4. This image provides researchers with a clear overview of research areas through labeled clusters depicted on the diagram. It helps highlight trends in different topics, allowing topics to be combined or divided into multiple topics. The following results are obtained from Table 3, Figure 1, Figure 2, and Figure 3.

Time Slice 1: 1986-2002

Research on destination images appeared in the basic themes category with 54 articles. Conceptually, this main theme is the foundation for the scientific field being studied. Notably, the appearance of the tourism destination image on the strategic map falls within basic themes with low density but high centrality. Therefore, there are still many issues related to this topic, including Tourism destination image and Decision making. Additionally, the Strategic Map in Time Slice 1 also shows the absence of the smart tourism technology factor.

Time Slice 2: 2003-2014

The fluctuation of the destination image topic is more evident in time slice 2 with 646 articles. The author team noticed that TDI tends to shift towards the Moto themes corner. This further confirms that the research topic of tourism destination image has received significant attention and research, becoming a rapidly developing topic and thereby perfecting the theoretical framework. Similarly, related research topics such as film tourism, websites, and online travel agents

emerged, indicating the beginning of the application of smart technology elements to tourism destination images in Time Slice 2.

Time Slice 3: 2015-2023

The annual scientific output of STT and TDI peaked at 666 articles in 2023. Specifically, the tourism destination image topic is at the intersection of motor themes and basic themes. Indeed, when acting as a basic concept or core research area, the tourism destination image, when combined with the STT factor, shifts to important perspectives and demonstrates their influence in the research field. Studies related to Tourist Satisfaction, Destination Attachment, Destination Management, Behavior, Revisit Intention, Risk Management, Perceived Risk, Crisis Management, etc., combined with ST applications, create a research intersection between niche themes and motor themes in the research diagram. Related applications of STT, such as Virtual Experience, Smart Hotel, Customer Experience, Smart Tourism Technology, Augmented Reality, Smart Destination, Big Data, Digital Technology, Gamification, Blockchain Technology, Internet of Things, Metaverse Tourism, User-Generated Content, etc., show the research boom on the topic in Time Slice 3. The emergence of STT combined with TDI creates a very interesting research gap.

Time Slice 4: 2023-2024

A total of 266 articles illustrate the integration of ST and TDI. In Time Slice 4, TDI has largely shifted to the Basic themes corner, indicating that research on TDI, such as Tourist satisfaction, Destination attachment, Memorable intention, Customer experience, Destination management, Crisis management, Risk management, Online travel agencies, etc., has now become the theoretical framework and research foundation for the development of STT. Moreover, STT has shifted to the Motor themes corner, thus the use of smart technology applications in TDI is progressing steadily. Examples of research topics in the tourism industry include Airbnb, Gamification, Virtual experience, Blockchain technology, Big data, User-generated content, Digital tourism innovation, etc. Therefore, the research team is very interested in the prospect of combining the analysis of tourism destination image with STT, leading to the emergence of new studies such as "Cultural Similarity and Host-Guest Interaction for Virtual Tourism" [52]; "Experiential Happiness: The Case of Unmanned Smart Hotels" [53]; and "Spatial Authentication in the Metaverse: A Blockchain-Based User-Centric Approach" [54]. Overall, examining the vertical theme map above shows that the most recent popular topics are those related to the use of smart technology and its relationship with TDI. These topics peaked in 2023 and remain promising in 2024 and beyond.

3.2 Trends in STT and TDI

Analyzing the occurrence of keywords helps researchers better understand research trends. This implies that the more keywords within a topic, the closer and more essential the relationship

between them [55]. In Figure 4, the analysis of trend topics in 2022 and 2023 shows the emergence of new keywords such as Virtual experience (124 times), Metaverse tourism (50 times), Smart tourism technologies (86 times), Smart destinations (78 times), and Digital technology (66 times). Additionally, related keywords like Airbnb (333 times) and Smart tourism (205 times) appeared in 2021. Tourism destination images (1,240 times) appeared frequently, especially in 2018, and this frequency has gradually decreased in subsequent years. Until recently, this keyword has continued to appear, and according to analysis and forecasts, it will appear more frequently in the future when combined with technological factors, especially with Augmented reality, Virtual reality, Technology, and Metaverse.

Furthermore, the research team discovered that some keywords appeared for the first time, representing a newly emerging related research topic in 2023 and 2024 and carrying significant weight, but would not be detected in the results of research on trend topics. Therefore, qualitative analysis methods should also be used to supplement examples such as Digital twins [26, 56], Phygital [57, 58], and Blockchain of things [31]. More importantly, these keyword topics will become the focus of research in the future.

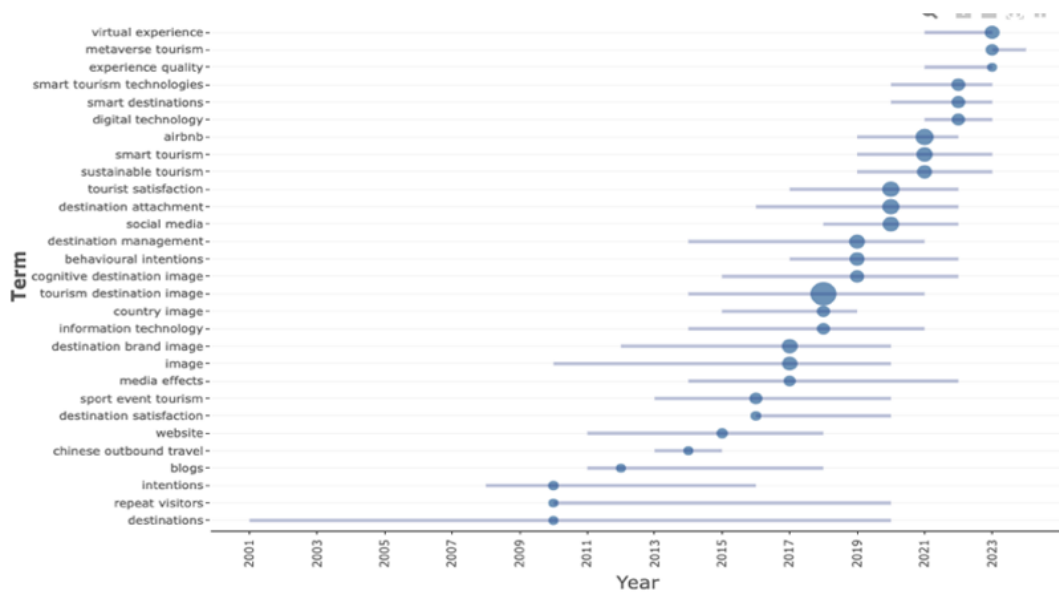


Figure 4. Trend topic analysis

Source: Authors, 2024

3.3 Research gap and research direction

Through the above analysis, it can be seen that STT (expressed through specific technologies such as Augmented reality, Virtual reality, Technology, Metaverse, Digital twins, Phygital, Blockchain of things, etc.) has a direct relationship with the keyword "Tourism destination image" and appears frequently in research over the past five years. This shows a trend among researchers to analyze aspects and factors related to "Smart tourism", "Smart tourism technology", and "Tourism destination image", as well as to study the relationship between them, therefore, it is necessary to explore this topic more deeply. Moreover, the analysis of each stage shows that the combination of STT and TDI will create very interesting research problems, suitable for the research context, compatible with current and future research trends. Some specific research aspects as well as intertwined relationships also need to be paid attention to: (1) the relationship between Big data, Artificial intelligence, Virtual reality, Augmented reality, Digital twins, Metaverse tourism, Smart tourism technologies, Smart destinations, Digital technology, and TDI; (2) the relationship between Experience/Model/Behavior intention of STT (including Augmented reality, Metaverse, Virtual reality, Gamification, Big data, etc. and TDI; (3) the relationship between STT factors and Tourism destinations on issues such as Perception, Tourist attraction, Tourist behavior, and Cognition.

4 Findings and Contributions

This research highlights the following key findings and contributions:

4.1 Findings

Firstly, the number of studies has increased significantly in recent years. The highest productivity was achieved in 2023, with a total of 666 articles, while the lowest productivity was in the first year of data collection, 1986, with only 1 published study (data for 2024 is relatively lower due to the research team not being able to count articles after 2024). This aligns with the rapid development and widespread use of smart technologies and simultaneously demonstrates the growing development and application of smart technology in the tourism sector to improve and enhance the TDI of destinations.

Secondly, with the emergence of STT, TDI developed (in the motor themes corner in 2024), creating a prominent and important research issue between STT and TDI from phase 3 and continuing to develop until 2024 and beyond. In reality, this combination creates experiences for tourists, enhances management efficiency for destination managers and policymakers, and exploits the potential in tourism activities. Therefore, researchers are interested in combining the analysis of tourism destination image with other aspects to create new research gaps, such as Tourist satisfaction, Destination attachment, Memorable intentions, Customer experience,

Destination management, Crisis management, Risk management, User-generated content, Online travel agencies, etc.

Thirdly, the visual map analysis conducted using keywords extracted by the authors from the collected bibliographic data to analyze the document output shows that the most frequently occurring keywords, such as Tourism destination image, Augmented reality, and Virtual reality, are all related to STT and TDI. Additionally, cluster analysis shows that the identified clusters related to the keyword Tourism destination image are linked to the keywords Behavioral intention and Experience of STT.

Fourthly, the bibliographic analysis conducted in this study represents an exploratory effort to reveal the development of trends in STT and TDI research. To the best of the authors' knowledge, such comprehensive quantitative analysis has not been conducted in this research field. The unique contribution of this study is the inclusion of more research documents for evaluation and analysis compared to previous reviews (4,371 articles), thereby providing a broader, more comprehensive, and up-to-date perspective on this topic. Moreover, the findings collected on research methods are very new, providing valuable opportunities for researchers in the scientific research community and relevant policymakers to understand this research issue comprehensively and quantitatively.

Finally, the study establishes an understanding of how the evolution and trends in STT and TDI have developed over time from 1986 to 2024, related to the number of documents and research topics, as well as promising areas with the potential to lead in the future. Therefore, new researchers can benefit greatly from such analyses to identify important and focused topics for conducting research. Furthermore, research teams can identify and focus on emerging research topics to seek support for their research policies.

4.2 Contributions

This article provides a systematic summary database to better understand STT and TDI from the perspective of analyzing evolution and topic trends. At the same time, it identifies potential research opportunities to conduct modern research that is suitable for the current and future context. Additionally, policymakers can use the results of this study to address the practical impacts of applying STT to develop TDI in their countries/regions/destinations/operating areas.

5 Conclusion

This research has examined the development and research models of STT and TDI topics from 1986 to 2024. The research methodology involved four steps: (1) defining research objectives and questions; (2) collecting bibliographic data resulting in 4,371 peer-reviewed articles from two databases, WoS and Scopus; (3) conducting quantitative analysis using the Biblioshiny tool; and

(4) interpreting the findings. The research found that a large number of documents were published, concentrated from 2015 to 2023, confirming that STT and TDI are promising and popular research areas. The research results include identifying key research points and thematic developments in the research field.

More specifically, this study has examined and analyzed the development and research trends in STT and TDI topics using a mixed method. Such analysis is a comprehensive solution that replaces the subjective document assessment of academic researchers, as it allows for the exploration of documents that other methods cannot. Moreover, it provides policymakers with opportunities to promote the research fields of STT and TDI as well as their practical applications. Bibliometric analysis results show that the most urgent topics to address include considering individual elements of STT, such as experiences and the use of STT. Or combined factors, issues, and intertwined aspects of STT's impact on TDI. Or considering specific technologies such as Augmented reality, Virtual reality, Big data, Artificial intelligence, Metaverse, Gamification, Digital twins, Blockchain of things, etc., and their impact on TDI at destinations/regions/countries. Or analyzing the attributes of STT on tourist experiences and whether they have an impact/influence on TDI.

The current research has some limitations, such as the subjectively defined search criteria (keywords, document type, and language), which can affect the analysis results, as different criteria can provide different perspectives on the research field.

References

1. Ercan, F. (2019), *Smart tourism technologies: applications in hotel business, Theory and practice in social sciences*, ST. Kliment Ohridski University Press Sofia, 528–546.
2. Botilias, G.-P., Pachoulas, G., Margariti, S. V., Besarat, J., Salmas, D., & Stylios, C. (2022), Smart Tourism via Smart Phone—An Enhanced Approach, *2022 7th South-East Europe Design Automation, Computer Engineering, Computer Networks and Social Media Conference (SEEDA-CECNSM)*, Ioannina, Greece, 23–25.
3. Pérez, A. (2022), Smart Museums, Definition and presentation of a smart management model for museums.: Definició i presentació d'un model de gestió smart per a museus, *Tourism and Heritage Journal*, 4, 126–139.
4. Heebkhoksung, K., Rattanawong, W., & Vongmanee, V. (2023), Development of Smart Sport Tourism Model Based on Smart City Integrated with Sport Tourism Principles, *2023 8th International Conference on Business and Industrial Research (ICBIR)*, Bangkok, Thailand, 627–631.
5. Koo, C., Kwon, J., Chung, N., & Kim, J. (2023), Metaverse tourism: conceptual framework and research propositions, *Current Issues in Tourism*, 26(20), 3268–3274.

6. Faur, M., & Ban, O. (2019), Models of Tourism Destination Competitiveness, *Proceedings of the 39th International Business Information Management Association (IBIMA)*, 30–31.
7. Gretzel, U., Koo, C., Sigala, M., & Xiang, Z. (2015), Special issue on smart tourism: convergence of information technologies, experiences, and theories, *Electronic markets*, 25, 175–177.
8. Dalgıç, A., & Birdir, K. (2020), Smart hotels and technological applications. içinde Çeltek, E. (Der.), *Handbook of Research on Smart Technology Applications in the Tourism Industry*, 324–343.
9. Jeong, M., & Shin, H. H. (2019), Tourists' Experiences with Smart Tourism Technology at Smart Destinations and Their Behavior Intentions, *Journal of Travel Research*, 59(8), 1464–1477.
10. Paliwal, M., Chatradhi, N., Singh, A., & Dikkatwar, R. (2022), Smart tourism: antecedents to Indian traveller's decision, *European Journal of Innovation Management*, 27(17).
11. Buhalis, D., & Amaranggana, A. (2015), Smart Tourism Destinations Enhancing Tourism Experience Through Personalisation of Services, *In Information and Communication Technologies in Tourism 2015*, 377–389.
12. Buonincontri, P., & Micera, R. (2016), The experience co-creation in smart tourism destinations: a multiple case analysis of European destinations, *Information Technology & Tourism*, 16(3), 285–315.
13. Neuhofer, B., Buhalis, D., & Ladkin, A. (2015), Smart technologies for personalized experiences: a case study in the hospitality domain, *Electronic markets*, 25, 243–254.
14. Erdem, A., & Şeker, F. (2022), Tourist experience and digital transformation, *In Handbook of Research on Digital Communications, Internet of Things, and the Future of Cultural Tourism*, IGI Global, 103–120.
15. Mitala, A., Konstantoglou, A., Folinias, D., & Fotiadis, T. (2022), Smart Tourism Technologies: How Effective Are They for Millennial Tourists? *Transcending Borders in Tourism Through Innovation and Cultural Heritage: 8th International Conference, IACuDiT, Hydra, Greece*, 339–351
16. Sharma, S., & Rishi, O. (2022), IoT Enabled Smart Tourism (IoTeST): Tourism Service Dimensions, *In Rising Threats in Expert Applications and Solutions: Proceedings of FICR-TEAS 2022*, Springer, 643–654.
17. Kotis, K., Dimara, A., Angelis, S., Michailidis, P., Michailidis, I., Anagnostopoulos, C.-N., Krinidis, S., & Kosmatopoulos, E. (2022), Towards Optimal Planning for Green, Smart, and Semantically Enriched Cultural Tours, *Smart Cities*, 6(1), 123–136.
18. Tang, R., Huang, C., Zhao, X., & Tang, Y. (2022), Research on Smart Tourism Oriented Sensor Network Construction and Information Service Mode, *Sensors*, 22(24), 10008.
19. Pooja, C., & Shankar Gowda, B. (2022), SmartTour: A Blockchain-Based Smart Tourism Platform Using Improvised SHA, *Congress on Intelligent Systems, Third Congress on Intelligent Systems Lecture Notes in Networks and Systems*, 103–116.

20. Soulam, N. B., & Azdimousa, H. (2022), Smart Tourism Destinations as Complex Adaptive Systems: A Theoretical Framework of Resilience and Sustainability, *International Conference on Advanced Intelligent Systems for Sustainable Development*, 122–135.
21. Bartoli, E., Elmi, B., Pascuzzi, D., & Smorti, A. (2018), Gamification in tourism, *Psychology & Behavioral Science*, 8(3), 93–95.
22. Ferràs, X., Hitchen, E. L., Tarrats-Pons, E., & Arimany-Serrat, N. (2020), Smart tourism empowered by artificial intelligence: The case of Lanzarote, *Journal of Cases on Information Technology (JCIT)*, 22(1), 1–13.
23. Ji, Y., & Yin, J. (2022), Diffusion Characteristics and Driving Factors of the Smart Tourism City Policy—Event History Analysis, *Sustainability*, 14(11), 6685.
24. Huang, C. D., Goo, J., Nam, K., & Yoo, C. W. (2017), Smart tourism technologies in travel planning: The role of exploration and exploitation, *Information & management*, 54(6), 757–770.
25. Orden-Mejia, M., & Huertas, A. (2022), Analysis of the attributes of smart tourism technologies in destination chatbots that influence tourist satisfaction, *Current Issues in Tourism*, 25(17), 2854–2869.
26. Litavniece, L., Kodors, S., Adamoniene, R., & Kijasko, J. (2023), Digital twin: an approach to enhancing tourism competitiveness, *Worldwide Hospitality and Tourism Themes*, 15(5), 538–548.
27. Buhalis, D., Leung, D., & Lin, M. (2023), Metaverse as a disruptive technology revolutionising tourism management and marketing, *Tourism management*, 97, 104724.
28. Liberato, D., Liberato, P., & Nunes, M. (2022), Gamification and Storytelling Enhancing Successful Wine and Food Tourism Products, *International Conference of the International Association of Cultural and Digital Tourism*, Springer, 433–452.
29. Wang, X., Zhen, F., Tang, J., Shen, L., & Liu, D. (2021), Applications, Experiences, and Challenges of Smart Tourism Development in China, *Journal of Urban Technology*, 29(4), 101–126.
30. Xin, L., Qiao, G., Song, H., Huang, Z., & Ye, M. (2023), Gamification innovation: understanding industrial tourism products and tourist response, *Asia Pacific Journal of Tourism Research*, 28(3), 274–291.
31. Suanpang, P., Pothipassa, P., & Jittithavorn, C. (2024), Blockchain of things (BoT) innovation for smart tourism, *International journal of tourism research*, 26(2), e2606.
32. Olimpia, B. (2008), Variables of the image of tourist destination, *Annals of the University of Oradea*, 17(2), 559–564.
33. Font, X. (1997), Managing the tourist destination's image, *Journal of Vacation Marketing*, 3(2), 123–131.
34. Ziabina, Y., & Pimonenko, T. (2020), The Green Deal Policy for renewable energy: a bibliometric analysis, *Virtual Economics*, 3(4), 147–168.
35. Mayo, E. J. (1973), Regional images and regional travel behavior, *The travel research association fourth annual conference proceedings*, Sun Valley, Idaho, 211–218.

36. Chon, K. S. (1992), The role of destination image in tourism: An extension, *The Tourist Review*, 47(1), 2–8.
37. Huang, G. I., Karl, M., Wong, I. A., & Law, R. (2023), Tourism destination research from 2000 to 2020: A systematic narrative review in conjunction with bibliographic mapping analysis, *Tourism management*, 95, 104686.
38. Tavitiyaman, P., Qu, H., Tsang, W.-s. L., & Lam, C.-w. R. (2021a), The influence of smart tourism applications on perceived destination image and behavioral intention: The moderating role of information search behavior, *Journal of Hospitality and Tourism Management*, 46, 476–487.
39. Tavitiyaman, P., Qu, H., Tsang, W.-s. L., & Lam, C.-w. R. (2021b), Smart tourism application and destination image: mediating role of theory of mind (ToM), *Asia Pacific Journal of Tourism Research*, 26(8), 905–920.
40. Duong, T. T., and Nguyen, T. B. N. (2023), Research trends on the relationship between smart tourism technology and tourism destination image using bibliometric analysis, *Economy & Forecast Review*, 33 (1859-4972), 85–89.
41. Gutiérrez-Salcedo, M., Martínez, M. Á., Moral-Munoz, J. A., Herrera-Viedma, E., & Cobo, M. J. (2018), Some bibliometric procedures for analyzing and evaluating research fields, *Applied intelligence*, 48, 1275–1287.
42. Mohamed, B., & Marzouk, M. (2023), Bibliometric analysis and visualisation of heritage buildings preservation, *Heritage Science*, 11(1), 101.
43. Porter, A. L., Kongthon, A., & Lu, J.-C. (2002), Research profiling: Improving the literature review, *Scientometrics*, 53, 351–370.
44. Saher, L. Y., Vakulenko, I. A., Shevchenko, K., & Bondarenko, Y. (2022), Bibliometric and retrospective analysis on economic behavior for inclusive growth, *Financial Markets, Institutions and Risks*, 6(2), 102–111.
45. De Bruyn, C., Said, F. B., Meyer, N., & Soliman, M. (2023), Research in tourism sustainability: A comprehensive bibliometric analysis from 1990 to 2022, *Heliyon*, 8, p. e18874.
46. Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., & Brennan, S. E. (2021), Declaración PRISMA 2020: una guía actualizada para la publicación de revisiones sistemáticas, *Revista española de cardiología*, 74(9), 790–799.
47. Hwang, G. J., & Tsai, C. C. (2011), Research trends in mobile and ubiquitous learning: A review of publications in selected journals from 2001 to 2010, *British Journal of Educational Technology*, 42(4), E65-E70.
48. Wang, X., Lu, J., Song, Z., Zhou, Y., Liu, T., & Zhang, D. (2022), *From past to future: bibliometric analysis of global research productivity on nomogram (2000–2021)*, *Frontiers in public health*, 10, 997713.

49. Aria, M., & Cuccurullo, C. (2017), bibliometrix: An R-tool for comprehensive science mapping analysis, *Journal of informetrics*, 11(4), 959–975.
50. Della Corte, V., Del Gaudio, G., Sepe, F., & Luongo, S. (2021), *Destination resilience and innovation for advanced sustainable tourism management: A bibliometric analysis*. *Sustainability*, 13(22), 12632.
51. García Fernández, C., & Peek, D. (2023), *Connecting the Smart Village: A Switch towards Smart and Sustainable Rural-Urban Linkages in Spain*. *Land*, 12(4), 822.
52. Li, C., Xu, D., Law, R., & Liu, X. (2024), Cultural similarity and guest-host interaction for virtual tourism, *Journal of Hospitality and Tourism Management*, 58, 11–15.
53. Sthapit, E., Ji, C., Ping, Y., Prentice, C., Garrod, B., & Yang, H. (2024), Experience-driven well-being: the case of unmanned smart hotels. *International Journal of Contemporary Hospitality Management*, 36(13), 1–18.
54. Seo, J., Ko, H., & Park, S. (2024), Space Authentication in the Metaverse: A Blockchain-Based User-Centric Approach, *IEEE Access*, (99), 1–1.
55. Raffaghelli, J. E., Cucchiara, S., Manganello, F., & Persico, D. (2016), *Different views on Digital Scholarship: separate worlds or cohesive research field?* *Research in Learning Technology*, 24(1).
56. Deng, B., Wong, I. A., & Lian, Q. L. (2024), From metaverse experience to physical travel: the role of the digital twin in metaverse design, *Tourism Review*, 79(1).
57. Çiftçi, Ş. F., & Çizel, B. (2024), Exploring relations among authentic tourism experience, experience quality, and tourist behaviours in phygital heritage with experimental design, *Journal of Destination Marketing & Management*, 31, 100848.
58. Ballina, F. J., Valdes, L., & Del Valle, E. (2019), The Phygital experience in the smart tourism destination, *International Journal of Tourism Cities*, 5(4), 656–671.