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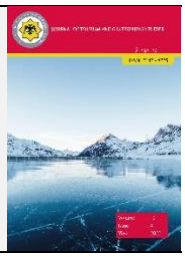

Development of Studies on Tourism Guidance and Technology from Past to Present: A Bibliometric Analysis with Visual Mapping Technique

*** Ezgi KIRICI TEKELİ** [a]

[a] Karamanoğlu Mehmetbey University, School of Applied Sciences, Department of Tourism Guidance, Karaman/Turkey

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Abstract

The current study aims to identify international publications on tourism guidance and technology from the past to the present, examine them with various parameters, and reveal their bibliometric profile. For this purpose, the Scopus database was scanned using the title, abstract, and keywords tabs on 5 October 2022. Scanning keywords were "tourism guidance," "tourism guiding," "tourist guide," "tour guide," and "technology." The VOSviewer software program was used for the bibliometric analysis of the scientific publications and the visual demonstration of the results. After scanning, 332 scientific publications were reached, usually written as conference papers in English. Although most publications were from China, Lancaster University appeared as the most productive institution. Most publications on tourism guidance and technology were in the computer, engineering, and social sciences fields. The word "augmented reality" emerged as the most frequently used keyword with the highest correlational strength. The most collaborative and strongly connected author on tourism guidance and technology was "Kim, S." while the most cited author was "Cheverst, K." with 820 citations. England was the most collaborative, strongly connected, and cited country, with 1430 citations. These results will probably be able to reveal the development process of the relevant subject in detail.

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***** *Corresponding Author*
E-mail: ezgi.krc@windowslive.com (E. Kırıcı Tekeli)

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INTRODUCTION

The rapid development of technology has provided the transition from an agricultural society to an industrial society. In other words, Industrial Revolutions have occurred depending on technological developments. The first industrial revolution (Industry 1.0) occurred in the 19th century, and mechanical production based on steam and water power started then. In the 20th century, the second industrial revolution (Industry 2.0) occurred with electricity-based production, and sectors utilized conveyor belts for the first time. In the 1970s, the integration of automation into production lines with electronic systems and information technologies began the third industrial revolution (Industry 3.0). With the third industrial revolution, the digital industrial age has started (Rüßmann et al., 2015; Srivastava, 2015). The developments in the digital age ignited the fourth industrial revolution (Industry 4.0). With the fourth industrial revolution, cyber-physical systems, the internet of things, big data, cloud computing, sensors, and robots have begun to be used (Chestworth, 2018), and a transition took place from an industrial society to an information society.

The developments in technology and the transition to the information society have affected the industries, and there have been considerable changes in the tourism industry (Buhalis & Law, 2008). Technological developments such as augmented reality, virtual reality, robots, and mobile applications have been prevalent in tourism (De Kervenoael, Hasan, Schwob & Goh, 2020). Technology has started to be used intensively by both tourism enterprises and tourists. Thus, tourists could benefit from mobile applications and other technological developments during their travel from the beginning to the end of the holidays to access all information needed. This situation shows how important digital technologies are for all stakeholders in the tourism industry (Kourouthanassis, Boletsis, Bardaki, & Chasanidou, 2015; Miguéns, Baggio & Costa, 2008; Patel, 2013; Tekeli, Kırıcı Tekeli & Kemer, 2022).

Tourist guides–also discussed in this research–meticulously follow the latest technology and have used these applications in tours. Put another way, tourist guides, who have a prominent place in the tourism industry, prevalently use technological applications in their activities in accordance with the digital age (Bilgili, 2021). Numerous studies published on tourism guidance and technology in the literature indicate parallelism with this situation. Some of the studies encountered on this subject are as follows: the effects of technological developments on tourist guides (Çakmak & Demirkol, 2017; Ercan, 2022); technology use in tours (Eser, Çakıcı, Babat & Kızılırmak, 2019); tourist guides' perceptions of technology use (Kara, Kurt Yılmaz & Güler, 2022); bibliometric analysis of studies on tourism guidance and technology in Turkey (Gökdemir & Göç, 2021); tourist guidance and digital transformation (Bilgili, 2021); tourist guidance and digital tourism (Düzgün, 2022); effects of digitalization on the tourist guidance profession (Kırıcı Tekeli & Tabak, 2021) mobile tourist guides (Kenteris, Gavalas & Economou, 2009; Lai, 2013; Li, Duan, Bai & Yun, 2015; Souffriau, Vansteenwegen, Vertommen, Berghe & Oudheusden, 2008; Vansteenwegen & Van Oudheusden, 2007; Wijesuriya et al., 2013); robot tourist guides (Al-Wazzan, Al-Farhan, Al-Ali and El-Abd, 2016; Bederson, 1995; Kırıcı Tekeli, Kemer & Kasap, 2021; Kim, 2015; Lee, Lim, Tewolde & Kwon, 2014; Özalkan, Özkurt & Yazıcı Ayyıldız, 2022; Pai, Kuang, Chang, Kuo & Lai, 2014; Yıldız, 2019); tourist guidance and augmented reality (Özekici & Kızılcık, 2022; Şalk & Köroğlu, 2020).

The current study revealed that the previous studies discussing tourism guidance and technology were usually published in engineering, computer, and tourism fields. Besides tourism, the existence of different disciplines investigating this issue shows that the subject is multidisciplinary. The studies on the subject have increased recently,

indicating that there will be an increasing trend in the future. In this context, a systematic examination of the previous studies is crucial in revealing the field's development process and guiding future studies. In other words, it became necessary to investigate to disclose the scientific publications' development on tourism guidance and technology. Therefore, this study aimed to determine the international studies on tourism guidance and technology from the past to the present and analyze them with various parameters. For this purpose, a search was carried out on the Scopus database with keywords with no time limit. The data obtained from the search were analyzed with a software program using the visual mapping technique and according to various parameters. Thus, the progress of scientific publications on tourism guidance and technology has been determined.

Conceptual Framework

The history of tourism guidance, one of the deep-rooted professions in the travel and tourism industry, dates back to ancient times. On the other hand, research on tourism guidance is relatively new, and academic studies are increasing (Quinn & Ryan, 2016). The Tourist Guidance Profession Law No. 6326 defines the "tourist guidance service" as follows: "a tourist guidance service is–provided that it is not a travel agency activity–to guide the domestic, foreign, individual, or a group of tourists to know interesting cultural, touristic, historical, environmental, natural, social, etc. places, in line with the culture and tourism policies, using the language chosen by them before the trip, or it is, on behalf of the travel agency, the execution, and management of the itinerary of a tour organized by the travel agency, as defined in the written documents agreed upon with the consumer" (Turist Rehberliği Meslek Kanunu, 2012). Besides, the "technology" discussed within the research is "application knowledge covering the manufacture methods, devices, equipment and tools used in an industry, and their usage methods" (Türk Dil Kurumu, 2022).

The definitions indicate that tourism guidance and technology are closely interrelated. To put it more clearly, in the ever-changing and developing world, all stakeholders in the tourism industry benefit from technological applications. In particular, tourist guides use digital applications to enrich their narratives and make them more attractive during the tour. Microphones, headsets, navigation, computer, tablet, digital dictionary, presentation applications, and guide finder applications are among the applications that provide convenience to tourist guides. Mobile technologies and smartphones also allow tourist guides to do their jobs easier. Smartphones are integrated with various functions that tourist guides can use, such as social media, email, web browsing, calculator, weather forecast, calendar, notepad, GPS, compass, and flashlight. In addition, virtual museums, virtual reality applications, augmented reality applications, electronic guides, and robot guides are some of the applications used by both tourists and tourist guides (Düzgün, 2022; Ercan, 2022; Harpe & Sevenhuysen, 2018; Sotohy, 2020; Şalk & Köroğlu, 2020).

The fact that tourist guides follow technology and benefit from it has stimulated numerous studies on tourism guidance and technology in the literature. Studies on tourism guidance and technology have usually focused on digital applications used during the tour. Mobile tourist guides are generally not evaluated in terms of the tourism industry or tourism guidance but rather in terms of engineering and technology (Kenteris et al., 2009; Li et al., 2015; Souffriau et al., 2008; Vansteenwegen & Van Oudheusden, 2007; Wijesuriya et al., 2013). On the contrary Lai (2013) investigated travelers' viewpoints on mobile tourist guides within the technology acceptance model. The study identified the antecedents affecting technology acceptance and determined informativeness, entertainment, performance expectancy, effort expectancy, social impact, and facilitating conditions as factors that enable the use

of mobile tourist guides.

Studies on robot tourist guides are mostly related to the field of engineering. Rhino, Minerva, Asimo, Tawabo, and Toyota Robot are only a few of the robot tourist guides developed today. While Asimo, Tawabo, and Toyota robot tourist guides operate in museums, towers, and exhibition halls in Japan, Rhino serves in Germany, and Minerva in America (Al-Wazzan et al., 2016). Al-Wazzan et al. (2016) are the researchers working on robot tourist guides. The authors developed a robot tourist guide using Kinect technology. They argued that the robot tourist guide would replace the human tourist guide by serving the tourists everywhere, providing sufficient information, thus, a smooth and enjoyable experience. A similar study by Bederson (1995) developed a robot tourist guide for museums and stated that museums would be more social places thanks to robot tourist guides. Kim (2015) developed a tour guide system using Bluetooth 4.0 and Wi-Fi sensor technology. Similarly, Lee et al. (2014) developed a robot tourist guide with ultrasonic distance sensors and a QR code feature. They used Bluetooth technology to send the information in the QR codes to the robot tourist guide. Pai et al. (2014) developed an easily operable and versatile robot tourist guide with voice control and guidance functions.

There are also studies conducted in the tourism field for robot tourist guides. Özalkan et al. (2022) measured the tourist guides' perspective on digitalization and robot guides. They documented that tourist guides benefited from headsets, navigation, and voice guidance applications, and these applications played a supportive role in places where the narration was limited. Furthermore, they noted that using robot guides would ease the workload in museums and archeological sites but, on the other hand, might prevent communication between travelers and the guide. Yıldız (2019) predicted in his study that robot tourist guides would guide in open and indoor areas in the medium and long term. Kırıcı Tekeli et al. (2021) have reached a similar conclusion in their study. Tourist guides stated that the most prominent aspect of robot guides would be standard service, while insincerity and lack of knowledge would be their weakness. Furthermore, they claimed that although they would contribute to creating different employment opportunities and drawing a technological country image, on the other hand, they would cause unemployment.

In addition to mobile and robot tourist guides, some researchers investigated the effects of technological developments on the professions of tourist guides. They revealed technological applications preferred by tourist guides are efficient in information equipment, communication, transportation, and security (Çakmak & Demirkol, 2017). Similarly, another study that mentioned technology's positive and negative effects on tourist guides stated that social media and mobile applications were the most frequently used technologies by tourist guides (Ercan, 2022). In their research, Eser et al. (2019) found that tourist guides had positive attitudes towards microphone systems, animation, 3-D animation systems, and interactive review applications, while they negatively approached voice guidance and virtual assistant applications. Another study determined tourist guides' professional anxiety factors originating from digital transformation and explained their attitudes toward technology use within the technology acceptance model's framework (Bilgili, 2021). The study conducted by Düzgün (2022) revealed that tourist guides followed technological developments in digital tourism, and they have an affirmative view of some of the digital applications and a negative view of some of them. Eventually, tourist guides' technology use has significant consequences for the tourism industry and tourists (Kara et al., 2022).

Augmented reality applications in tourism guidance and technology are also crucial. A study examining the intention of tourists to adopt augmented reality-based tour guide applications found these applications practical and

entertaining for touristic tours (Özekici & Kızılcık, 2022). Another study documented that the awareness level of augmented reality applications among tourist guides was low. Knowledgeable tourist guides about augmented reality applications expressed that these are important, and when used, they would be advantageous to tourist guides and tourists (Şalk & Köroğlu, 2020).

Studies on tourism guidance and technology in the literature have been examined and concluded that technology is a multifaceted concept. The proof of this situation is the studies conducted on different subjects, such as the effects of technological developments on tourist guides, technology usage in tours, tourist guides' perceptions of technology use, tourist guidance and digital transformation, tourist guidance and digital tourism, the effects of digitalization on the tourist guidance profession, mobile tourist guides, robot tourist guides, tourist guidance and augmented reality. Different from other studies, this research determined the emergence and development of the subject by examining international publications on tourism guidance and technology.

Method

The current study discussed the subjects of tourism guidance and technology and conducted a bibliometric analysis of the relevant studies from the past to the present. A flourishing number of studies that were subject to bibliometric analysis indicate the significance of this statistical analysis method in numerous scientific fields, including tourism (Ellegaard & Wallin, 2015). This research, also, preferred to use the bibliometric analysis method, which allows for determining the scientific basis of the topic covered in scientific publications and revealing the trends, development, and future roadmap of the subject in the tourism field (Hall, 2011; López-Bonilla & López Bonilla, 2020).

The first person to use the concept was Alan Pritchard in 1969 (Diodato, 2012; Lawani, 1981). Pritchard (1969, p. 349) defines bibliometrics as "the application of mathematical and statistical methods to books, articles, conference papers, and other communication media." Diodato (2012, pp. 8-9) defines the concept as "a preferred quantitative method for the mathematical and statistical analysis of all scientific publications published in print or electronic media." López-Bonilla and López-Bonilla (2020, p. 2) state that bibliometric analysis is "a method for dealing with scientific publications related to a particular field with a quantitative method." Examining scientific publications in various ways and subjecting them to bibliometric analysis allows one to get information about the development course of the relevant subject (Lawani, 1981). The current study, which aimed to reveal the development process of research on tourism guidance and technology, gave explanations about research questions, variables, data collection methods, and data analysis and introduced the details of the bibliometric analysis.

Research Questions

The current study developed some research questions to reveal the development process of scientific publications on the subjects of tourism guidance and technology. These questions were related to the research purpose and clarified the analysis of the research. The research questions are:

- What is the distribution of studies on tourism guidance and technology by years?
- What is the distribution of studies on tourism guidance and technology by publication types?
- What is the distribution of studies on tourism guidance and technology by the languages of publication?
- What is the distribution of studies on tourism guidance and technology by countries?

- What is the distribution of studies on tourism guidance and technology by affiliations?
- What is the distribution of studies on tourism guidance and technology by fields?
- What is the distribution of studies on tourism guidance and technology by sources?
- What is the citation distribution of studies on tourism guidance and technology by years?
- Which are the most cited publications in tourism guidance and technology studies?
- What is the network map of keywords used in tourism guidance and technology studies?
- What is the network map of the most cooperative authors for tourism guidance and technology studies?
- What is the network map of the most cooperative countries for tourism guidance and technology studies?
- What is the network map of the most cited authors for tourism guidance and technology studies?
- What is the network map of the most cited countries for tourism guidance and technology studies?

The research developed fourteen questions. The analysis on Scopus yielded the answers to the first nine questions, while the answers to the last five research questions were from the VOSviewer software program.

Study Field

The research field comprised all scientific publications on tourism guidance and technology published in the Scopus database. The current study handled the variables with a holistic perspective. Accordingly, international publications on tourism guidance and technology were examined and analyzed in terms of particular parameters.

Data Collection Method

International publications on tourism guidance and technology were determined using the Scopus database on 5 October 2022. Scopus, a globally accepted database of abstracts and citations, provides access to scientific journals, books, and conference papers in science, technology, medicine, social sciences, arts, and humanities. Today, research is gradually gaining a global and interdisciplinary dimension, and Scopus continuously grows with studies from all over the world. Therefore, Scopus, a frequently preferred database by researchers, is used by over 3000 institutions worldwide. Researchers analyze and visualize the results from Scopus to reveal trends and get more detailed information (Scopus, 2022). Due to these features, the current study preferred the Scopus database and reached worldwide accepted international publications on tourism guidance and technology.

The study searched relevant international publications using the Scopus database's tabs title, abstract, and keywords. The keywords used for the scanning were “tourism guidance,” “tourism guiding,” “tourist guide,” “tour guide,” and “technology.” The word “OR” was preferred between the first four keywords, while “AND” was chosen before the last keyword. Thus, the study tried to determine scientific research that focused on technology and any of the first four keywords. The scanning yielded 332 scientific publications covering studies on tourism guidance and technology. The process of obtaining scientific publications is shown in detail in the PRISMA flow diagram in Figure 1.

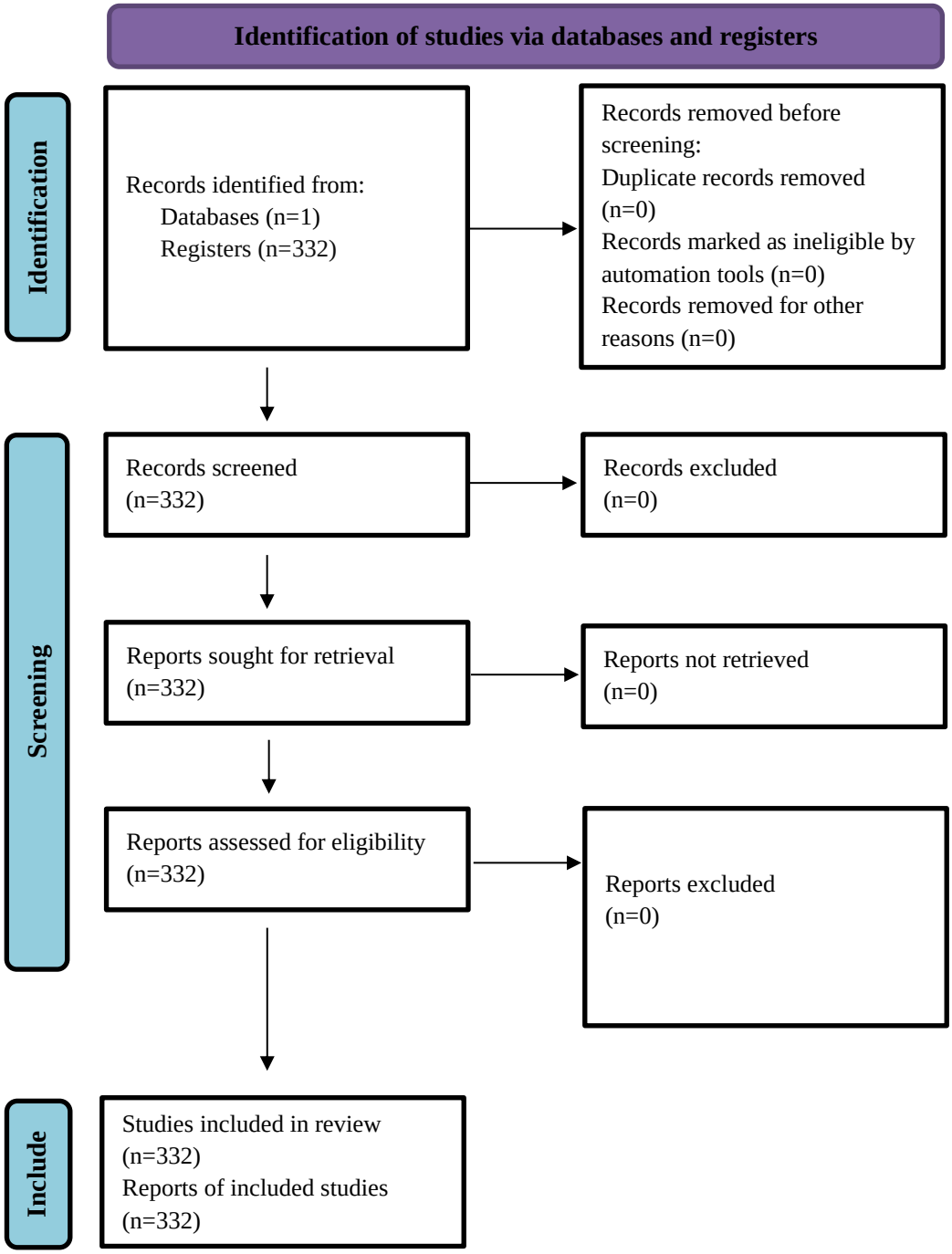

Figure 1. PRISMA Flow Diagram

Source: PRISMA Flow Diagram, 2020

All of the scientific publications reported in Figure 1 were examined and it was seen that there were publications in different fields. However, it has been determined that all scientific publications are related to the subject of tourism guidance and technology. In this context all publications were examined and systematically evaluated in terms of years, types, languages, country of origin, affiliations, study areas, source titles, distribution of citations by years, and cited publications. Since Scopus is constantly updated and includes new scientific publications, scanning the Scopus database with the same keywords, but based on a different period, might produce an entirely different result from the current situation. Indeed, it does not seem possible to obtain similar results if the same data collection method is used on a different date (Liu, Zhan, Hong, Niu & Liu, 2013).

Data Analysis

The study employed the "VOSviewer" software program to perform a bibliometric analysis of scientific publications on tourism guidance and technology and present the results visually. Since it is open-source and free of charge, this software program is usually preferable among users (Van Eck & Waltman, 2020). Van Eck and Waltman (2017, p. 1054) define the VOSviewer software program as "a scientific mapping program designed for the analysis and visual representation of bibliometric networks." At the outset of the study, the Scopus database was scanned, thus yielding a file containing 332 scientific publications with citations, bibliographic information, abstracts, keywords, and financing details. After downloading this file in a proper format, the formatted file was immediately uploaded to the VOSviewer software program. In the program, "Co-authorship," "Co-occurrence," and "Citation" tabs were utilized to identify the outstanding keywords, authors, and countries included in scientific publications on tourism guidance and technology. Then network of keywords for the relevant topic, the most cooperative authors and countries, and most cited authors and countries were determined with the analysis. Thus, scientific publications on tourism guidance and technology were examined and interpreted in terms of various parameters.

The VOSviewer software program has its unique terminology. It is crucial to know this terminology to make the analysis clearer. Maps created using VOSviewer contain "items." Items might be relevant publications, researchers, keywords, and so on within a study. Each map covers only one item. There might be a "link" between the items, which expresses the relationship between the two items, for example, co-authoring links between researchers or co-occurrence links between keywords. Items and links together form a network. Hence, the network is a "cluster" containing the links between items. The items are grouped into clusters. An item can belong to only one cluster. Some items might not belong to any cluster. In addition, clusters are called with numbers such as cluster 1, cluster 2, and so on (Van Eck and Waltman, 2020). As a result, knowing the terminology for the program helps to interpret the analyses.

Results

The data on tourism guidance and technology studies were evaluated with various parameters and analyzed using a visual mapping technique. The results are presented with the help of tables, graphs, and figures. The first finding on tourism guidance and technology studies revealed the development process of the subject over the years. Table 1 shows the distribution of the publications by year.

Table 1. Distribution of Studies on Tourism Guidance and Technology by Years

Year	Number of Publication	Year	Number of Publication	Year	Number of Publication
2022	20	2012	16	2002	2
2021	26	2011	11	2001	4
2020	25	2010	23	2000	4
2019	18	2009	12	1999	1
2018	25	2008	12	1998	2
2017	20	2007	8	1997	1
2016	16	2006	9	1995	1
2015	13	2005	16	1993	1
2014	19	2004	6	1992	1
2013	14	2003	6	**Total**	**332**

Source: Scopus database.

Table 1 shows the distribution of scientific publications on tourism guidance and technology over the years. The date of the first study on tourism guidance and technology was 1992. The period between 1992 to 2022 generated many scientific publications on tourism guidance and technology. Indeed, 332 studies conducted on tourism guidance and technology were identified, although no scientific publications existed on the subject in some years. The most productive year with the highest number of studies was 2021, with 26 scientific publications. Studies on tourism guidance and technology will attract more attention from now on, and the number of studies will increase in the coming years.

Table 2. Distribution of Studies on Tourism Guidance and Technology by Document Types and Languages

Document Type	Number of Publication	Language of Publication	Number of Publication
Conference Papers	187	English	324
Articles	114	Spanish	4
Conference Reviews	13	Portuguese	2
Book Chapters	12	Chinese	1
Reviews	5	Slovenian	1
Editorials	1	-	-

Source: Scopus database.

Table 2 shows the distribution of the studies conducted on tourism guidance and technology by publication type and language. The studies identified were conference papers, articles, conference reviews, book chapters, reviews, and editorials. Most studies on tourism guidance and technology were conference papers (n=187). Although the studies on the subject were in various languages (English, Spanish, Portuguese, Chinese & Slovenian), most were in English (n=324). As an international database, Scopus allows publications in many languages.

Table 3. Distribution of Studies on Tourism Guidance and Technology by Countries and Affiliations

Country	Number of Publication	Affiliation	Number of Publication
China	52	Lancaster University	8
Taiwan	41	National Taiwan University	5
United States	28	University of the Aegean	5
United Kingdom	27	Hong Kong Polytechnic University	4
South Korea	17	Bulgarian Academy of Sciences	4
Germany	16	Lapin Yliopisto	3
Italy	15	Nanyang Technological University	3
Greece	12	Plovdiv University Paisii Hiledarski	3
Malaysia	12	Tatung University	3
India	11	Central Michigan University	3

Source: Scopus database.

Table 3 shows the data on countries and affiliations working on tourism guidance and technology. Although 56 countries studied tourism guidance and technology, Table 3 covered the top ten countries. China ranked first with 52 scientific publications on tourism guidance and technology, followed by Taiwan (n=41) and the USA (n=28). The number of relevant scientific publications in Türkiye (n=4) was pretty low. On the other hand, out of the 160 affiliations that conducted scientific publications on the relevant subject, the first ten institutions appeared in the table. Lancaster University ranked first with eight studies, followed by the National Taiwan University (n=5) and the University of the Aegean (n=5).

Table 4. Distribution of Studies on Tourism Guidance and Technology by Subject Areas and Sources

Subject Area	Number of Publication	Source Title	Number of Publication
Computer Science	221	Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics	21
Engineering	105	ACM International Conference Proceeding Series	11
Social Sciences	67	Lecture Notes in Electrical Engineering	8
Mathematics	50	Conference on Human Factors in Computing Systems Proceedings	5
Business, Management, and Accounting	33	Advances in Intelligent Systems and Computing	4
Decision Sciences	29	2021 IoT Vertical and Topical Summit for Tourism	3
Arts and Humanities	22	Applied Mechanics and Materials	3
Environmental Science	19	Communications in Computer and Information Science	3
Earth and Planetary Sciences	11	Digital Presentation and Preservation of Cultural and Scientific Heritage	3
Energy	11	International Archives of the Photogrammetry Remote Sensing and Spatial Information Sciences ISPRS Archives	3

Source: Scopus database.

Table 4 shows the distribution of scientific publications on tourism guidance and technology according to the subject areas and sources. Despite studies on these subjects in 23 different fields, the table showed the top ten by publication numbers. In this ranking, publications in the computer science field were in the first place (n=221), followed by engineering (n=105) and social sciences (n=67). On the other hand, the studies conducted on tourism guidance and technology were published from 160 various sources. Table 4 shows the top ten sources publishing the relevant studies. As seen, "Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics" had published the most scientific publications on these subjects (n=21), followed by "ACM International Conference Proceeding Series" (n=11) and "The Lecture Notes in Electrical Engineering" (n=8).

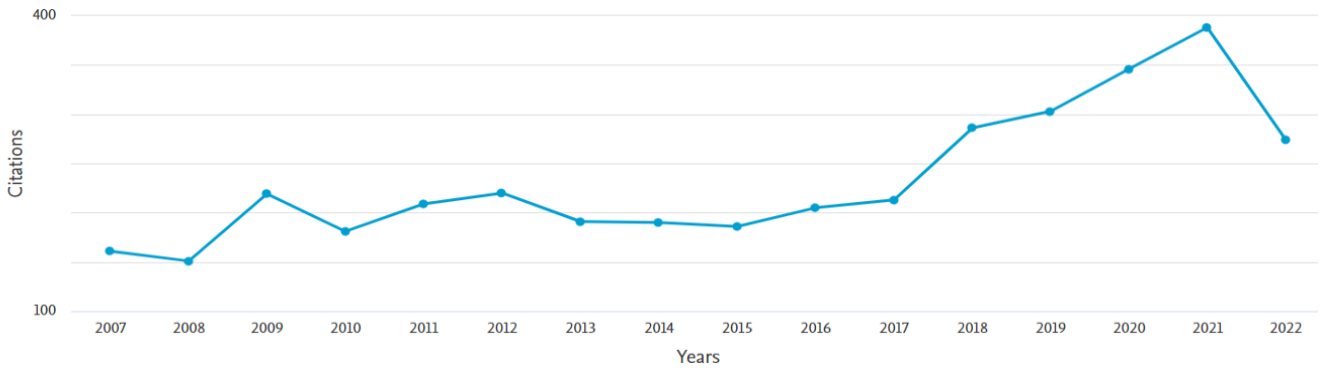

Figure 2. The Graph of the Distribution of Citations of Studies on Tourism Guidance and Technology by Years

Source: Scopus database.

Figure 2 shows the distribution of citations of studies on tourism guidance and technology by year. The graph demonstrated the data for the last 15 years and covered 2007-2022. The information from the Scopus database revealed that 161 citations were made in 2007 and 388 in 2021 on these subjects. In the current year of 2022, there

were a total of 275 citations. The graph showed an increasing rate of citations to the studies conducted on tourism guidance and technology over the last 15 years.

Table 5. Most Cited Publications in Studies on Tourism Guidance and Technology

Name of Publication	Author	Source	Year of Publication	Number of Citations
Developing a context-aware electronic tourist guide: Some issues and experiences	Cheverst, Keith; Davies, Nigel; Mitchell, Keith; Friday, Adrian; Efstratiou, Christos	Conference on Human Factors in Computing Systems-Proceedings	2000	604
Experiences of developing and deploying a context-aware tourist guide: The GUIDE project	Cheverst Keith; Davies Nigel; Mitchell Keith; Friday Adrian	Proceedings of the Annual International Conference on Mobile Computing and Networking	2000	371
Intrigue: Personalized recommendation of tourist attractions for desktop and handheld devices	Ardissono, Liliana; Goy, Anna; Petrone, Giovanna; Segnan, Marino; Torasso, Pietro	Applied Artificial Intelligence	2003	278
Toward a first nations cross-cultural science and technology curriculum	Aikenhead, Glen S.	Science Education	1997	205
Tourism and glocalization: "Local" tour guiding	Salazar, Noel B.	Annals of Tourism Research	2005	161
Using and determining location in a context-sensitive tour guide	Davies, Nigel; Cheverst, Keith; Mitchell, Keith; Efrat, Alon	Computer	2001	144
An innovative mobile electronic tourist guide application	Kenteris, Michael; Gavalas, Damianos; Economou, Daphne	Personal and Ubiquitous Computing	2009	134
Traveler acceptance of an app-based mobile tour guide	Lai, Ivan K.W.	Journal of Hospitality and Tourism Research	2015	97
Electronic mobile guides: A survey	Kenteris, Michael; Gavalas, Damianos; Economou, Daphne	Personal and Ubiquitous Computing	2011	82
Recommendations based on semantically enriched museum collections	Wang, Yiwen; Stash, Natalia; Aroyo, Lora; Gorgels, Peter; Rutledge, Lloyd; Schreiber, Guus	Web Semantics	2008	73
The total number of citations for studies on tourism guidance and technology				**4331**

Source: Scopus database.

Table 5 shows the top ten most cited studies on tourism guidance and technology. Each study was listed from the most cited publications to the least by giving their title, author, source name, publication year, and the number of citations. The most cited scientific publication was "Developing a context-aware electronic tourist guide: Some issues and experiences" (n=604), published by Cheverst, Davies, Mitchell, Friday, and Efstratiou in 2000, at Conference on Human Factors in Computing Systems-Proceedings. The second most cited publication was "Experiences of developing and deploying a context-aware tourist guide: The GUIDE project," published by Cheverst, Davies, Mitchell, and Friday in 2000, in the Proceedings of the Annual International Conference on Mobile Computing and

Networking (n=371). On the other hand, the information obtained from the Scopus database shows that scientific publications on tourism guidance and technology have received 4331 citations in the last 15 years.

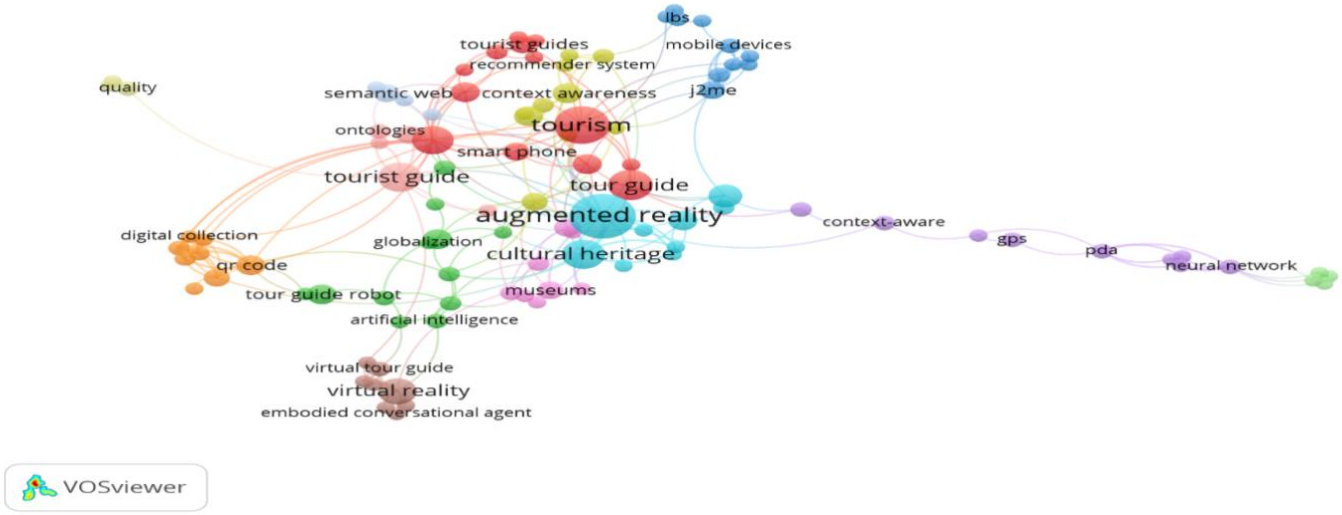

Figure 3. The Network of Keywords for Tourism Guidance and Technology Studies

Figure 3 shows a network map for the 886 keywords frequently used in the studies on tourism guidance and technology. When the minimum repeat number of keywords was two, 111 out of 886 met the threshold value. The analysis of the keywords network showed that of the 111 words, only 103 were related to each other. These 103 words were in 13 different clusters. In line with this information, "augmented reality" in the broadest turquoise ring appeared as the most frequently repeated keyword with the highest correlational strength. Besides, "cultural heritage," "mobile application," "QR code," "tourism," "exhibition technologies," "museum learning," "tourist guide applications," "tourist guide," and "mobile applications" were the words used frequently and their correlational strength was high. The rings of different colors representing the clusters, and the lines showing the strength of the relationship between the rings, indicate a dense network of words.

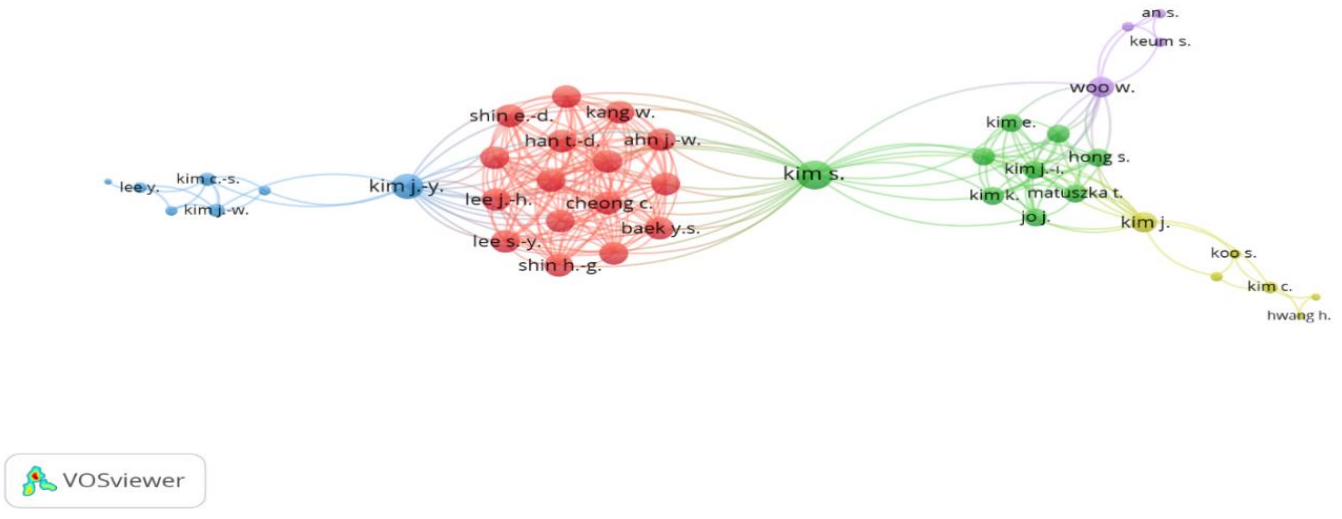

Figure 4. The Network Map of the Most Cooperative Authors in the Studies on Tourism Guidance and Technology

Figure 4 shows the network map of the most cooperative authors in studies on tourism guidance and technology. While creating the network map, 945 authors were reached by selecting the minimum document and citation numbers of the authors as 1. Only 749 authors out of these 945 met the threshold. Among these 749 authors, only 42 had a

connection with each other. The authors were included in five different clusters. "Kim, S.," appearing in the green ring, was the most cooperative and connected author on tourism guidance and technology, followed by "Cheverst, K." and "Kim, J.Y." The network map of the most collaborating authors, in general, determined quite strong connections between the authors.

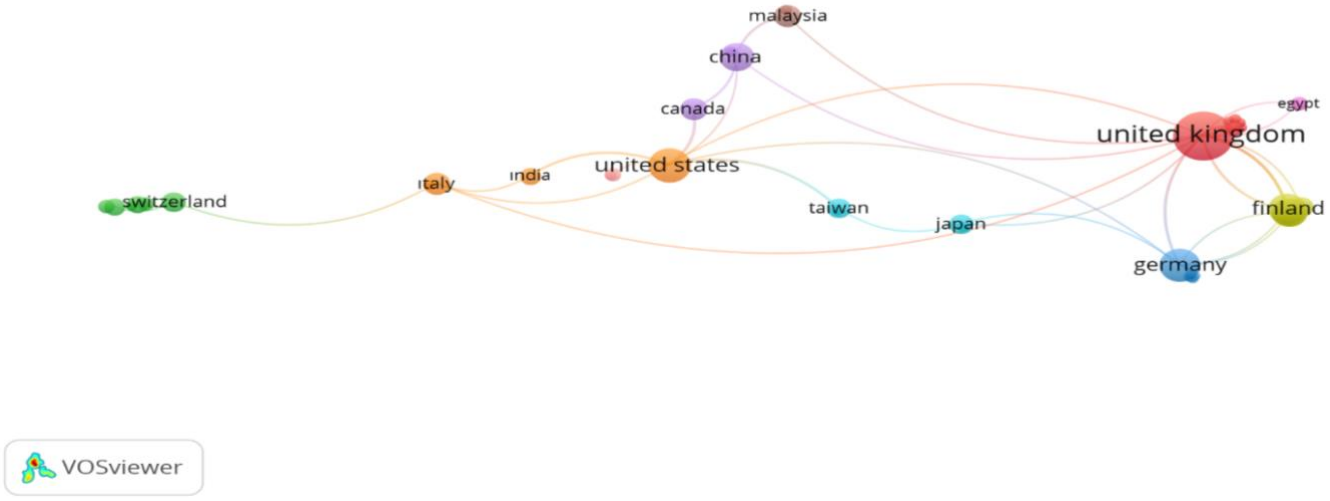

Figure 5. The Network Map of the Most Cooperative Countries in the Studies on Tourism Guidance and Technology

Figure 5 shows the network map of the most cooperative countries in tourism guidance and technology studies. In creating the network map, 56 countries were reached by selecting 1 for the minimum number of documents and citations for each country. Of the 56 countries, 51 met the threshold. Only 41 of the 51 countries were interconnected in the network map. These 41 countries were in 10 different clusters. The "UK" included in the broadest red ring was the country with the most cooperation and strongest connection, followed by the "USA" in the orange ring and "Germany" in the blue. The overall evaluation of the network map showed that the relations between countries were not too strong.

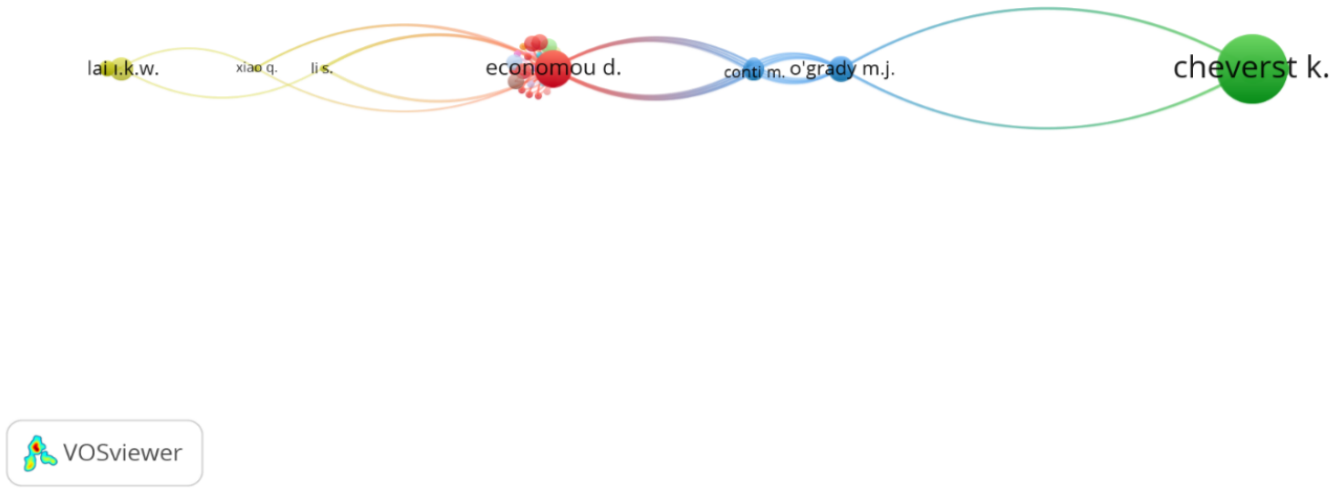

Figure 6. The Network Map of Most Cited Authors in the Studies on Tourism Guidance and Technology

Figure 6 shows the network map of the most cited authors in the studies on tourism guidance and technology. In creating the most cited authors' network map, selecting 1 for the minimum number of documents and citations for each author produced a result of 945 authors. Out of the 945 authors, 749 met the threshold value. Instead of including

all authors, only 50 interconnected authors were included in the network map. The authors were in 15 clusters. "Cheverst, K." in the broadest green ring was the most cited author (n=820), followed by "Davies, N." (n=797) and "Mitchell, K." (n=797). The network map of the most cited authors showed intense relationships among some authors while weak relationships among others.

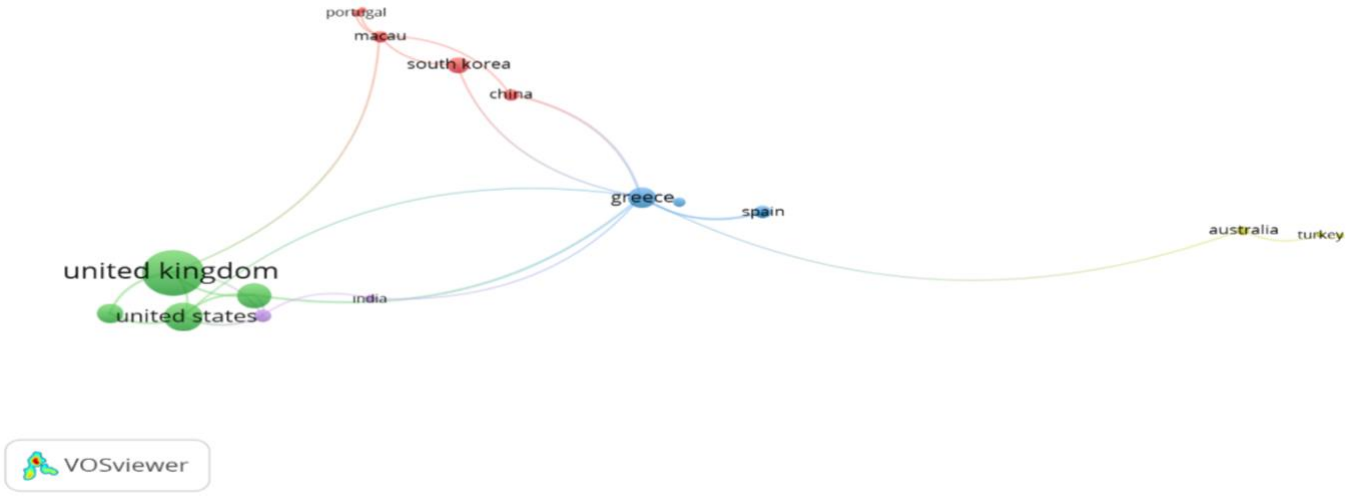

Figure 7. The Network Map of Most Cited Countries in the Studies on Tourism Guidance and Technology

Figure 7 shows the network map of the most cited countries in studies on tourism guidance and technology. In creating this network map, selecting 1 for the minimum number of documents and citations for each country produced a result of 56 countries. Of the 56 countries, 51 met the threshold value. Out of these 51 countries, the number of interconnected countries was 18. The network map classified these countries into five clusters. The "UK" in the broadest green ring was the most cited country (n=1430), followed by the "USA" in the green ring (n=564) and "Italy" (n=447). The network map of the most cited countries generally shows weak relationships.

Conclusion, Discussion and Recommendations

Tourism guidance is one of the professions whose importance has increased in recent years. Technological developments also affecting tourist guides have contributed to the widespread use of technology in tours. The rapid evolution of technology and the increasing importance of the tourist guidance profession boost the number of studies on tourism guidance and technology. Therefore, systematically examining and analyzing the studies on this subject seems like a requirement. Accordingly, the current work has investigated the relevant topic with certain parameters and performed bibliometric analyses using a software program.

The first international publication on tourism guidance and technology was in 1992. It is evident that the number of studies conducted from 1992 to 2022 indicates an increasing trend. The result shows that scientific publications on tourism guidance and technology will multiply and attract more attention. Similarly, in their study, Gökdemir and Göç (2021) stated that the number of studies on tourism guidance and technology would advance in the future. The study revealed that most scientific publications on tourism guidance and technology were conference papers in the English language. Studies by Al-Wazzan et al. (2016), Bederson (1995), Lee et al. (2014), Li et al. (2015), and Wijesuriya et al. (2013) are scientific publications in English on tourism guidance and technology and support the result achieved. The current study revealed that China, Taiwan, and the USA were the most publishing countries on tourism guidance and technology. While the number of international publications on the relevant topic in Türkiye

was insufficient, the national publications have considerably boosted in recent years (Bilgili, 2021; Çakmak & Demirkol, 2017; Düzgün, 2022; Ercan, 2022; Eser et al., 2019; Gökdemir & Göç, 2021; Kara et al., 2022; Kırıcı Tekeli et al., 2021; Özalkan et al., 2022; Özekici & Kızılcık, 2022; Şalk & Köroğlu, 2020; Yıldız, 2019). This situation also indicates that the number of international publications on the relevant subject will increase in Türkiye. The study determined Lancaster University, National Taiwan University, and the University of the Aegean as the affiliations with the highest number of publications.

This study observed that the publications on tourism guidance and technology were frequently in the computer, engineering, and social sciences fields. Of these studies, those on mobile tourist guides and robot tourist guides were usually conducted in engineering and computer fields (Al-Wazzan et al., 2016; Bederson, 1995; Kenteris et al., 2009; Kim, 2015; Lee et al., 2014; Li et al., 2015; Pai et al., 2014; Souffriau et al., 2008; Vansteenwegen & Van Oudheusden, 2007; Wijesuriya et al., 2013). The interest shown by out-of-tourism disciplines is evidence of the multi-disciplinarity of the subject. Another piece of evidence supporting the multidisciplinary nature of the topic manifested itself with the keywords network. The word "augmented reality" was the most frequently used keyword with the highest correlational strength. In addition, the usage of "cultural heritage," "mobile application," "QR code," "tourism," "exhibition technologies," "museum learning," "tourist guide applications," "tourist guide," and "mobile applications" were frequent. These frequently used keywords indicate that studies on tourism guidance and technology were handled manifoldly. The source named "Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics" was the source where the most number of related studies were published.

Reviewing the distribution of citations in the relevant studies showed that the number of citations increased in parallel with the increase in the number of publications. In addition, the most cited publication for the studies on tourism guidance and technology was "Developing a context-aware electronic tourist guide: Some issues and experiences" (n=604). Another finding was that "Kim, S." was the most cooperative author with the strongest connection in the studies on tourism guidance and technology. The most cooperative country with the strongest connection was the UK. On the other hand, the most cited author was "Cheverst, K." while the most cited country was the UK. These results differ from the findings of previous studies. The reason for this dissimilarity might be the different research methods of the earlier studies (Al-Wazzan et al., 2016; Düzgün, 2022; Ercan, 2022; Kara et al., 2022; Li et al., 2015). Indeed, no research has been found using the same method as ours.

Theoretical Implications

This research revealed the development process of scientific publications on tourism guidance and technology over the years and presented these publications' types, languages, countries, affiliations, fields, sources, as well as the most cited studies. This study examining the relevant subject with the foregoing parameters and filling a gap in the tourism guidance literature might be a resource for those considering researching this subject. In addition, the bibliometric analysis by using a software program in the study provided more detailed information, covering a network map of frequently used keywords in tourism guidance and technology studies, the most collaborating authors and countries, and the most cited authors and countries. This study might contribute to the literature and methodology due to its content and method on tourism guidance and technology.

Practical Implications

This study's results on tourism guidance and technology will contribute to tourist guides as well as to academicians and researchers. The study examined international publications on tourism guidance and technology in detail, determined the technology used in the tourism guidance profession and the digital applications, and thus determined the strong relationship between technology and tourism guidance. Indeed, tourist guides must benefit from technological applications to develop their professional perspective. The new generation of tourist guides' close technology follow-up and dynamic technology utilization enrich their narratives and make them more attractive. Therefore, with the effective use of technology, tourist guides will provide a competitive advantage in the sector and maintain their existence.

Limitations and Future Research

The database, keywords, software program, and analyses used in this study are seen as a limitation of this research. In addition, the analysis of only international publications on the subject is another limitation of this research. In the future, it is recommended to use a different database, such as Web of Science, and to perform bibliometric analysis using other software programs, such as Bibliometrix R-Package. National and international publications on tourism guidance and technology can be analyzed using meta-analysis or meta-synthesis techniques. In addition, technological subjects can be researched in terms of both tourists and tourist guides, and comparisons can be made. Tourism guidance and technology can be analyzed using qualitative or quantitative research methods. Discussing the relevant subject with alternative approaches will contribute to the tourism guidance literature. Thus, future research will improve the quality and quantity of research on tourism guidance and technology while examining the subject in depth using different methods. Besides, it is recommended to provide proper training in universities or professional chambers for efficient technology utilization in the tourism guidance profession. Giving training or seminars on the subject will contribute to tourist guides.

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