

Future-Proofing Tourism: Artificial Intelligence & Innovation. A Bibliometric Analysis

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Abstract. *Tourism represents an essential component in nowadays economic, social and cultural environment, a subject that has been tackled by many researchers. Due to the changing environment, the tourism industry is impacted by many changes and aspects including artificial intelligence and innovation. These two key elements are transforming tourism by enhancing personalized experiences, optimizing travel planning, and creating smarter, more sustainable destinations for the future. Even though there has been a lot of focus on this topic, the relationship between these was not deeply investigated. This article aims to address the gap by determining a starting point of the linkage between tourism, artificial intelligence and innovation and their future together. Through analyzing existing literature and applying a bibliometric analysis, the study examines 256 specific scientific papers from the Scopus database on this topic. The metadata is examined through VOSviewer software by creating co-occurrence and co-citations of journals, authors, articles and keywords. The outcome of data shows a significant increase in the scientific literature. The methodological framework has four stages related to the collection of data, examination of data, representation of data and interpretation of data. The findings acknowledge the topic's complexity by presenting a thorough analysis of the scientific framework, delivering valuable insights for stakeholders, and emphasizing crucial directions for future research that require further exploration.*

Keywords: tourism, artificial intelligence, innovation, VOSviewer, bibliometric analysis.

Introduction

The tourism industry is one of the fastest-growing industries worldwide, being also one of the major job sources at around 10% of the global workforce and one of the top export earners. For some countries, tourism means essential business and the backbone of the economy (Bijlani, 2021). As per UNWTO, in 2024 Tourism direct GDP reached an estimated 3.4 trillion USD, equivalent to 3% of global GDP. This data reflects a total recovery of the industry after the COVID-19 pandemic, when more than 74% of the business were forced to shut down. According to Trono (2024), the world crisis pointed out the vulnerability of the tourism industry, and the stringent need for recovery plans through innovation and digital transformation. As a consequence, the context of the pandemic has led to rapid implementation of artificial intelligence, virtual reality and robotics in the tourism industry (Kumar et al., 2024). Recent studies have pointed out that increase of customer satisfaction (Correia et al., 2024), operational optimization, cost optimization, sustainability, cultural preservation (Allal-Chérif, 2022), destinations innovation (Wang et al.,

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2025) and new product development are just some of the reasons why Artificial Intelligence and digital innovation tools are mandatory to be applied. Researchers have recently started to approach the concept of future-proofing tourism through Artificial Intelligence and Innovation. The growing academic interest is revealed in the present study, which presents a bibliometric analysis of 256 scientific papers from the prestigious database Scopus. Considering the low number of works but also the recent focus on the topic, one can conclude that the literature hasn't been extensively explored. A similar study has been completed by Knani et al. (2022), when a bibliometric analysis of Artificial intelligence in tourism and hospitality was performed. Conducting a bibliometric analysis is extremely important for both the business sector and academia, to get a complete overview of the existing literature.

As such, the current paper is structured as follows: the first part refers to creation of a scientific context, a background of the topic with specific orientation towards other studies and theoretical background. The second part tackles the construction of the methodology together with the creation of bibliometric analysis. In the last part of the article, the results/discussions and conclusions are developed. With the help of the software Vosviewer, co-occurrence and co-citation analysis have been carried out to obtain responses to the following research questions:

Q1: Who are the main contributors in terms of scientific articles, journals, and scientific authors, that address the topic of artificial intelligence and innovation in the tourism industry?

Q2: What are the most frequently used keywords concerning artificial intelligence and innovation in tourism and how these topics have evolved over time?

Although the analysis is comprehensive, there is a need to repeat the study in order to monitor the developments in the literature on this topic.

Theoretical background

Artificial Intelligence is defined as a branch of computer science that aims to create machines capable of intelligent behavior (Khan, 2024). The concept of Artificial Intelligence was used around 1950, when it was established as an academic discipline (Haenlein & Kaplan, 2019). It is only recently that AI entered the business environment and into the public eye.

The reason for this is the progress made recently in storage of data and computing power. Artificial Intelligence finds its application in many different sectors such as health care, automotive, marketing and finance, space exploration, psychology, education and the tourism sector is not an exception (Doborjeh et al., 2022). The contributions brought by the study developed by Doborjeh et al. (2022) refer to the different AI methods used in hospitality and tourism as well as their applications such as Virtual reality, Augmented Reality, Automation and Robotics, various types of chatbots such as virtual assistants. Finally, the previously mentioned study reviews also the efficiency of different AI methods in the tourism industry and gives directions for future research.

According to Samara et al. (2020) the adoption of Artificial Intelligence into tourism business and industry is critical for competitiveness and resilience. Artificial Intelligence acts transformative on the tourism business, changing the traditional way of work through automation of tasks (e-tickets, online bookings, online check-in, chatbots, etc). The Samara et al. (2020) study concludes that the implementation of AI can create value in four areas (Forecasting to anticipate demand, production at lower costs and higher quality, better promotion of services with a better targeting of customers and an overall increase of customer satisfaction). In their study Knani et al. (2022), it is revealed that AI helps personalize the tourist experiences and improves the decision-making process so that better experiences can be provided.

The present literature on the connection between innovation and development of sustainability is situated on a growing scale and these terms are considered to be the key factors for future business proofing (Ahmad et al., 2022). Sustainable innovation has various definitions given by numerous scholars including the one from Boons et al. (2013) which state that such a culture fosters sustainable performance. An essential part of today's business environment is the organizations' strategy regarding the subject of artificial intelligence and innovation. It is considered by Jin et al. (2019) that organizations which develop a strategy for sustainability will secure in the future their competitiveness on the market. Nowadays, sustainability cannot evolve without innovation and more precisely the growth of innovation culture. It was argued in recent studies carried-out by Linnenluecke et.al (2010) and Shevchenko et al.(2016) that there should be a mixture between innovation culture, and sustainability orientation in designing the organization' innovative performance. As such, the creation of a sustainability-oriented innovation culture is indispensable for highlighting the idea that sustainability should not be seen as something optional but rather embedded in the culture (Jin et al., 2019). Based on their research, the authors concluded that a higher sustainability orientation of the organizations is correlated with higher innovation culture as well as the fact that innovation culture together with the outcomes are influenced by it. Sustainability-led-innovation has been defined as a concept in which it is promoted the creation of new products, services and markets that are operated based on social-economic-environmental-ethical implications (Brezovec, A., 2013). In a paper developed by Seebode et al. (2012), there has been researched a concept in which innovation development led to the appearance of a sixth wave process. In this, sustainability is seen as the next wave of innovation, the 6th one (Silva & Di Serio, 2016). Therefore, the authors consider that sustainability represents the new form of innovation.

Fundamentally, the presence of this notion appears in many domains including in the tourism industry. The concept of sustainable tourism represents a very hot topic situated on a growing trend that begins to generate interest in literature based on the benefits associated with it such as: economic growth and development, keeping a balance between production, resources, and nature (Murcia et al., 2017). Based on the research carried out by Santos et al. (2021), the authors concluded that the existing research which tackle sustainability are more numerous than the ones about innovation as well as the idea that few papers address both sustainability and innovation simultaneously. Innovation in tourism is defined by the World Tourism Organization (2024) as a “collaborative action between governments, academia, corporations, micro, small and medium enterprises (MSMEs) and start-ups, investors, supporting business partners (accelerators, incubators, etc.) and other stakeholders” (World Tourism Organization, 2024).

Moving to the relationship between tourism and tourism' organizations, due to AI's rapid transformation of corporate processes, travel organizations need to rethink their innovative strategies. Firms from the tourism industry are guided through procedures and effective risk management, optimizing resource allocation while enhancing communication, automation, and overall operational efficiency. Now organizations can adapt to competitive marketplaces and achieve continuous innovation and advancement because of this change, especially the ones from the tourism industry (Liu, 2024).

This technology is vital for improving creativity, particularly through the cultivation of unique, organizational talents for boosting travel experiences. AI re-fashions specify and localize operations which are both sustainable over time and generate competitive advantages in a strategic environment in flux (Kemp, 2023). Moreover, it hastens tourism product development, optimizes R&D, and improves decision-making using data analytics, all contributing to the tourism

innovation process. It minimizes the risk and cost of innovation and ensures overall product quality and reliability over the life of the tourism experiences (Rout et al., 2024).

Moreover, the partnership on AI, a coalition of academic, nonprofit and business partners, emphasizes the importance of raising public awareness and promoting the beneficial use of technology in many industries, including tourism (Heer, 2024). This also involves the exchange of information betterment between AI systems and office working humans, building trust by clarifying roles that enhance corporate performance (Chowdhury et al., 2024). It enables businesses to enhance innovation activities and operational capacity and as such helping all of the stakeholders involved.

AI can also assist innovation managers through the improved analytics of innovation in tourism. This enables organizations to enhance the development of travel services and retain competitiveness (Kakatkar et al., 2024). As automation takes hold, companies are increasingly adopting open innovation models via partnerships to ensure continuous adaptability and growth.

Collaborative travel networks, particularly through AI-based platforms, accelerate knowledge exchange and discovery within innovative ecosystems. These platforms allow firms to pursue sustainable innovations by increasing their access to external capabilities and resources, which can provide a foundation for the development of green and sustainable travel services (Mercier-Laurent, 2024; Melander, 2024). Successful stories of tourism innovation are often a byproduct of collaborative and competitive cooperation.

Methodology

To compile existing knowledge on the two topics “Artificial Intelligence” and “Innovation” in the tourism industry, a bibliometric analysis has been performed. Bibliometric analysis is a popular quantitative research method applied to analyze existing literature with the aim of helping researchers identify trends, influences and collaborations but also to identify any research gaps and to offer new research directions. For this purpose, the four-step bibliometric analysis process outlined by Donthu et al. (2021) has been applied.

1. Definition of the research questions that guide bibliometric analysis
2. Data collection referring to gathering of relevant data
3. Data analysis
4. Data interpretation and evaluation

In order to answer the article’s research questions, RQ1: Who are the main contributors in terms of scientific articles, journals, and scientific authors, that address the topic of artificial intelligence and innovation in the tourism industry ? RQ2: What are the most frequently used keywords concerning artificial intelligence and innovation in tourism and how have these topics evolved over time? , we used the database of scientific articles of Scopus. We used Scopus because of the relevant number of journals found on the topic, their quality and the quality of results that emerge from their analysis. To find the relevant articles we have applied several criteria in the search engine of the database. We used the main keywords “Artificial Intelligence AND Innovation AND Tourism” in our search by title and selected as timeframe articles from 2006 until 2025.

Further we selected only those articles written in English, resulting in 249 articles. The next step was to select document types such as “articles” and “reviews” by title which led us to 108 findings. We narrowed down our selection by selecting subjects’ areas such as “Business”, “Management and Accounting”, “Computer Science”, “Social Sciences”, “Environmental Science”, “Psychology”, “Economic, Econometrics and Finance”, resulting in 101 findings. For

the next step, “data analysis”, we chose VOSviewer, a software tool for constructing and visualizing bibliometric networks. The database of the 101 findings created in Scopus based on the above-mentioned criteria was analyzed and visualized with VOSviewer. Mappings of co-authorship, co-citation and as well as co-occurrence networks have been created based on the downloaded data. The database was extracted in December 2024. The complete research framework is illustrated in Figure 1.

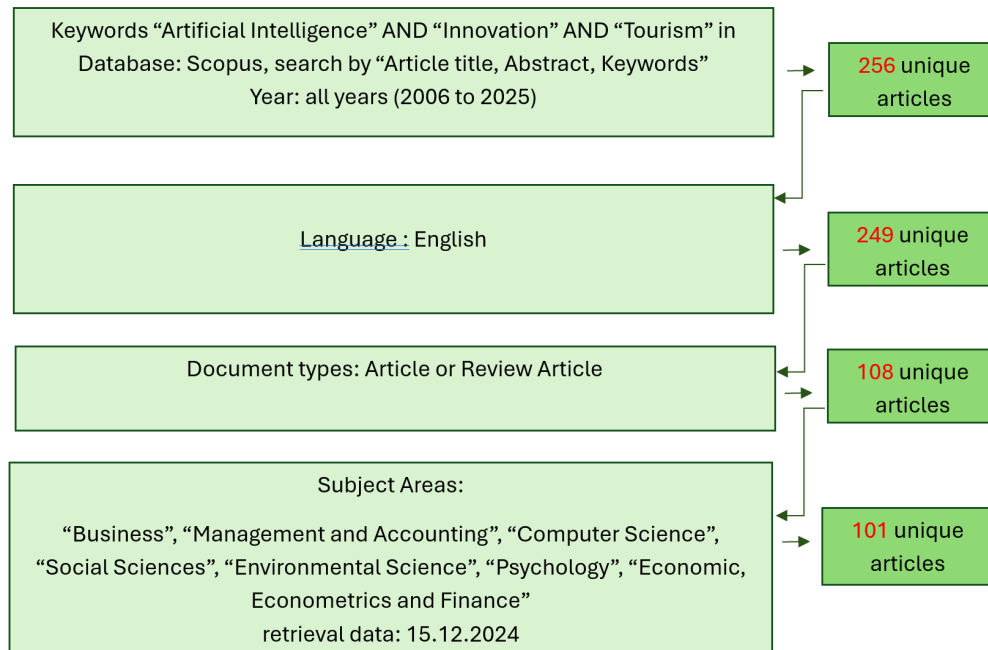


Figure 1. Process of selection of data

Source: Author’s own research.

Co-citation technique helps to identify, map and visualize the relationship between two or more works (documents such as journals) based on the frequency they are cited together by one or more other works. The purpose of this technique is to help researchers understand the connections between scholarly works, their relevance, their influence, and the emerging trends. Co-occurrence techniques analyze the relationship between existing keywords of a dataset, the frequency with which two or more terms appear simultaneously within articles. The purpose of this technique is to highlight emerging trends and understand how the occurred concepts are linked together, how they could evolve, this way mapping future trends for future research directions.

Results and discussions

The inserted line graph, Figure 2, represents the development of literature published during the years 2006 to 2025 on this subject with an ascending trend on the last years of the academic basis. The number of publications is almost nonexistent before 2020, suggesting that the studied topic was considered of low interest for the scientific community. In comparison, 20 research papers related to the analyzed topic were published in 2022 — which marked the beginning of a growing recognition of the importance of the topic. The upward trend culminated in 2024, when the number of publications exceeded the threshold of 50, indicating that the topic has become a priority for researchers and institutions.

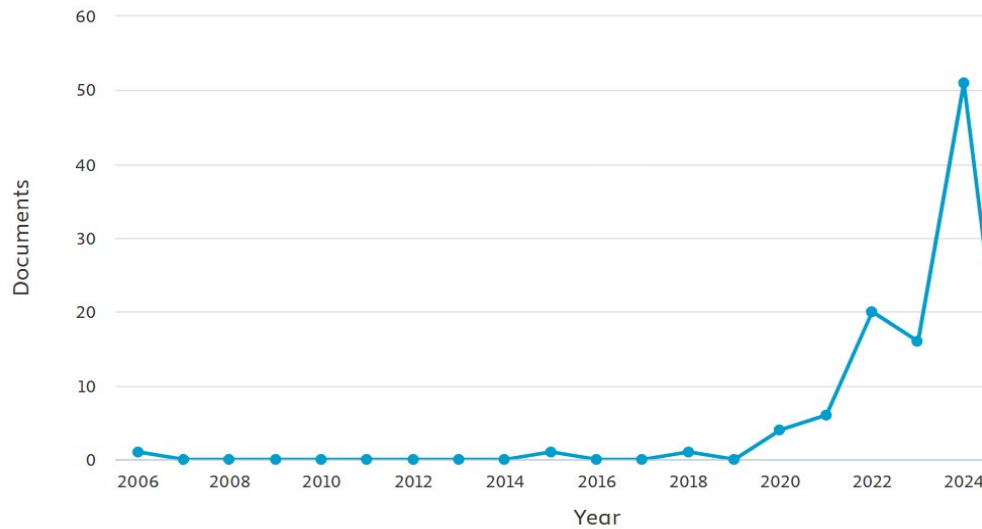


Figure 2. Publications over the years

Source: Authors' own research based on Scopus database.

As the Figure 3 illustrates, there is a significant discrepancy among national contributions to the topic studied. China stands out with over 35 published research studies, reflecting an active mobilization of academic and technological resources as well as substantial investments in research. In second place, with a more modest involvement, but with increasing attention to this field, is the USA, with approximately 14 published articles, followed by Spain with 12 publications. At the opposite pole, with limited interest from the local academic community, are Indonesia, Italy and France each with under 5 scientific research studies published on the chosen topic.

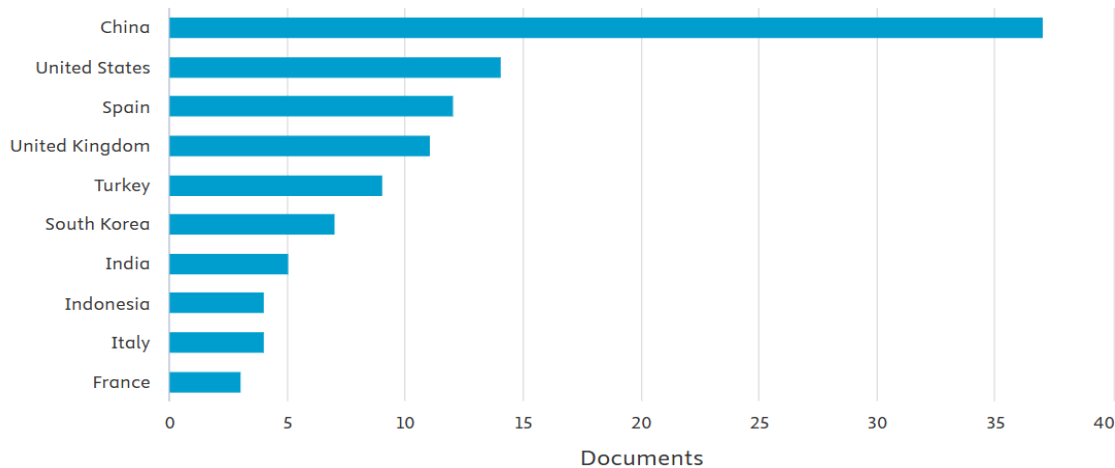


Figure 3. Distribution of Publications on the Studied Topic by Country

Source: Authors' own research based on Scopus database.

The Figure 4 highlights the focus on specific universities in participating in the chosen research topic, reflecting the resource capacity of American universities as well as the diversified

international involvement through the participation of universities in South Korea, Spain and Sweden – with significant potential for growth.

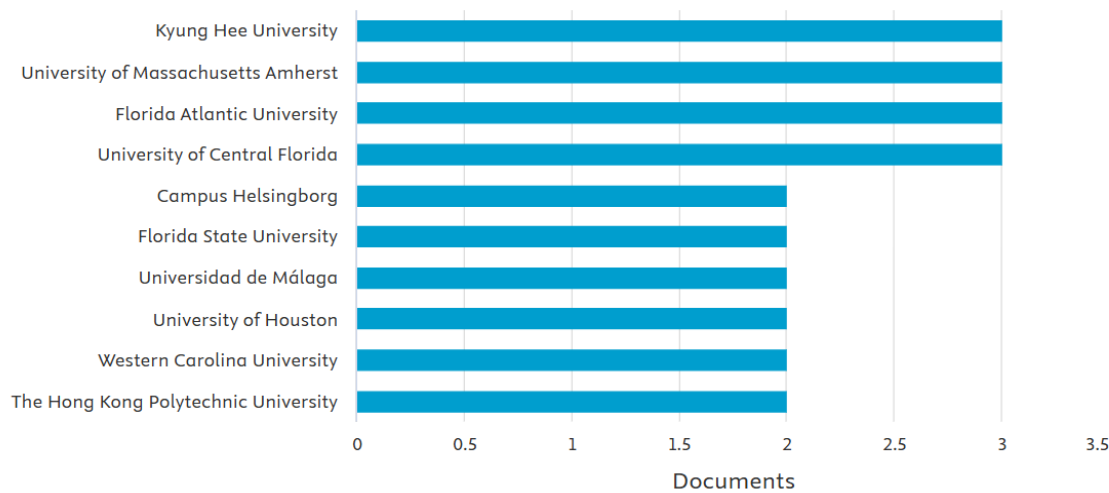


Figure 4. Distribution of Documents by University

Source: Authors' own research based on Scopus database.

The diagram in the Figure 5 reflects the distribution of the two types of documents analyzed: articles and reviews. At 90.1%, articles are considered the main source of dissemination of research on the topic selected in - Future-Proofing Tourism: Artificial Intelligence & Innovation, suggesting an emphasis on primary research. On the other hand, 9.9% of the documents are reviewed, although the percentage is lower, this category offers broader perspectives on the topic studied with well-defined theoretical bases.

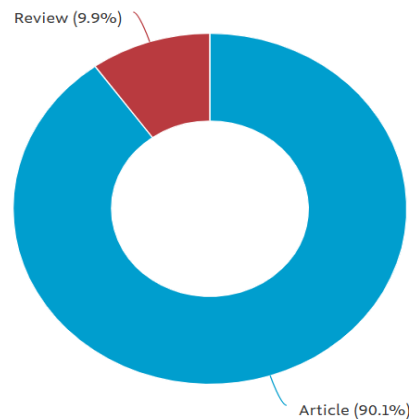


Figure 5. Distribution of Document Types: Articles vs. Reviews

Source: Authors' own research based on Scopus database.

Figure 6 illustrates clear growth trends, stagnation or fluctuation in the number of documents published in academic journals highlighted in the previous graph, during the period 2021-2024, and we can observe several relevant aspects. The appearance of publications in the journal Applied Mathematics and Nonlinear Sciences in 2024, on the studied topic, can be

associated with technological progress and scientific innovation, especially in the context of advances in artificial intelligence, complex systems and data analysis. This evolution can be attributed to the fact that the new fields are more closely linked between theoretical work and application possibilities.

However, on average, total annual publications in the International Journal of Contemporary Hospitality Management have been relatively stable, indicating that there is no sharp increase in the number of new research directions in traditional themes in hospitality and in contemporary management.

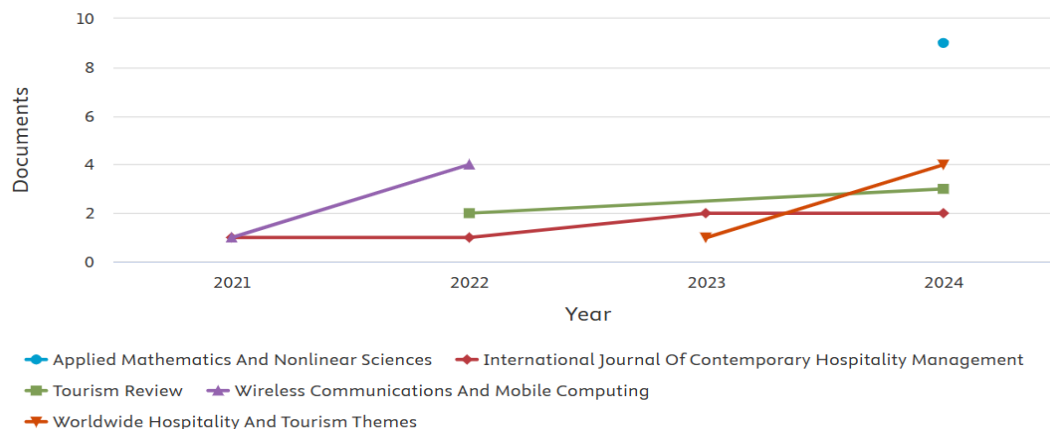


Figure 6. Analysis of Academic Publication Trends (2021-2024)

Source: Authors' own research based on Scopus database.

To answer the first research question, based on the usage of VOSViewer software, a co-citation map of the cited sources has been generated by considering as minimum unit 20 citations. In the Figure 7 displayed below, the nodes represent academic journals and the edges between the nodes are the connections, the relationships between two journals that are being cited together. The colors represent different clusters of journals that are grouped based on co-citation patterns. Larger nodes represent higher significance and as such, based on the figure showed, the journals that are indicated are "Tourism Management," "Sustainability," and "International Journal of Contemporary Hospitality Management", likely because they are more frequently cited or referenced in the academic literature related to the field of study.

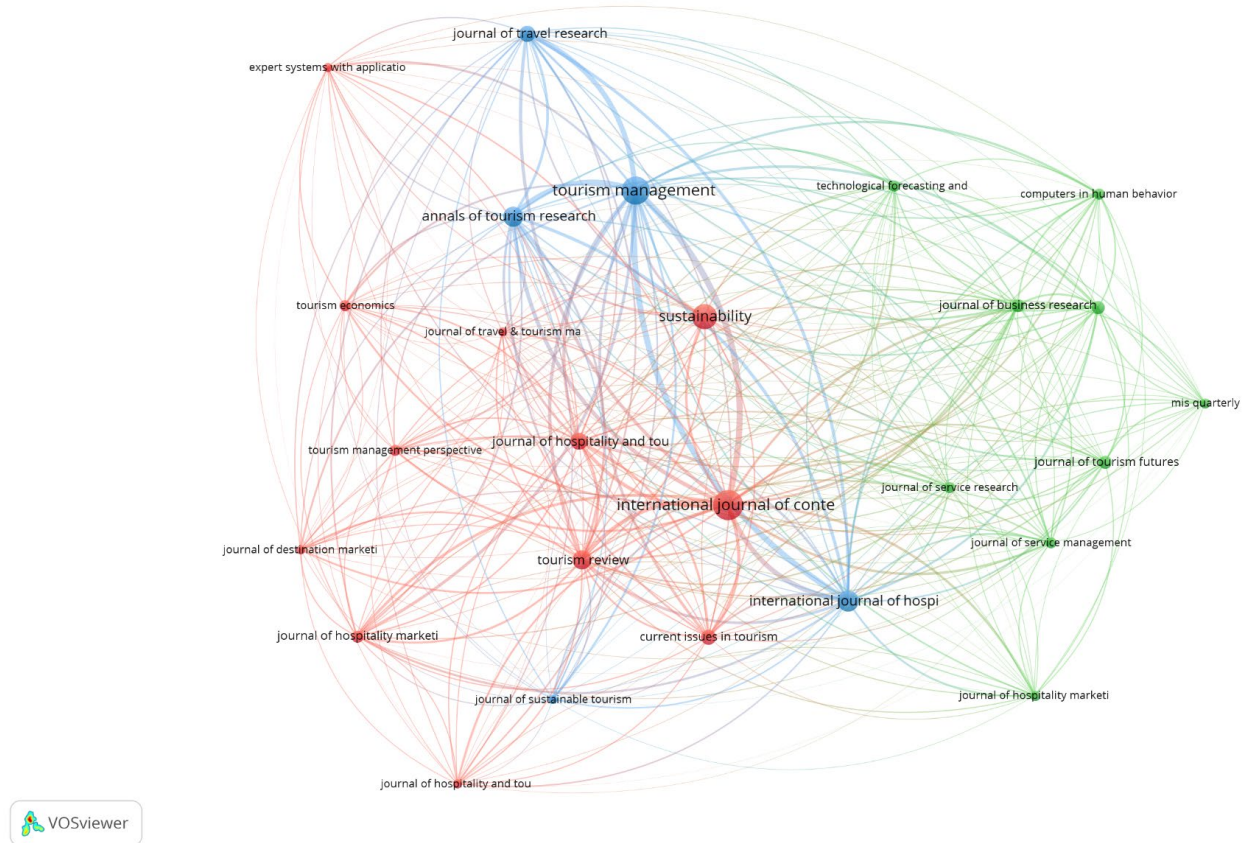


Figure 7. VOSviewer Map of The Co-Citation of Cited Source

Source: Authors' own research using VOSviewer.

Moreover, to find out the most relevant scientific documents related to our field of research, a citation of documents was used by utilising VOSViewer software. It resulted in 22 documents clustered in X clusters having minimum citations of 10, as illustrated in the Figure 8.

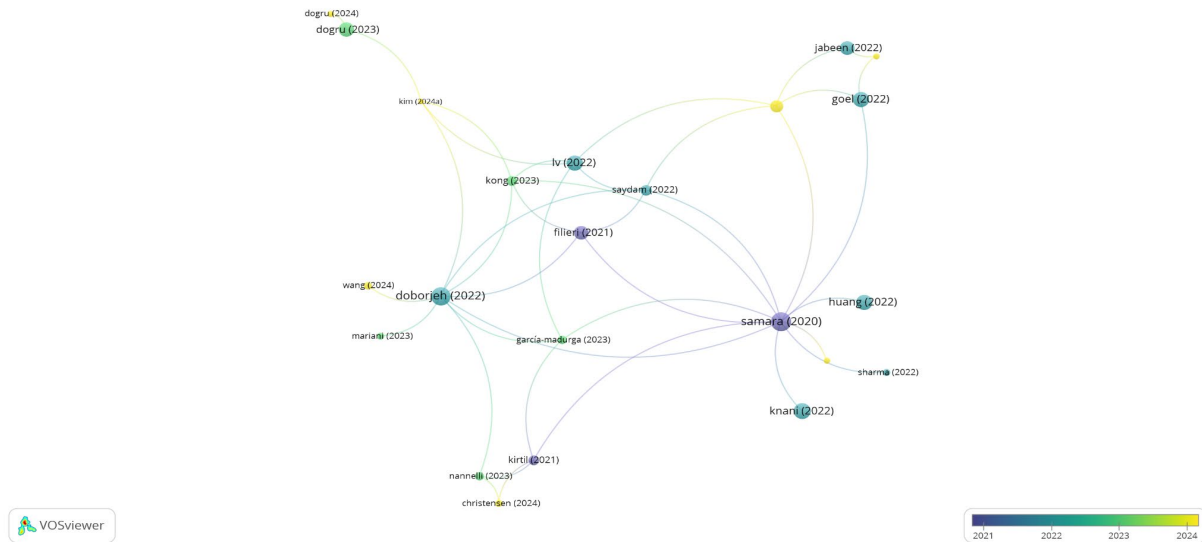


Figure 8. VOSviewer map of the citation, most cited documents

Source: Authors' own research using VOSviewer.

In addition, in order to have a better visualization of the most cited articles, the Table 1 resumes the first 5 most cited scientific articles. The first one, refers to how Big Data and Artificial Intelligence (BDAI) are transformative forces in the tourism sector as well as the challenges associated with these.

Table 1. Top cited articles

Authors	Title of article	Title of journal	Year	No. citations
Vassilios Peristeras; Ioannis Magnisalis; Dimitra Samara	Artificial intelligence and big data in tourism: a systematic literature review	Journal of Hospitality and Tourism Technology	2020	143
Zohreh Doborjeh; Nigel Hemmington; Maryam Doborjeh; Nikola Kasabov	Artificial intelligence: a systematic review of methods and applications in hospitality and tourism	International Journal of Contemporary Hospitality Management	2021	135
Mouna Knani; Said Echchakoui; Riadh Ladhari;	Artificial intelligence in tourism and hospitality: Bibliometric analysis and research agenda	International Journal of Hospitality Management	2022	103
Arthur Huang; Ying Chao; Efrén de la Mora Velasco; Anil Bilgihan; Wei Wei	When artificial intelligence meets the hospitality and tourism industry: an assessment framework to inform theory and management	Journal of Hospitality and Tourism Insights	2021	94
Hui Lv; Si Shi; Dogan Gursoy	A look back and a leap forward: a review and synthesis of big data and artificial intelligence literature in hospitality and tourism	Journal of Hospitality Marketing & Management	2021	91

Source: Authors' own research using VOSviewer.

For tackling the second research question a co-occurred term in the titles of the article dataset was analyzed with VOSviewer. The results are presented in Figure 9. The stronger the co-occurrence of two terms, the closer they will be located on the map. “Artificial intelligence” and “tourism” occupy the central position in the network, meaning they have the highest frequency and that they are the most relevant terms for researchers. The timeframe provided by the map is also very relevant. While terms such as “sustainable development”, “big data”, “literature review”, “automation” were among the first co-occurred keywords in 2022, the connection to the keywords relevant to the tourism field emerged later in 2023 and 2024, showcasing the emerging trend for future research.

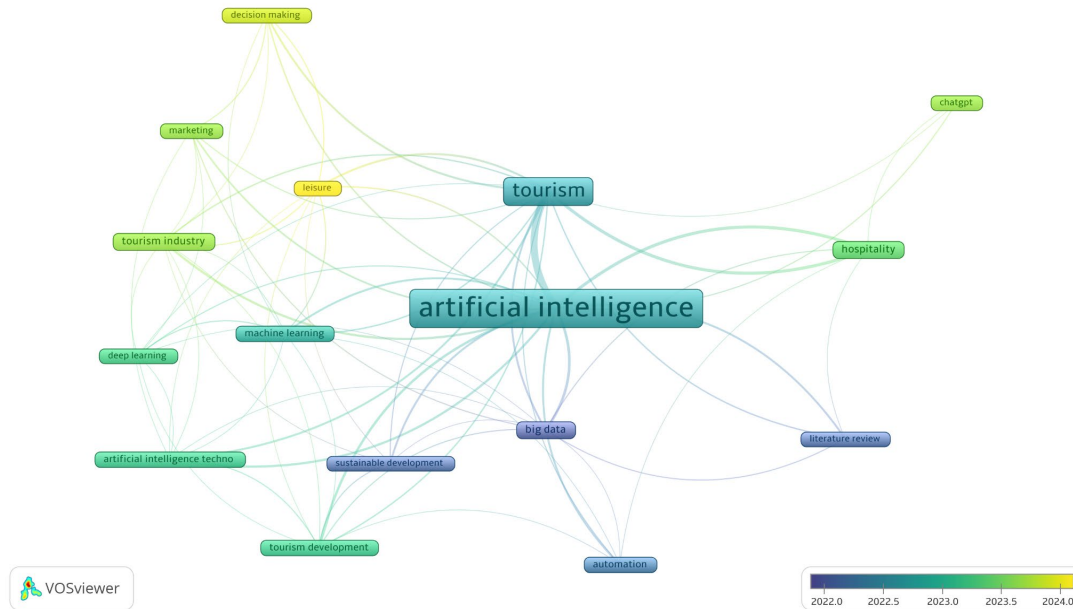


Figure 9. VOSviewer map of the co-occurrence of keywords

Source: Authors' own research using VOSviewer.

Conclusion

The data analyzed highlights a notable evolution in research interest regarding the selected topic, particularly in recent years. Until 2020, the subject received minimal attention from the scientific community, with almost no publications. However, starting in 2022, an upward trend became evident, reaching over 50 publications in 2024, signaling a growing priority among researchers and institutions.

National contributions exhibit significant disparities, with China emerging as a leader, publishing over 35 studies, demonstrating strong academic and technological engagement. The USA and Spain follow, though with lower numbers, indicating increasing interest. Conversely, countries like Indonesia, Italy, and France show limited academic involvement, with fewer than five studies each.

University participation also reflects varying resource capacities, with American universities taking the lead, alongside active contributions from institutions in South Korea, Spain, and Sweden, showcasing international engagement and growth potential.

Regarding publication types, research articles dominate at 90.1%, emphasizing primary research, while reviews, though only 9.9%, provide valuable theoretical insights. Journal publication trends between 2021 and 2024 reveal the emergence of new interdisciplinary

connections, particularly in Applied Mathematics and Nonlinear Sciences, suggesting the impact of artificial intelligence and technological advancements. Meanwhile, the International Journal of Contemporary Hospitality Management maintains a steady publication rate, indicating stability in traditional research themes. Overall, the data underscores a shift toward interdisciplinary research, increased global involvement, and the growing relevance of innovation and AI in future-proofing tourism. Referring to the most important journals, „Tourism Management," "Sustainability," and "International Journal of Contemporary Hospitality Management" are the primary ones used for research on this topic as well as 5 main articles from which it can be extracted valuable related information. Future research should focus on analyzing in which way these elements artificial intelligence and innovation influence tourism future development and which are the specific means. The co-occurrence of keywords figure suggests that further investigation should be carried out in the field of leisure tourism and application of artificial intelligence, such as ChatGPT, which is more and more used especially in the travel decision-making process of individuals, when selecting their vacation, or in their interactions with travel companies' customer support. The limitations of these scientific articles are mainly referring to the utilization of Scopus database and the selected criteria used for extracting the data.

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