Unveiling trends in digital tourism research: A bibliometric analysis of co-citation and co-word analysis

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ABSTRACT

Digital tourism has witnessed substantial evolution, shaping the trajectory of tourism research. Employing bibliometric analysis on 1,079 articles from the Web of Science database, this study identifies predominant themes and research trends in digital tourism. Key findings revealed three main co-citation clusters: 'Smart tourism destinations and smart tourists', 'Evolution and impact of E-tourism on travel behavior', and 'Personalized smart tourism experience'. Additionally, co-word analysis showcased prominent themes such as 'AR-Integrated E-Tourism', 'Co-creation of smart tourism destinations in China post-COVID-19′, and 'AI-driven personalized destination recommender systems in tourism'. The study highlights gaps in digital tourism research, advocating for socio-cultural preservation alongside tech advancements. Co-citation analysis suggests new travel theory directions, while AR's role in sustainable tourism is spotlighted. Practically, AI and Big Data emerge as pivotal in personalized experiences, with co-word analysis aiding industry foresight and emphasizing AI-driven, sustainable strategies. Limitations include reliance on a single database, suggesting future studies to integrate multiple sources and qualitative insights. The study's findings offer a roadmap for academics and practitioners, emphasizing potential avenues in digital tourism, especially in the context of sustainable and responsible practices.

1. Introduction

Digital tourism is the combination of economy, tourism and computer information technology, and is a comprehensive science and technology. The concept of digital tourism comes from "digital earth" and is an important part of digital earth science (Yuan et al., 2016). Since the 1980s, due to the development of information technology, e-commerce technology, "3S" technology remote sensing technology RS (Remote Sensing), geographic information systems (GIS), global positioning systems (GPS), and virtual reality technology, the realization of digital tourism has gradually become possible. Digital tourism is a tourism information service system based on the network environment (Preko et al., 2023). It is generally composed of key technologies, digital

information, and service objects, mainly including tourism management information, tourism product information, tourism marketing information, tourism service information and other aspects. At present, Google Earth and Virtual Earth3D based on Internet technology have been widely used (Roman et al., 2022).

Tourism information system is considered as the abbreviation of digital tourism. Luo et al. (2022) believes that with the practical application of electronic map and other technologies becoming increasingly mature, the digitization process of tourism information has been accelerated, and suitable tourism management information systems have been developed, mainly for tourism enterprises and government management departments, as well as digital management of tourism resources and information statistics. The combination of Internet

technology and large-capacity storage technology has further promoted the rapid development of digital scenic spots (Zhuang et al., 2022).

Given the growing importance of digital tourism, the purpose of this bibliometric study is to investigate its academic terrain. This method is essential for assessing the scope of academic contributions and identifying emerging trends in scholarly discourse. Through a comprehensive examination of publication trends, this study aims to outline the evolution of the digital tourism domain. In light of this context, the central question that guides this study is: What are the inherent thematic constructs, dominant subjects, and emerging areas in digital tourism research, and how might they steer future developments? Bibliometric perspectives provide a window into the evolution, current state, and future trends of digital tourism research, allowing for the identification of scholarly pathways, gaps, and influences. This methodology serves as a guidepost, allowing academics and industry professionals to stay abreast of developments, make prudent decisions, and enhance the collective understanding of digital tourism. The subsequent research objectives, derived from the bibliometric evaluations, provide the framework for this study:

1. To identify influential past research works and current prevalent themes in digital tourism using co-citation analysis.
2. To uncover thematic structures, dominant topics, and emerging areas in digital tourism research, aiming to forecast future directions and potential focal points using co-word analysis.

Bibliometric analyses, particularly co-citation and co-word analysis, have proven useful in determining the evolution and trajectory of scholarly research across disciplines. Researchers can visualize the overarching landscape of their field using these methodologies, pinpointing not only how ideas have evolved over time, but also how concepts intersect and interrelate (Yu et al., 2018b). For example, the landscape of Fuzzy Theory in China was studied for 30 years, revealing patterns and trends in its development (Yu et al., 2018a). Wider et al. (2023b) meticulously dissected another rapidly emerging field, the Metaverse. They identified influential publications, elucidated the knowledge structure, and forecasted future trajectories in the Metaverse using co-citation and co-word analysis. Similarly, the field of emerging adulthood in higher education was investigated, with a focus on psychological perspectives within higher education institutions and the development of a blueprint for its knowledge structure (Wider et al., 2023a). These analytical methodologies have also been applied in the domain of knowledge management in tourism and hospitality. Fauzi et al. (2023) embarked on a bibliometric journey that shed light on the historical, contemporary, and prospective pathways in knowledge management, while emphasizing pivotal contributions and emerging trends. Concurrently, the role of higher education institutions (HEIs) in the context of the United Nations' Sustainable Development Goals (SDGs) has been thoroughly mapped in order to identify the most relevant goals for these institutions (Fauzi et al., 2023a). Fauzi (2023b) also investigated the fascinating domain of dark tourism, conducting a bibliometric analysis that deconstructed its past, present, and projected trajectories. In essence, these studies demonstrate how co-citation and co-word analyses can be effective tools for understanding and charting the course of various academic terrains.

2. Literature review

The tourism industry has been transformed by digital tourism, which is driven by technological and internet advancements (Annamalah et al., 2023). The evolution of digital tourism can be traced to the rise of online travel agencies and the pervasive adoption of the Internet. The study conducted by Gössling (2021) offers insight into the evolution of virtual and augmented reality in tourism. The article explores how elements such as smartphones, augmented reality, virtual reality, big data, and AI/ML have transformed the virtual tourism experience. Digital technologies have substantially improved tourists' travel experiences. The use of mobile devices, social media platforms, virtual reality, augmented reality, and artificial intelligence has transformed various aspects of the travel experience. The study by Verma et al. (2022) examines the social, psychological, economic, and environmental outcomes of technological and ICT innovations in the tourism industry. In the context of tourism, the impact of technology on social networking, identity formation, mental function, learning, and consumer choices is examined. Numerous technological enablers propel digital tourism. The research conducted by Saura et al. (2020) emphasizes on key digital marketing strategies and developments in the digital tourism industry. It highlights Search Engine Optimization, Search Engine Marketing, Search Store Optimization, sentiment analysis, social media networks, remarketing, programmatic advertising, and influencer marketing as important digital marketing strategies within the digital tourism ecosystem.

Some researchers have employed quantitative techniques to examine the development models of tourism in the digital context. For instance, Wang (2022) developed a satisfaction evaluation model from the consumer's vantage point and identified the responsiveness to customer requirements as a weak link in rural tourism services. Similarly, Wang et al. (2022) conducted a questionnaire survey to analyze the mechanism of rural tourism digital poverty alleviation, emphasizing the widespread distribution of digital poverty across regions, villages, towns, and business households. In addition, Hu (2020) employed the DEA model to empirically assess the impact of digital technology on enhancing the efficiency of the tourism industry. Their findings demonstrated that digital technology could expand the cognitive boundaries of the tourism market and promote an all-encompassing efficiency transformation.

Moreover, several researchers have concentrated on developing digital tourism systems utilizing digital information technology and theoretical models. Miao et al. (2009), for instance, established a practical and operational evaluation system for digital tourism initiatives using the fuzzy analytic hierarchy process. Their work provided a method for evaluating digital tourism initiatives and a foundation for modifying their design. In addition, Huang et al. (2016) utilised virtual reality technology to integrate the content of the country, enterprises, consumers, technology, and other factors in order to develop a digital tourism system for Xinjiang's scenic areas. Meanwhile, Zeng et al. (2023) conducted a thorough analysis of digital tourism from the perspective of cultural consumption, highlighting its role in expanding spatial landscapes and integrating online and offline experiences. They highlighted its potential for augmenting consumption scenarios, user experiences, media and language communication. Lastly, Liang and Qi (2021) investigated the interactive growth of Huizhou sculpture culture and digital rural tourism. They created a cultural experience perception model, designed a tourism phone application, and analysed data gathered from online and offline user testing to enhance the tourism application.

In conclusion, the literature review focuses on the earliest research on digital tourism, including its conceptualization, integration with the digital economy, and the development of digital tourism systems. Both qualitative and quantitative research techniques have made significant contributions to the field in the past. In comparison to existing research on digital tourism, our study stands out by employing a meticulous bibliometric analysis. We go beyond traditional exploratory methodologies to highlight key publications, key contributors, and emerging trends in the domain. Our goal is to identify and highlight critical research gaps as well as potential avenues for future exploration and advancement through an in-depth exploration of the digital tourism literature landscape.

3. Methods

3.1. Bibliometric approach

The bibliometric research method, which is a science mapping technique, examines the relationships between academic disciplines, research fields, scholars, and papers (Jiang et al., 2019). This method has attracted significant scholarly interest due to its capacity to visually represent the structural composition of scientific fields by combining classification and visualization techniques (Chen et al., 2021). By applying statistical and mathematical methods to bibliographic data, researchers can identify patterns, trends, and relationships within the literature of a particular field or discipline (Pereira et al., 2023).

The primary goal of using a bibliometric approach is to gain a nuanced understanding of the characteristics, influence, and evolution of scientific publications, authors, journals, and research topics (Montalvo-Falcón et al., 2023). This study employs a bibliometric approach to offer a thorough review of publications related to digital tourism. Co-citation and co-word analysis are two prevalent bibliometric techniques that amplify the method's effectiveness. By employing both co-citation and co-word analysis, researchers can obtain a comprehensive perspective on the past, current, and potential future trajectories of a research field, such as digital tourism.

3.2. Stage 1: data collection

Our data collection was conducted using the Web of Science (WOS) databases, focusing specifically on the 'topic' field to search within titles, abstracts, and keywords of articles. The search was tailored to articles containing a comprehensive list of relevant terms, including "e-tourism" or "electronic tourism" or "digital tourism" or "online tourism" or "internet tourism" or "smart tourism" or "tourism e-commerce" or "tourism technolog*" or "tourism information system*" or "tourism website*" or "tourism destination website*" or "information technology and tourism" to zero in on the most pertinent research. This extensive query was designed to capture articles published from the inception of the WOS database until June 17, 2023. The WOS database was our platform of choice due to its renowned quality and reliability for bibliometric research (Yadav and Banerji, 2023; Birkle et al., 2020; Martín-Martín et al., 2021).

3.3. Stage 2: screening process

In our bibliometric study, a precise screening process was employed. We restricted our search to meso-level topics as indicated in the "Citation Topics Meso" column, ensuring the study was closely aligned with the selected keywords. Only articles were considered, excluding other types of publications. To maintain linguistic coherence, we confined our search to articles written exclusively in English. This rigorous selection criterion resulted in a compilation of 1,079 articles, all of which were deemed fit for a deeper bibliometric assessment. To streamline our data analysis, we employed version 1.6.18 of the VOSviewer software. A detailed breakdown of our data collection and screening process is presented in Table 1.

3.4. Stage 3: analyzing the data

The process of data analysis encompasses four primary procedures. Initially, a descriptive statistic was performed using the Web of Science (WOS) database in order to obtain pertinent descriptive analysis regarding the publication of articles. This analysis focused on three specific aspects: (1) The quantity of relevant papers, (2) The quantity of citations and self-citations, and (3) The value of the h-index. After completing the descriptive analysis, we examined the database using the VOSviewer software to conduct co-citation and co-word analysis. We adopted the full counting method for these analyses. As recommended

Table 1
Search string.

WoS Database	ALL
Time Period	Up to June 17, 2023
Search field	TOPIC
Search keywords	("e*tourism" or "electronic tourism" or "digital tourism" or "online tourism" or "internet tourism" or "smart tourism" or "tourism e-commerce" or "tourism technolog*" or "tourism information system*" or "tourism website*" or "tourism destination website*" or "information technology and tourism")
Citation Topics Meso	ALL
Document Type	Article
Languages	English

by Gauffriau (2021), full counting ensures that each author of a publication receives one credit, while fractional counting divides one credit among the publication's authors.

3.4.1. Co-citation analysis

Co-citation analysis is a bibliometric technique used to determine the 'intellectual kinship' between two documents (Fang et al., 2023). Using this method, two articles are deemed related if they are cited together in a third document. Over time, documents that are frequently co-cited form clusters that represent particular topics or themes in a research field (Dong, 2023). By generating co-citation networks, co-citation analysis can be used to identify the key documents and topics that have shaped digital tourism research (Li et al., 2023a). These networks graphically depict the relationships between documents, thereby facilitating the identification of the most influential works and prevalent topics in the field of digital tourism.

3.4.2. Co-word analysis

Co-word analysis is a bibliometric technique that evaluates the frequency and co-occurrence of keywords in a collection of documents (Dwivedi et al., 2023). It assumes that frequently occurring keyword combinations represent a specific research topic or theme (Narong and Hallinger, 2023). The following step entails generating a co-occurrence matrix and displaying the results as a co-word network or map. These visualizations can assist in identifying clusters of frequently co-occurring words, which represent the most prominent themes or topics in the digital tourism literature. In addition, by analyzing the emergence and expansion of particular keywords over time, researchers can identify new and emerging areas of digital tourism research. This data is useful for predicting future trends and potential areas of focus in the field.

4. Result and discussion

4.1. Trends in publication and descriptive analysis

A search of the Web of Science database yielded 23,675 citations for the selected articles (N = 1,079), of which 20,375 were without self-citations. With an H-index of 71, the average number of citations per article was 21.94. The compilation of 1,079 articles shows a rise in demand for studies related to digital tourism. Despite the fact that this research started in 1996, it wasn't until 2006 that significant advancements were made. Since that time, the volume of pertinent publications has grown dramatically. Fig. 1 shows the number of articles that were published and the number of citations from 1996 to 2023.

4.2. Co-citation analysis

The co-citation analysis was conducted using a citation threshold of 46, resulting in a total of 32 cited references. Fig. 2 displays a network analysis based on the provided sources. Table 2 displays the ten co-cited
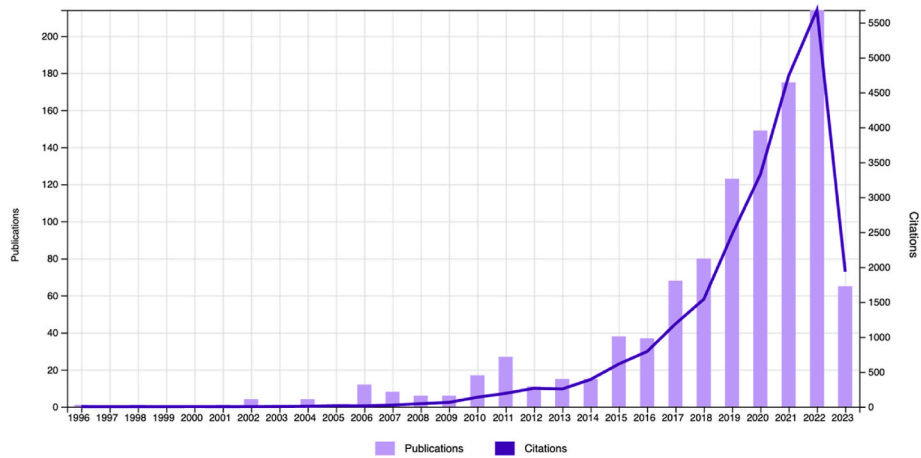
Fig. 1. Number of publications and citations between 1996 and 2023.
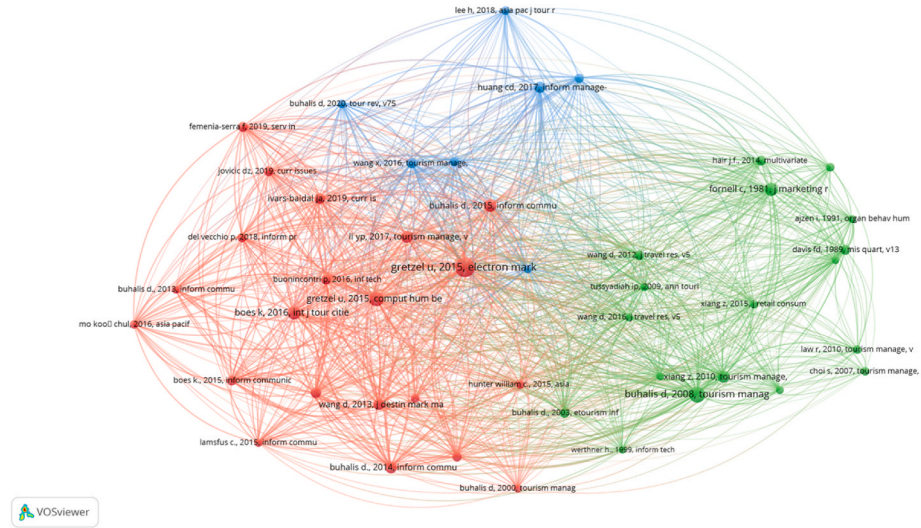(source: Web of Science)

Fig. 2. Co-citation analysis (VOSviewer visualization).

references with the highest total link strength. Gretzel et al. (2015a) received 221 citations, Gretzel et al. (2015b) received 115 citations, and Boes et al. (2016) received 99 citations.

The co-citation analysis has revealed three distinct clusters, each with its own thematic focus. These clusters represent groups of publications that share thematic similarities and are interconnected. Nodes of the same color are used to identify clusters of publications that share common topics. Each cluster is identified and characterized as follows:

- Cluster 1 (Red) includes 21 publications with the title "**smart tourism destinations and smart tourists**". The growing interest in smart tourism destinations (STDs) reflects a major shift in the tourism industry (Boes et al., 2016; Buhalis and Amaranggana, 2013; Jovicic, 2019). STDs, based on the smart city paradigm, harness Information and Communication Technologies (ICTs) not just to bolster competitiveness but to redefine the entire tourist experience (Buhalis, 2000; Gretzel et al., 2015b; Ivars-Baidal et al., 2019). They're not just passively providing information but actively engaging in real-time with tourists, offering immediate feedback mechanisms and adapting dynamically to visitor preferences. Beyond enhancing service delivery and fostering value co-creation, they signify a paradigm shift in addressing the ever-evolving needs of the modern traveler (Buhalis and Foerste, 2015; Buonincontri and

Micera, 2016; Li et al., 2017; Neuhofer et al., 2012). A consequential trend in this paradigm is the emergence of the "smart tourist". No longer just consumers of travel experiences, these tourists, equipped with a myriad of digital tools, actively partake in shaping their travel narratives (Femenia-Serra et al., 2019). Their interactions, preferences, and feedback are constantly recorded as 'big data', offering invaluable insights for destinations. This isn't just about enhancing a single trip but about refining the broader travel offering based on real-time data (Del Vecchio et al., 2018). This transition towards STDs isn't without challenges. As destinations strive to become 'smarter', there's an inherent challenge in seamlessly integrating technology into the travel experience without making it obtrusive or diluting the authenticity of the experience. Moreover, the industry risks homogenizing destinations, where each offers similar digital touchpoints, thereby eroding their unique socio-cultural essence. This underscores the need for a balance between technological progression and cultural preservation (Gretzel, 2011; Hunter et al., 2015). Concurrently, the shift demands a new approach to destination management, one that's not siloed but integrated, fostering collaborations and harnessing the power of network structures (Del Chiappa and Baggio, 2015; Koo et al., 2016).

- Cluster 2 (Green) contains 18 publications on the "**evolution and impact of E-tourism on travel behavior**". E-tourism, made possible

Table 2
The top 10 documents based on their co-citation and total link strength.

No.	Documents	Citation	Total link strength
1	Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015a). Smart tourism: foundations and developments. *Electronic markets, 25*, 179–188.	221	1436
2	Gretzel, U., Werthner, H., Koo, C., & Lamsfus, C. (2015b). Conceptual foundations for understanding smart tourism ecosystems. *Computers in Human Behavior, 50*, 558–563.	115	936
3	Boes, K., Buhalis, D., & Inversini, A. (2016). Smart tourism destinations: ecosystems for tourism destination competitiveness. *International Journal of Tourism Cities, 2*(2), 108–124.	99	849
4	Buhalis and Amaranggana (2015). Smart tourism destinations enhancing tourism experience through personalization of services. In *Information and Communication Technologies in Tourism (2015): Proceedings of the International Conference in Lugano, Switzerland, February 3-6, 2015* (pp. 377–389). Springer International Publishing.	90	695
5	Wang, D., Li, X. R., & Li, Y. (2013). China's "smart tourism destination" initiative: A taste of the service-dominant logic. *Journal of Destination Marketing & Management, 2*(2), 59–61.	69	643
6	Buhalis and Law (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. *Tourism management, 29*(4), 609–623.	144	637
7	Buhalis, D., & Amaranggana, A. (2014). Smart tourism destinations. In *Information and Communication Technologies in Tourism (2014): Proceedings of the International Conference in Dublin, Ireland, January 21-24, 2014* (pp. 553–564). Springer International Publishing.	81	604
8	Buonincontri and Micera (2016). The experience co-creation in smart tourism destinations: a multiple case analysis of European destinations. *Information Technology & Tourism, 16*, 285–315.	53	582
9	Li, Y., Hu, C., Huang, C., & Duan, L. (2017). The concept of smart tourism in the context of tourism information services. *Tourism management, 58*, 293–300.	81	576
10	Ivars-Baidal, J. A., Celdrán-Bernabeu, M. A., Mazón, J. N., & Perles-Ivars, Á. F. (2019). Smart destinations and the evolution of ICTs: a new scenario for destination management? *Current Issues in Tourism, 22*(13), 1581–1600.	61	574

Source: Author interpretation based on VOSviewer analysis

by the proliferation of digital technology, is more than just a shift from traditional tourism operations to electronic platforms; it is a paradigm shift that has redefined the traveler's journey (Buhalis, 2003). The essence of this transformation is found not only in the adoption of technology, but also in the modification of traditional tourist decision-making processes (Ajzen, 1991; Venkatesh et al., 2003; Davis, 1989). The significance of websites and online platforms extends beyond mere information dissemination. They actively shape destination perceptions, shape travel aspirations, and make trip planning more seamless (Choi et al., 2007). Advances in Internet accessibility and mobile technology have accentuated this transformation, imbuing tourism with a sense of fluidity and spontaneity (Buhalis and Law, 2008; Law et al., 2014). Smartphone accessibility has not only democratized information access, but has also accelerated the emergence of 'smart tourism destinations', where real-time information and immersive experiences converge (Wang et al., 2013; 2016). The rise of social media platforms has enriched the landscape of E-tourism. These platforms, which are rich in shared narratives and user-generated content, not only inform but

also have a profound influence on travel decisions (Leung et al., 2013; Xiang and Gretzel, 2010; Tussyadiah and Fesenmaier, 2009). Thus, the trajectory of E-tourism has not only reshaped contemporary travel behavior, but it also holds the promise of continuously revolutionizing it in tandem with technological evolutions, introducing nuanced dynamics in the travel domain.

- Cluster 3 (Blue) contains seven publications. These publications show an increased emphasis on **personalized smart tourism experience.** This paradigm shift demonstrates the symbiotic relationship that is developing between technology and tourism. According to the research, technology platforms enable dynamic interconnections and instantaneous information exchange related to tourism activities (Buhalis and Amaranggana, 2015). This immediacy has given rise to massive datasets, dubbed Big Data, which reveal discernible patterns when subjected to computational analysis. As a result, smart tourism destinations are leveraging this data to provide optimal, tailor-made services that resonate with tourists' specific preferences and desires. According to Buhalis (2020), the evolution of tourism technology has been marked by a progression from traditional Information Communication Technologies (ICTs) to the realms of E-tourism and smart tourism. This evolution emphasizes the essence of ambient intelligence in tourism experiences, which is characterized by the seamless integration of disruptive technologies to provide highly personalized, context-sensitive services. Such integration changes the structure, processes, and practices of the industry, having a significant impact on service innovation, strategy, and competitiveness. An examination of the mechanisms underlying smart tourism technologies—which include travel websites, social platforms, and smartphones—shows that they have the potential to transform travel satisfaction (Huang et al., 2017). These technologies go beyond simply optimizing processes to create personalized travel experiences, most notably through their informativeness, interactivity, and personalization. Such characteristics not only improve overall travel satisfaction but also influence the intention to return (Jeong and Shin, 2020; Lee et al., 2018). Simultaneously, in this competitive landscape, the pressing need to gauge and comprehend the diverse needs of tourists is becoming paramount. Advanced smart technologies are being used to create experiences that are both memorable and personalized. In this context, Neuhofer et al.'s (2015) case study is particularly illuminating, demonstrating the promise of these technologies in the hospitality sector. It emphasizes the importance of understanding the intricate needs of tourists and, as a result, the importance of bespoke services.

Table 3 summarizes the digital tourism co-citation analysis, which includes cluster labels, the number of publications, and representative publications.

4.3. Co-occurrence of keyword

For each of the 64 identified keywords, a minimum of 22 occurrences were found. The co-word analysis revealed that "smart tourism" appeared 252 times, making it the most used keyword. "Model" and "technology" were second and third, with 121 and 110 occurrences, respectively. The top 15 co-occurring keywords are shown in Table 4. Fig. 3 shows the network structure of keyword co-occurrences, which is composed of three separates but seemingly connected clusters. The following characteristics of each cluster are assessed and discussed:

- Cluster 1 (Red): This cluster, titled **"AR-Integrated E-Tourism"**, contains 26 keywords. One transformative trend emerging in the context of digital tourism is the integration of AR in e-tourism platforms, reshaping customer experience and destination image perception in significant ways. While the potential of this technological revolution is vast, its success hinges on the widespread

Table 3

Co-citation clusters of digital tourism.

Cluster	Cluster label	Number of publications	Representative publications
1 (Red)	Smart tourism destinations and smart tourists	21	Boes et al. (2016); Buhalis and Amaranggana (2013); Buhalis (2000); Buhalis and Foerste (2015); Buonincontri and Micera (2016); Del Chiappa and Baggio (2015); Del Vecchio et al. (2018); Femenia-Serra et al. (2019); Gretzel (2011); Gretzel et al. (2015b); Hunter et al. (2015); Ivars-Baidal et al. (2019); Jovicic (2019); Koo et al. (2016); Li et al. (2017); Neuhofer et al. (2012).
2 (Green)	Evolution and impact of E-tourism on travel behavior	18	Ajzen (1991); Buhalis (2003); Buhalis and Law (2008); Choi et al. (2007); Davis (1989); Law et al. (2010); Law et al. (2014); Leung et al. (2013); Tussyadiah and Fesenmaier (2009); Venkatesh et al. (2003); Wang et al. (2013); D. Wang et al. (2016); Xiang et al. (2015); Xiang and Gretzel (2010).
3 (Blue)	Personalized smart tourism experience	7	Buhalis and Amaranggana (2015); Buhalis (2020); Huang et al. (2017); Jeong and Shin (2020); Lee et al. (2018); Neuhofer et al. (2015); X. Wang et al. (2016).

Source: Author's interpretation derived from VOSviewer analysis

Table 4

Keyword co-occurrence analysis top 15 keywords.

Rank	Keyword	Occurrences	Total link strength
1	Smart tourism	252	826
2	Model	121	488
3	Technology	110	433
4	Social media	98	402
5	Internet	93	398
6	Management	89	388
7	Tourism	139	385
8	Satisfaction	85	377
9	Information	81	365
10	Foundations	80	359
11	Hospitality	68	351
12	Travel	72	342
13	Information-technology	57	282
14	Impact	76	273
15	Co-creation	45	237

acceptance and adoption of AR technologies as a new standard in e-commerce and tourism services (Reinhold et al., 2022; Saif et al., 2021; Schweidel et al., 2022). However, it's pivotal to consider potential barriers, especially among segments less familiar with technological advancements. Augmented reality, by providing immersive previews of destinations, is undeniably redefining the traditional tourism experience (Verma et al., 2022). Yet, a lurking concern is whether such previews might set lofty expectations, sometimes overshadowing the tangible allure of the destination. Tourists can virtually explore attractions, aiding in pre-trip information search, planning, and decision-making (Ozdemir et al., 2023). This accessibility, while enhancing user perceptions of service quality and overall satisfaction, has the potential to alter the very essence of tourism: spontaneous exploration and unfiltered discovery (Sia et al., 2022; Yu et al., 2023). AR tools, with their interactive elements, may foster trust and a sense of connection to the destination, but there's a parallel necessity to ensure that these tools don't distort or overly idealize a destination (Oncioiu and Priescu, 2022). The performance of AR-integrated systems, while closely tied to the quality of digital content, platform usability, and personalization levels (Arena et al., 2022), also runs the risk of creating a 'bubble' effect if over-personalized, potentially limiting tourists' horizons. Furthermore, in our digital age, while customer reviews enhanced with AR visuals can impact destination image and satisfaction (Zhu et al., 2022), it's crucial to ensure that these enhancements don't overshadow lesser-known but equally enriching destinations. This technological paradigm shift, brimming with opportunities for the tourism industry, necessitates a balanced approach, ensuring that
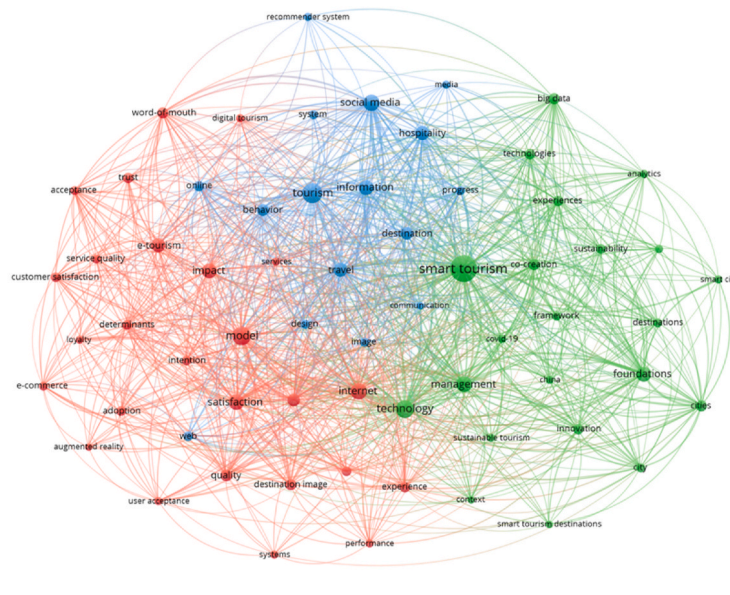

Fig. 3. Co-word analysis of digital tourism (VOSviewer visualization).

continuous AR improvements don't compromise the authentic allure of travel experiences.

- Cluster 2 (Green): This cluster, encompassing 22 keywords, delves deep into the topic of "**co-creation of smart tourism destinations in China post-COVID-19**". The sweeping global implications of the COVID-19 pandemic, paired with the rise of the fourth industrial revolution, have intensified the integration of smart solutions and digital platforms into the tourism sector, especially in China. This integration is not just about leveraging technology; it's about revitalizing the industry post-pandemic through co-created smart tourism destinations, where tourists actively participate in shaping their experiences. Rooted in the smart city concept, these destinations morph into technologically-enabled hubs. Harnessing advanced analytics, big data, and other innovative technologies, these hubs focus on optimizing visitor experiences while enhancing destination management (Rodrigues et al., 2023). Digital platforms play a critical role by offering unparalleled data collection opportunities, shedding light on tourist behavior and preferences in specific contexts (Tse et al., 2023). This data richness facilitates the crafting of more personalized and sustainable tourism experiences. The co-creation approach, leveraging the insights from the data, not only elevates visitor experiences but also spurs innovation, aligns with sustainability, and places emphasis on resilience (Buhalis et al., 2023). The pandemic underscored adaptability's paramount importance. As such, smart tourism destinations in China are now designed to anticipate and mitigate challenges. The fusion of predictive analytics, crisis management, and digital technologies ensures the sector's swift response and recovery from potential disruptions, echoing the lessons from the pandemic and the overarching need for sustainable and resilient tourism infrastructure (Sharifi et al., 2021).
- Cluster 3 (Blue): This cluster of 16 keywords is dedicated to the topic of "**AI-driven personalized destination recommender systems in tourism**". This cluster, featuring 16 keywords, revolves around the theme of "AI-driven personalized destination recommender systems

in tourism." As we transition into an era dominated by the fourth industrial revolution, the global tourism industry is witnessing a transformative shift. The foundation of this metamorphosis is laid by innovations in AI, big data, the Internet of Things (IoT), communication technologies, and web design, which collectively redefine how travelers select and experience their destinations (Li et al., 2023; Shaikh, 2022). Online travel and hospitality platforms are increasingly leveraging advanced recommender systems, a culmination of AI and machine learning progress, to deliver tailored and user-focused travel recommendations (Sia et al., 2023). Beyond merely using behavioral data harvested from platforms like social media, these systems utilize intricate algorithms that parse vast information reservoirs from diverse sources, offering insights and suggestions meticulously aligned with individual preferences, covering destinations, accommodations, and attractions (Pradeep and Muytenbaeva, 2023; Zhang et al., 2021). But the intelligence of these systems doesn't end with personalization. Equipped to monitor global travel patterns and local happenings, they can suggest destinations that are both trending and timely (Quijano-Sánchez et al., 2020). Moreover, the advent of these AI-driven tools isn't restricted to enhancing individual voyages; they have broader societal implications. For instance, in the context of smart cities, these recommender systems are envisioned as potent instruments to augment citizen experiences, streamline urban challenges, and inform effective decision-making. In this landscape, the intertwining of AI with heritage tourism in Asia or the considerations of privacy in the context of augmented reality (AR) and big data analytics (BDA) apps only underscore the expansive horizon of AI's impact on global tourism and urban development.

Table 5 presents a concise overview of the co-word analysis conducted for the domain of digital tourism. It includes cluster labels, the count of keywords, and representative keywords.

5. Implications

5.1. Theoretical implications

Research on digital tourism is of great significance to both scholars and professionals in the tourism industry. By conducting research on digital tourism, scholars can better understand the current state of the field, identify research trends and gaps, review the impact of research, and build evidence-based decision-making. This can greatly contribute to the advancement of digital tourism knowledge, and help professionals and customers stay abreast of the latest developments, make informed decisions, and improve the traveler experience. The theoretical implications include three domains. The study's identification of research voids in digital tourism, such as the need for a more comprehensive investigation into specific tourism formats and a deeper examination of the social and cultural implications of digital tourism, highlights areas for future research and theoretical development. This underscores the importance of finding a balance between technological advancements and preserving the socio-cultural fabric of tourist destinations (Amoiradis et al., 2021; Rahmoun and Baeshen, 2021). Second, the study's utilization of co-citation analysis has the potential to advance the creation of a novel theoretical framework for understanding travel choices and tourism behaviors. This framework could introduce fresh perspectives and dynamics into the digital tourism and travel domain, such as the information trust in social media and user-generated content (Kitsios et al., 2022). Third, this study informs broader debates in the fields of tourism and digital economy about the role of AR-Integrated E-Tourism in shaping sustainable and responsible tourism practices (Kononova et al., 2020). Such technology can have a significant impact on destination image and customer satisfaction (Kazandzhieva and Santana, 2019).

Table 5
Co-word analysis on digital tourism.

Cluster No and colour	Cluster label	Number of keywords	Representative Keywords
1 (Red)	AR-Integrated E-Tourism	26	Acceptance, adoption, augmented reality, customer satisfaction, destination image, determinants, digital tourism, e-commercec, e-tourism, experience, information-technology, intention, internet, loyalty, model, perceptions, performance, quality, satisfaction, service quality, services, systems, trust, user acceptance, word-of-mouth
2 (Green)	Co-creation of smart tourism destinations in China post-COVID-19	22	Analytics, big data, China, cities, co-creation, context, COVID-19, destinations, experiences, foundations framework, innovation, management, smart city, smart tourism destination, sustainable tourism, technologies
3 (Blue)	AI-driven personalized destination recommender systems in tourism	16	Behaviour, communication, design, destination, hospitality, image, information, media, online, progress, recommender system, social media, system, tourism, travel, web.

Source: Author's interpretation derived from VOSviewer analysis

5.2. Practical implications

The study of digital tourism helps to identify emerging technologies and trends that are likely to shape the future of tourism, enabling researchers and practitioners to prepare for and adapt to these changes. There are three practical implications of studying digital tourism. First, the study's recognition of influential prior research and contemporary dominant trends within digital tourism, encompassing the utilization of cutting-edge technologies like Artificial Intelligence, the Internet of Things, and Big Data to provide customized and personalized services, offers valuable insights for steering future research and advancement in the realm of digital tourism. This perspective is focused on enriching tourist experiences and meeting the specific needs and preferences of travelers (Pencarelli, 2020). Second, the co-word analysis used in this study can serve as a useful tool for researchers and practitioners to systematically analyze issue on digital tourism and identify knowledge gaps. Especially, smart tourism destinations are being designed with resilience in mind of the sector for adapting to and recovering from future disruptions such as the COVID-19 pandemic more quickly (Paliwal et al., 2022). Third, the coordination of smart tourist and knowledge ecosystem contributes to the generation of massive amounts of social big data. Symbolic Convergence Theory suggests that when individuals share stories and symbols, it can lead to the development of a collective consciousness or a sense of community among tourists (Gyimóthy, 2013). This shared understanding can impact their decisions, behaviors, and choices related to digital tourism destinations. It can also influence how destinations market themselves and manage their online presence to align with the emerging symbolic convergence (Nugraheni et al., 2020). The study's findings can inform the development of digital tourism systems and strategies that are more sustainable and socially responsible based on the integration of AI and big data so for providing personalized travel recommendations.

6. Conclusion, limitations and future avenues

Our study distinguishes itself in the expansive field of digital tourism research by employing a rigorous bibliometric analysis. Unlike many conventional studies that employ exploratory methodologies, our approach is more in-depth, identifying key publications, identifying pivotal contributors, and identifying emerging trends in the industry. This methodology has enabled us to identify and emphasize critical research gaps while illuminating possible future research directions. Through this in-depth examination of the digital tourism literature landscape, we hope to provide academics and industry professionals with a comprehensive and insightful road map for the field.

As evidence of our methodological rigor, our co-word analysis highlights the transformative roles of AR, AI, and co-creation techniques. Cluster 1 illuminates, for instance, the nuances of AR's impact on e-tourism platforms. Subsequently, Cluster 2 and Cluster 3 explore the post-COVID-19 era's evolving dynamics and the profound impact of AI on personalized tourism experiences. Similarly, our co-citation analysis enriches the discourse by highlighting significant academic discussions and interrelationships between frequently used keywords. These discussions traverse a broad spectrum, from the concept of Smart Tourism Destinations to the ever-evolving nature of E-tourism and the promising prospects of personalized smart tourism experiences.

Notwithstanding its valuable contributions, the study is not without its limitations. In the current investigation, we exclusively employed articles that were indexed in the WOS database. Alternative databases, such as Scopus and Google Scholar, could potentially yield divergent outcomes, potentially encompassing a greater number of indexed publications (Mongeon & Paul-Hus, 2016). Notwithstanding this constraint, it is widely posited that the choice to exclusively utilize the WOS database has constrained the quantity of publications indexed in esteemed journals, with a potential trade-off in terms of quality (Fauzi, 2022). Future research can expand the analysis to include multiple databases. A more qualitative approach can also provide deeper insights into the identified thematic areas. Additionally, the study reveals a need for more research focusing on digital tourism in developing regions, presenting an opportunity for future exploration in this area.

Nonetheless, this bibliometric investigation significantly enhances the digital tourism literature, offering researchers and practitioners valuable insights and potential directions. As technology continues to shape the tourism sector, future research should consider incorporating diverse databases and advanced text-mining techniques for more nuanced analysis. Investigating emerging technologies like immersive technology (AR, VR, etc.), the Internet of Things (IoT), and AI could provide exciting avenues for further research. Moreover, understanding the societal, ethical, and environmental implications of digitalization in tourism should be a priority for future investigations.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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