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Bibliometric Review on Use of Technology in Hospitality and Tourism: A Retrospective Review and Future Directions

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ABSTRACT

This study aims to systematically evaluate studies on the use of technology in hospitality and tourism. In this respect, it aims to provide future directions for studies on the use of technology in hospitality and tourism with a retrospective approach. The research is exploratory and uses bibliometric analysis to reveal the structure of technology-based scientific studies in hospitality and tourism. Data were obtained by coding "technology" and "hospitality and tourism" and a total of 1316 studies were examined in terms of structure and content. The WOS database and the VOSviewer program were used to analyze the data. The history of studies on the use of technology in hospitality and tourism is parallel to the developments in technology. The journals in which publications are published are those with high impact factors, and the most cited authors are those with high h-indexes. Although 1316 papers were reviewed, it is limited to the WOS database. Current research on the topic primarily focuses on artificial intelligence-related topics such as robotics, smart tourism, augmented reality and big data. Since this study deals with technology in general, it offers a retrospective view of the subject in a general framework and has contributed to the gap in the literature by directing future studies. This study offers a broad retrospective framewor.k on the subject and addresses gaps in the literature by suggesting directions for future research.

Keywords: Tourism Technology, Hospitality and Tourism, Bibliometric Analysis

1 Introduction

Information and communication technologies improve many capabilities of organizations such as resource management, production capacity, management policies, marketing strategies, relations with consumers, suppliers, public institutions and other stakeholders. Buhalis (2003) mentioned that technology has four evolutions. The first period started in the 1960s and is the data processing era, which

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generally aims to develop information-based processes and increase operational efficiency. In this strategic information systems era, where a competition-oriented approach is dominant among institutions. It is seen that personal computers started to be used more frequently in this era. The last period is the process that started in the late 1990s and continues until today. In this period, intra-organizational and inter-organizational networks and information transfer have developed more. The internet has created a revolution in communication. The use of information communication technologies not only for production and information transfer purposes but also for marketing purposes has become widespread.

Every evolution that technology goes through affects all industries such as manufacturing, transportation and logistics, travel, tourism, etc. transportation systems, especially air transportation, are significantly affected by technological developments. Since the 1950s, when mass air travel began, computerized reservation systems have been used to control and manage every aspect of the process, including flight plans, fares, passenger information, cargo, baggage, and employees, through automation. It is inevitable to use technology to manage operations such as air travel, where there is a lot of information, quickly and effectively (Sheldon, 1997).

The tourism industry is affected by all factors such as technological advances and the emergence of new technologies, globalization, new trends of consumers, etc. to eliminate borders, to establish connections between suppliers and tourists, tour operators, travel agencies and other industries, and to ensure the flow of information, information technology infrastructure and global distribution systems are integrated into tourism. The development of information technology and the evolution of computerized reservation systems, especially in airlines, have led to the development of global distribution systems, defined as a computerized reservation network in the world (Radulović, 2013). Falko (2016) mentions that there is an increasing competition between Amadues, Sabre and Travelport among the largest global distribution systems in the international tourism market.

The development of technology affects the tourism industry in many ways, such as the production of goods and provision of services, managing information, telecommunication systems (Buhalis, 2003), customer relations, hospitality, tourist experience, establishing intra-organizational connections between different units of a tourism business, providing faster and easier connections between different tourism businesses, and changing the direction of tourism marketing. With new technological developments, the paradigms of the tourism, accommodation and travel industries are changing (Murphy et al., 2019). The dynamics of tourism with technology, political perceptions regarding tourism, and the change in the balance of power in the market reveal the economic importance of tourism and enable the participation of many new stakeholders in tourism (Buhalis et al., 2008). These developments evolved into a different dimension after the 2000s, when technology gained serious momentum. First, social media platforms, and then the integration of artificial intelligence-based technological developments into tourism have begun to emerge as popular issues (Şengel & Işkın, 2024).

New research areas are emerging to understand and convey the impact of technological developments on tourism (Buhalis et al., 2008). These areas of study generally focus on topics such as information technologies and their effects on tourism, evolving service standards (Mistilis & Dwyer, 2000), expanding and diversifying tourist and tourism experiences (Neuhofer et al., 2014), smart tourism destinations and competition (Boes et al., 2016), social media use and travel (Xiang et al., 2010), human robot technology in accommodation and tourism (Tung et al., 2017), virtual reality and augmented reality technology in tourism (Yung et al., 2017). The increasing interaction between technology and tourism has also been reflected in academic studies and very important studies have been included in recent years that reveal this interaction. This study aims to present the bibliometrics of tourism and technology-themed studies conducted from the past to 2023. No lower limit date was determined for

the study. Because the aim was to examine all studies on the subject over time. In this way, a broad retrospective perspective was presented in the study rather than focusing on a specific area or date related to the subject. The study focuses on examining academic studies on the use of technology in the tourism industry, which increasingly covers a larger part of our lives, in the light of parameters such as author, journal, country, citation and university. This study, which aims to identify studies focused on the use of technology in tourism and present a future projection in the light of past findings, contributes to the sustainable development of the literature in the relevant field.

2 Conceptual Framework

2.1 Use of technology in tourism

With the development of technology, there has been an increase in the number of studies on technology-themed keywords in literature. Venkatesh et al. (2000) concluded in their study that the acceptance of information technologies by users in the workplace is still complex and difficult to understand. They also stated that the acceptance of information technologies is very important.

Tourism as a labor-intensive industry, the use of technology is of critical importance. Especially thanks to the development of information communication technologies and the internet, tourists have started to make more independent holiday preferences. This situation creates new types of tourists. Instead of being included in a package tour, tourists have started to plan their own trips. For tourists who want to make the most of the limited time left in the busy work environment of today's world, it is important that their expectations are met quickly. The tourism industry achieves tourist satisfaction if it understands the changing tourist profile well and meets the needs and expectations of tourists correctly and quickly. For this reason, the tourism industry needs to understand the changes in technology and tourist types and provide personalized services. At this point, new technologies should be integrated into the tourism industry and previous tourist experiences and current demands should be utilized. According to Buhalis et al. (2008), the use of technology in tourism is still at a primitive level. This situation makes the development of e-tourism difficult. The integrated operation of all the links in the tourism industry will further strengthen the system. Some tourism stakeholders do not include technologies such as computer systems in their organizations. Organizations that cannot adapt to technology may have negative effects on their corporate performance (Davis et al., 1989). Today, we can comment that the attitude of "resistance to technology" is breaking down to some extent compared to the past, in line with the studies of Davis et al. (1989) and Murphy (2019). In this study, Davis et al. stated that in order to increase user acceptance of computer systems, we need to understand why people accept or reject computers. However, in Murphy's study, the question "Is technology necessary in tourism?" has already been answered and, going beyond this, the importance of service robot design in the tourism industry and the evaluation of robotic service in terms of marketing and customer acceptance are emphasized.

Davis (1989) states in his study that there are various reasons why people do not use information technologies, such as not thinking that effective use of technology will provide benefits to their work or that even if they find technology useful, it will be difficult to use. Guttentag (2010) states that technological developments are generally not made directly for the tourism industry, and therefore tourism organizations and researchers may experience adaptation problems in transitioning to new technologies. The development of information technologies is very important in terms of providing quality service to tourists, who are consumers in the tourism industry. Tourism is a service industry where information is intensive. Mistilis and Dwyer (2000) stated that service sectors have resisted adopting technology to a certain extent, but since the 1990s, service quality and competitiveness have increased with the increased rapid access and time gained with the use of technology. Law et al. (2014) reviewed studies on accommodation and tourism conducted between 2009 and 2013, identifying that

information and communication technologies were utilized across various units and for diverse applications in the tourism industry.

People include the center of the tourism industry. With the development of technology and globalization, tourists can demand more customized experiences, while at the same time they can be less tolerant of obstacles that may come in the way of the experiences they want to have. Offering personalized experiences to tourists, being able to integrate with the technologies used by tourists, offering them unique experiences, and providing fast and effective solutions to their changing needs and demands are very important in terms of customer satisfaction. In the tourism industry, people should not be considered only as consumers. From a producer's perspective, there are many businesses in the tourism industry and each of them has many sub-departments. An employee in a hotel's housekeeping department, a chef in a restaurant, a manager at the front desk, a sales representative of a travel agency or a tourist guide are all parts of a common chain. A producer must definitely be able to speak the language of the consumer they want to address. At this point, every element of all businesses in the tourism industry should be competent enough to effectively meet the expectations of their target audience. Tourist businesses should be the follower and supplier of every new technology, from the websites they use, reservation programs, social media, other applications used by tourists or microphone headsets to be distributed on a tour, and they should also train their employees in this direction. In addition, the services tourists receive online should be consistent with those they receive face-to-face, otherwise this can create a serious trust problem for tourists (Marcoa et al., 2018).

2.2 New technologies used in tourism

When the studies on tourism and technology are examined, it is seen that there are differences in the subjects covered from the past to the present. This situation is parallel to the development of technology and globalization. Especially with the widespread use of the internet, the structure of the tourism industry is changing, and this situation has an impact on how tourism destinations are perceived and consumed. New technologies such as virtual reality technology give a new direction to tourism marketing. With 3D virtual reality technology, tourists can experience the destination from a different perspective before they arrive, and virtual reality technology also makes it easier for tourism organizations to reach new markets and gain acceptance. Huang et al. (2016) stated in their study that there is a limited understanding of how destinations will be marketed to both consumers and other participants in the virtual world. Guttentag (2010), another researcher who studies virtual reality, also stated that virtual reality has not yet received the necessary attention from tourism organizations and researchers. Guttentag emphasized the importance of virtual reality in many areas such as marketing, management, accessibility and protection of cultural heritage in tourism. As virtual reality technology develops, it is likely that this experience will be perceived as a substitute product for consumers. This experience should not be perceived as a replacement for reality, but as a satisfying service for the consumer.

Another technological innovation used today is augmented reality. Augmented reality technology is being developed as a part of smart tourism and provides information about destinations. The visual appeal and ease of use offered by augmented reality make it preferred by tourists, and this also creates an intention to visit the destination. However, tourists are still slow to adapt to innovation (Chung et al., 2015). When Law et al. (2014) research is examined, it is seen that widely used social media has a significant impact on consumers. Social media significantly affects consumers' purchasing decisions and creates a destination image in the minds of consumers. In addition, managers can respond quickly to consumers' needs and desires with information communication technologies. In this context, businesses in the tourism industry need to integrate technological innovations into their marketing strategies. It is important for businesses to update their websites according to consumer needs. Especially

for small-scale accommodation businesses, having websites with content created by consumers will provide these businesses with a competitive advantage in the tourism market. The use of social media and other current technologies by tourism businesses helps them create an effective marketing strategy.

Wang (2012) focused on how smartphones, which are used by almost everyone, affect the tourist experience in his study. Smartphones have the effect of changing the behavior and emotional state of tourists. Tourists can access information instantly, find fast and effective solutions to problems, share their travel experiences and store their data with smartphone technology. In this context, the use of smartphones is very important for the tourism industry.

New technologies such as 3D printing, driverless cars, robots, etc. can be evaluated in service automation. Especially the accommodation, travel and tourism industries attract robotic technology. Robots can be used in different departments of accommodation businesses. Robots can learn new things from each person they interact with thanks to the artificial intelligence technology installed. This improves their next communication with guests. Therefore, it helps to ensure customer satisfaction. Therefore, the businesses that are the first to have these technologies will be able to gain a competitive advantage. Robotic technology can be used not only in accommodation businesses but also in restaurants, theme and amusement parks, meetings and events, airports, car rental companies, tour operators and travel agencies, tourist information centers, galleries and museums. Although it does not seem very possible for the entire process in the service sector to progress completely depending on automation, businesses that have new technologies have an advantage. Metaverse, robotic and artificial intelligence technologies, which are widely used, may become more attractive with the decrease in purchasing and maintenance costs (Ivanov et al., 2017).

3 Methodology

This study aims to conduct a bibliometric analysis of academic studies on the use of technology in the field of hospitality and tourism. Historical developments show that modern tourism activities began in the 18th century and later. Especially in the first half of the 20th century, two world wars and economic, social and political crises seriously disrupted the developments in tourism. However, in the second half of the same century, innovations in the fields of transportation, communication and correspondence gave significant momentum to the development of tourism movements. The most driving force that brought about the developments in this process was technology. The development of technology and the increasing integration in tourism-related fields each passing day have also brought about an increase in academic research on this interaction. While this situation provides a comprehensive literature on the one hand, it also makes it difficult to identify gaps in research and systematically examine the literature. In this context, bibliometric analyses facilitate both the process of conducting academic research by providing the opportunity for systematic literature review and contribute to the identification of gaps in the literature for future studies and to conduct original research.

Bibliometric analysis was used to obtain results appropriate to the purpose of the study. This analysis provides both in-depth information about the technologies in the field and provides an overview of the effectiveness of phenomena in the literature (country, author, journal, etc.) with quantitative measurements. This systematic analysis is a method that can be applied to certain databases (WOS, Scopus, Google, etc.) but also allows comparison of databases when needed. Donthu et al., (2021) states that bibliometric analysis is generally a method that allows processing of large data and data analysis for large-scale topics in this context and emphasizes that this can be achieved through technology-supported programs. Thus, a comprehensive retrospective review is made on a certain subject and an agenda of the past period is created. Therefore, a retrospective perspective is taken in the study. In this study, where bibliometric analysis of studies conducted in the field of hospitality and tourism are made,

a review of the WOS database was preferred. The reasons for this database chosen which being widespread, journals with high impact factors being indexed here (Yang et al., 2013), and leading authors in a field adopting this as the first choice for publishing papers (Şengel & Koç, 2022).

For the bibliometric analysis to provide systematic data and measurable results, the Vosviewer program was used. The program allows the obtained bibliometric series to be systematically organized and comprehensive analyses to be performed (van Eck & Waltman, 2010). However, Vosviewer was used in the second stage. In the first stage, the keywords "technology" and "hospitality and tourism" were entered into the search tab of the WOS database and results were obtained for 1316 studies. Since the results were given for 500 publications, the data was downloaded in 3 different files. In the second stage, these results were transferred to the Vosviewer program and findings were obtained according to parameters such as country, author, journal, affiliation with interaction-based analyses such as co-word and co-citation. Since the study is based on secondary data analysis, ethics committee certificate was not obtained from any institution. As the study is based on secondary data, no ethics committee approval was required.

4 Findings

Table 1 shows the distribution of technology and tourism publications by country and the number of citations these publications received in the WOS database. 20 countries are included in the table. The ranking was created by considering the number of publications. Accordingly, the country with the most publications on technology and tourism is China with 105 publications. China's number of citations is also 105. The 4 countries that come after China in terms of the number of publications are the USA, Spain, England and Italy, respectively. England, which is in 4th place with the number of publications, has received more citations than China with 173 citations.

Table 1: *Distribution of Publications by Countries*

No	Country	Publication	Citation
1	China	105	105
2	USA	71	111
3	Spain	52	36
4	England	49	173
5	Italy	36	48
6	Australia	31	40
7	Taiwan	26	15
8	South Korea	23	57
9	India	22	26
10	Malaysia	21	9

Table 2 shows the universities that have published the most on technology and tourism and their citation counts in the WOS database. 10 universities are included in the table. The ranking was created by considering the number of publications. Accordingly, the university that has published the most on technology and tourism is The Hong Kong Polytechnic University with 18 publications and has received 40 citations. The next four countries with the most publications are University of Surrey, University of Central Florida, Kyung Hee University and Bournemouth University. Although Bournemouth University is ranked 5th in terms of the number of publications, its citation count is 52.

Table 2: *Distribution of Publications by Universities*

No	University	Publication	Citation
1	The Hong Kong Polytechnic University	18	40
2	University of Surrey	12	28
3	University of Central Florida	11	25
4	Kyung Hee University	10	38
5	Bournemouth University	8	52
6	Griffith University	6	5
7	Federal University of Rio Grande do Norte	6	1
8	University of Johannesburg	6	2
9	Manchester Metropolitan University	5	33
10	SiChuan University	5	12

Table 3 shows the authors who published on technology and tourism, their publication numbers and the citations they received in the WOS database. The ranking is organized according to the number of publications. Rob Law is in first place with 7 publications and 25 citations. Following by 4 researchers are Zhen Xiang, Ulrike Gretzel, Myung Ja Kim and Rodolfo Baggio, respectively. Although Kim is in fourth place with the number of publications, he is ahead of Law with 33 citations. Although the number of authors with 3 publications is high in this list, there are also authors with 3 publications outside the list. It is understood that although the number of publications of the authors is the same, the number of citations varies.

Table 3: *Distribution of Publications by Authors*

No	Author	Publication	Citation
1	Rob Law	7	25
2	Zheng Xiang	6	23
3	Ulrike Gretzel	5	20
4	Myung Ja Kim	4	33
5	Choong-Ki Lee	3	33
6	Rodolfo Baggio	3	20
7	Iis Tussyadiah	3	16
8	Viachaslau Filimonau	3	16
9	Sangwon Park	3	10
10	Youngjoon Choi	3	7

Table 4 shows the sources (journals, books, book chapters, conferences, etc.) in which the examined publications were published. Only the first 10 of the examined studies were taken and since all of them were journals, the term journal was used instead of source. The ranking was made according to the number of publications. The examined publications were most frequently included in Sustainability Journal. There are 40 publications on technology and tourism in Sustainability Journal, and these publications received a total of 35 citations. Following by 4 sources are Current Issues in Tourism, Tourism Review, Tourism Economics and Tourism Management, respectively. Among these examined sources, the highest citations were in Tourism Review (69), followed by Journal of Travel Research (44).

Table 4: *Distribution of Publications by Journals*

No	Journal	Publication	Citation
1	Sustainability	40	35
2	Current Issues in Tourism	16	16
3	Tourism Review	16	69
4	Tourism Economics	15	21
5	Tourism Management	13	32
6	Information Technology & Tourism	13	22
7	International Journal of Hospitality Management	13	29
8	Journal of Travel Research	12	44
9	International Journal of Contemporary Hospitality Management	12	6
10	Annals of Tourism Research	11	33

Table 5 shows the sources cited the most by the examined publications. Among these, the one with the highest number of citations was Tourism Management with 1667 citations. The one with the closest citation was Annals of Tourism Research with 756 citations. When the sources cited by the examined publications are examined, the International Journal of Hospitality Management, which is ranked 3rd, received 526 citations, the Journal of Travel Research, which is ranked 4th, received 516 citations, and the International Journal of Contemporary Hospitality Management, which is ranked 5th, received 457 citations. It is seen that all the journals in the top 10, except MIS Quarterly, received over 300 citations. Since the top 10 journals are included in Table 5, journals with high impact factors such as Journal of Sustainable Tourism, Tourism Management Perspectives, International Journal of Tourism Research, Journal of Destination Marketing and Management, Journal of Hospitality and Tourism Technology, Journal of Marketing, Information Management, Journal of Travel Research, could not be included in the table despite their high citation counts.

Table 5: *Most cited journals and authors in the reviewed publications*

No	Source	Citation	No	Authors	Citation
1	Tourism Management	1667	**1**	Dimitrios Buhalis	283
2	Annals of Tourism Research	756	**2**	Ulrike Gretzel	131
3	International Journal of Hospitality Management	526	**3**	Iis Tussyadiah	116
4	Journal of Travel Research	516	**4**	Stanislav Ivanov	115
5	International Journal of Contemporary Hospitality Management	457	**5**	Viswanath Venkatesh	111
6	Computers in Human Behavior	349	**6**	Rob Law	110
7	Current Issues in Tourism	331	**7**	Zheng Xiang	96
8	Journal of Travel & Tourism Marketing	304	**8**	Marianna Sigala	87
9	Journal of Business Research	301	**9**	Fred D Davis	84
10	MIS Quarterly	282	**10**	Barbara Neuhofer	80

Among the publications examined on technology and tourism, the most cited person was Dimitrios Buhalis with 283 citations. Accordingly, it can be said that Dimitrios Buhalis made pioneering publications in this field. Ulrike Gretzel, who came after, received a total of 131 citations, Iis Tussyadiah 131, Stanislav Ivanov 115 and Viswanath Venkatesh 111 citations. It can be said that the authors who were cited the most in the top 10 of the most cited publications achieved a good number of citations by receiving at least 80 citations. Although the number of citations outside the top 10 was high, authors with high h-indexes such as Joseph F. Hair, Claes Fornell, Colin Michael Hall, Dan Wang, Icek Ajzen, Stefan Gössling, Namho Chung, Yu Chih Huang, Myung Ja Kim Jamie Murphy were not included the Table 5.

Table 6: *Publications Most Cited by the Reviewed Publications*

No	Author	Article/Title	Journal	Citation
1	Buhalis, Law (2008)	Progress in Information Technology and Tourism Management: 20 Years on and 10 Years After the Internet-The State of e-Tourism Research	Tourism Management	81
2	Fornell, Larcker (1981)	Evaluating Structural Equation Models with Unobservable Variables and Measurement Error	Journal of Marketing Research	59
3	Davis (1989)	Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology	MIS Quarterly	45
4	Gretzel, Sigala, Xiang, Koo (2015)	Smart Tourism: Foundations and Developments	Electron Markets	35
5	Venkatesh, Morris, G.B. Davis and F.D. Davis (2003)	User Acceptance of Information Technology: Toward a Unified View	MIS Quarterly	35
6	Neuhofer, Buhalis, Ladkin (2014)	A Typology of Technology-Enhanced Tourism Experiences	International Journal of Tourism Research	32
7	Ajzen (1991)	The Theory of Planned Behavior	Organizational Behavior and Human Decision Processes	29
8	Guttentag (2010)	Virtual Reality: Applications and Implications for Tourism	Tourism Management	28
9	Law, Buhalis, Cobanoglu (2014)	Progress on Information and Communication Technologies in Hospitality and Tourism	International Journal of Contemporary Hospitality Management	27
10	Huang, K.F Backman, S.J. Backman, Chang (2016)	Exploring the Implications of Virtual Reality Technology in Tourism Marketing: An Integrated Research Framework	International Journal of Tourism Research	26
11	Hair (2010)	Multivariate Data Analysis: An Overview	International Encyclopedia of Statistical Science	25
12	P.M. Podsakoff, MacKenzie, Lee, N.P. Podsakoff (2003)	Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies	Journal of Applied Psychology	25
13	Xiang, Gretzel (2010)	Role of Social Media in Online Travel Information Search	Tourism Management	23
14	Leung, Law, Hoof, Buhalis (2013)	Social Media in Tourism and Hospitality: A Literature Review	Journal of Travel & Tourism Marketing	22
15	Marcoa, Gómeza, Sevilla (2018)	Progress in Information Technology and Tourism Management: 30 Years on and 20 Years After The Internet-Revisiting Buhalis & Law's Landmark Study about e-Tourism	Tourism Management	22
16	Venkatesh, Davis (2000)	A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies	Management Science	22
17	Sigala (2017)	New Technologies in Tourism: From Multi-Disciplinary to Anti Disciplinary Advances and Trajectories	Tourism Management Perspectives	21
18	Tussyadiah, Wang, Jung, Dieck (2018)	Virtual Reality, Presence, and Attitude Change: Empirical Evidence from Tourism	Tourism Management	21
19	Yung, Lattimore (2017)	New Realities: A Systematic Literature Review on Virtual Reality and Augmented Reality in Tourism Research	Current Issues in Tourism	20
20	Murphy, Hofacker, Gretzel (2017)	Dawning of the age of robots in hospitality and tourism: Challenges for teaching and research	European Journal of Tourism Research	20
21	Tung, Law (2017)	The potential for tourism and hospitality experience research in human-robot interactions.	International Journal of Contemporary Hospitality Management	20

The most cited studies among the examined publications, their authors, the journals they were published in and the years they were published were also considered within the scope of this study (Table 6). The ranking was made from the highest to the lowest citation count, and the works with more than 20 citations were included in Table 6. It can be said that these publications will be guiding for articles to be written in this field. Accordingly, the study by Buhalis and Law (2008) is the study with the highest number of citations among the examined publications with 81 citations. Then, the study by Fornell and

Larcker (1981) which came in second place received 59 citations. Among the first 21 studies examined, there are 3 studies including Law and Buhalis. Accordingly, it can be said that these two authors are pioneers in studies on technology and tourism in the tourism literature. The journal to which the 21 publications in Table 6 were most cited was Tourism Management, and a total of 175 citations were made to this journal.

Figure 1 shows the co-citation map of academic studies that underwent bibliometric analysis. The map provides the co-citations of the 1316 studies examined and the clusters of relationships between these citations. The interaction of the most cited authors and journals (an evaluation is made in the context of authors in Figure 1) with each other is given with the help of colors and line densities. The results of the study show that three clusters, green, red and blue, stand out and it is seen that these clusters have relationships with each other, although not as much as the clusters within.

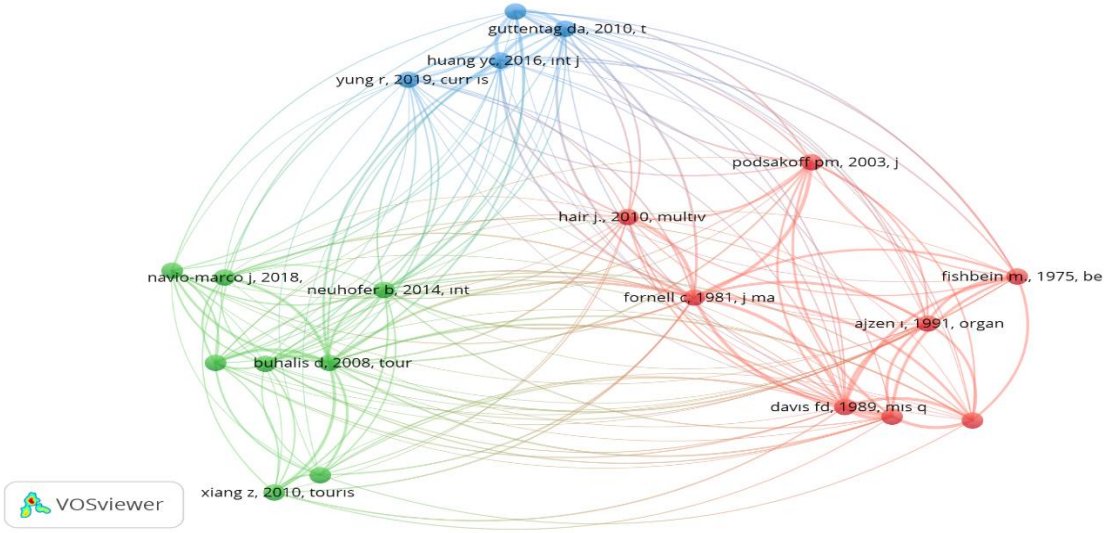

Figure 1. Common Citation (Co-Citation) Map of Publications

It can be said that the studies in the red cluster are chronologically older and therefore focus on more traditional technology topics. It can be seen that the green and blue clusters cite publications whose dates are closer to the present day. It can be said that these studies are related to current topics that have become popular today (Figure 1).

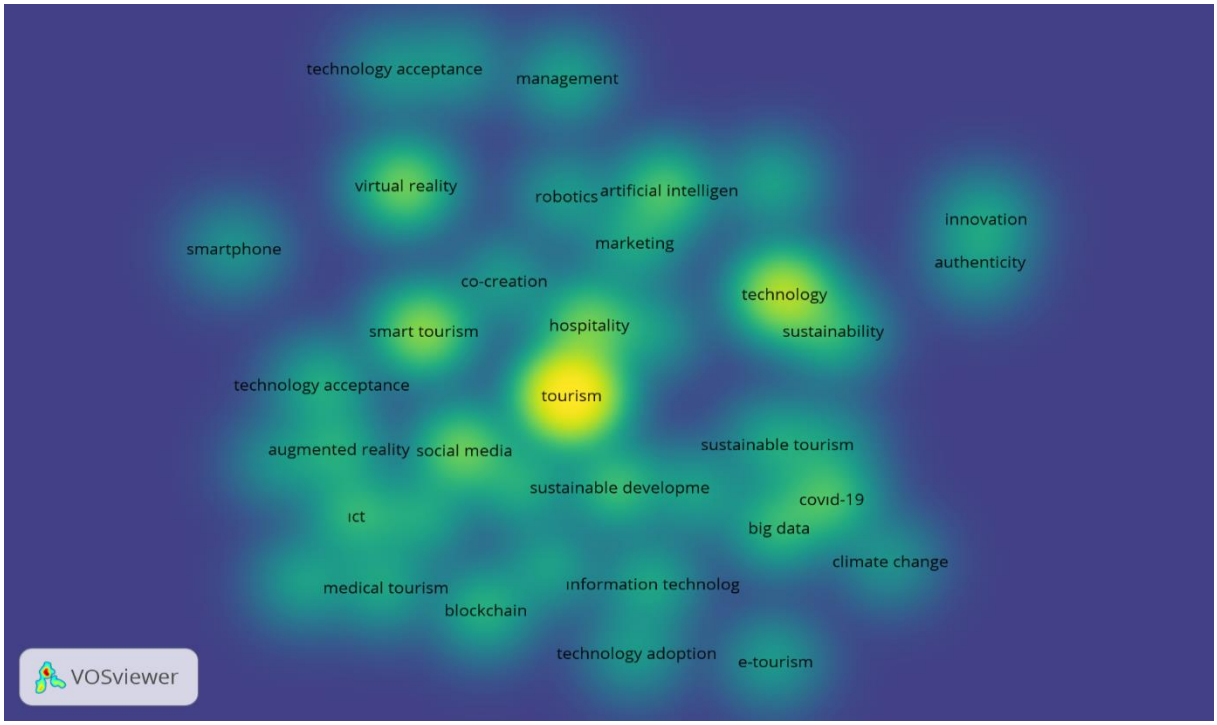

Figure 2. Common Word (Co-Word) Analysis of The Keywords

The heat map given in Figure 3 is formed according to the frequencies of the prominent topics in the examined studies. The frequency of the word used as a common word for the yellowing of colors increases. In the light of this information, it is seen that the first three concepts that stand out in the search for publications such as hospitality, tourism and technology are prominent. Apart from these three main words, artificial intelligence and words associated with artificial intelligence such as robotics, virtual reality, augmented reality, smart tourism, big data, blockchain are frequently used as co-words in the examined studies. Although these topics are studied, since the yellow color and their central position are not clear, it can be said that it is necessary to work on similar topics. Apart from these, it has been revealed that technology-related topics such as information technology, social media, e-tourism, which are considered more traditional, are studied. Technology acceptance and technology adaptation have also been identified as important topics studied regarding technology. The main important finding in Figure 2 is the words other than technology. Because these words show the areas where technology is tried to be integrated in the field of hospitality and tourism. It is seen that sustainable tourism, where topics such as sustainability, sustainable tourism and climate change are prominent, is used with technology. Apart from these, management, innovation, marketing and COVID-19 are other prominent topics that are used with technology. The prominence of COVID-19, which has affected the whole world especially in the 2-3-year period and has created a serious capacity in academic studies, can also be expressed as an interesting finding.

5 Conclusion

As we prepare to enter the second quarter of the 21st century, it is clearly seen that technology has gained an identity that has spread to every aspect of human life. It is possible to see these effects in academic research for almost every discipline, especially tourism. The subject has gone beyond increasing the quality of academic studies with the help of statistically supported package programs. It is seen that studies focusing on the integration of technologies such as smart applications (Li et al., 2017), robotic (Murphy et al., 2017) and virtual reality (Tussyadiah et al., 2018) and artificial intelligence (Samala et al., 2020) directly into hospitality and tourism activities have a very dominant

place in the hospitality and tourism literature on the subject. In the focus of these findings, this study offers a future perspective based on past experiences by conducting a bibliometric analysis of studies conducted in the field of hospitality and tourism.

The results show that studies focusing on the use of technology in the field of hospitality and tourism are chronologically parallel to technological developments and are numerous. It is seen that journals with high impact factors focus on scientific studies on technology. Similar studies in literature also emphasize journals with high impact factors (Ferreira et al., 2022; Iqbal et al., 2022). It can be said that one of the basic criteria here is that studies in which bibliometric analysis is performed focus on indexes widely accepted in the field of social sciences such as WOS and Scopus. It is seen that the publishing journals focus on management, sustainability, technology and general hospitality and tourism research as subjects. The authors who publish show a general distribution, but it can be said that the cited authors consist of leading authors with h-index in the field of tourism. Şengel and Işkın (2024) emphasize in their study that researchers with high h-index are at the forefront because of the topicality of the subject and the sensitivity of the researchers to current issues.

5.1 Theoretical contributions

It is useful to identify the theoretical contributions of studies using the bibliometric analysis method. These studies are systematic literature reviews. They provide systematic data that can identify original research areas and gaps in the literature on the subject under review. Öztürk and Dil (2022) state that bibliometric analyses provide future predictions with a retrospective identity in support of this information. Based on this information, more traditional topics related to technology have gained importance in academic research on the use of technology in tourism, especially before the 2000s. Until the 2010s, social media had an important share in studies on this subject. As of the 2010s, more specific and original research areas have emerged in terms of conceptualization and theoretical framework formation processes in the literature due to the technological developments experienced. Şengel and Işkın (2024) state that there are many studies conducting bibliometric analysis on the use of technology in hospitality and tourism. However, it is seen that these generally focus on specific topics rather than providing a general evaluation. In this context, this study, which provides a more general framework regarding the use of technology in tourism, contributes to the formation of a theoretical framework in terms of retrospective approach.

5.2 Future directions for studies

Technology is at the center of almost every discipline, both theoretically and practically, not just hospitality and tourism. Although tourism is a service-oriented industry, technology is used in many areas of the industry to a considerable extent. The intellectual structure related to scientific writing in any field is one of the most obvious platforms where the structural status of that field can be monitored. In this respect, the literature on the use of technology in tourism has a history almost parallel to technological developments (Şengel, 2019). The capacity of technological developments constitutes the structure of these scientific studies. In particular, global distribution systems, central reservation systems, automation systems, information and communication technologies, internet use and websites are the subjects studied in order regarding the use of technology in tourism (Schulz, 1996; Werthner & Klein, 1999; Buhalis, 2000). Later, social media has been the subject of studies on the use of technology in tourism for a long time (Miguéns et al., 2008). Today, it is seen that these topics are used in studies, although limited compared to current technology topics (Şengel et al., 2022; Işkın et al., 2024). Although these are limited compared to current technology topics, they have a high rate in academic studies related to tourism. Especially the subject of automation is among the most popular topics of the recent periods in service automation and robotic studies outside of its traditional meaning (Tussyadiah, 2020; Jabeen

et al., 2022). Future studies can focus on older topics related to technology, its contributions to a different department, and its roles such as the added value it will create in the field.

Today, it is seen that a literature parallel to the developments in the world regarding the use of technology in the field of hospitality and tourism is taking shape. This study has revealed that journals with high impact factors prioritize certain topics. The metaverse comes first among these topics (Gursoy et al., 2022; Buhalis et al., 2023; Akyürek et al., 2024). Future studies can continue to work on the integration of the metaverse in different areas related to tourism. In addition, topics based on planning can be included. In these studies, the roles of decision-making stakeholders in the use of the metaverse in tourism can be focused on, or topics can be studied regarding what planning strategies will provide these developments.

Another popular topic related to technology is artificial intelligence. Artificial intelligence, in addition to being popular, has been widely used in recent years because it includes many topics related to technology (Filieri et al., 2021). Many topics such as robotization and service provider robots in tourism, augmented reality, smart applications are discussed in this context (Ferràs et al., 2020; Pei & Zhang, 2021). However, especially with the existence of platforms that enable the production of text, visual, video, etc. content, especially ChatGPT, artificial intelligence has been used more frequently and has gained popularity (Carvalho & Ivanov, 2024). There is such a development in the field of tourism. It is thought that artificial intelligence, which is a current topic, or topics related to this concept will continue to maintain this popularity in the coming period (Kırtıl & Aşkun, 2021; Knani et al., 2022; Doborjeh et al., 2022; Solakis et al. 2024). The use of these topics in academic studies in the field of hospitality and tourism will both increase the possibility of publication in journals and enable the formation of a theoretical background and conceptual framework related to artificial intelligence in the relevant field. In the studies conducted, it is important to present strategies for sectors and businesses in the tourism industry to gain advantage and competitiveness by using artificial intelligence, especially with managerial implications to be presented as suggestions. It is also important to study topics such as artificial intelligence integration in different areas such as tourism education, tourism financing, and tourist decision-making processes.

6 Declaration

6.1 Limitations

Although the study provides a systematic literature review on the use of technology in tourism, it is limited to the Web of Sciences.

6.2 Conflict of interest

There is no conflict of interest in this study.

6.3 Authors' Contributions

Ümit ŞENGEL: Article idea, data organization and formal analysis and reporting

Zeynep ÖZTOR: Literature review and writing

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