Mobile Technology in Tourism

Subjects: Statistics & Probability

Contributor: Sirong Chen , Rob Law , Shaogui Xu , Mu Zhang

The influence of mobile technology on tourism is very significant. With the support of mobile-related devices (smartphones, glasses, or other wearable devices), technology, data and services, multiple travel concepts, and travel modes including mobile tourism, smart tourism, e-tourism, and sustainable tourism have emerged or developed further. Mobile technology is touted as the next technology wave that can fundamentally change tourism and hotels. Moreover, mobile technology is playing an increasing role in the travel experience, and increasing travel research is concentrated in this field.

Research findings show that, first, the research of mobile technology in tourism can be divided into three phases and to a certain extent is synchronized with the development of mobile technology. Second, in the area of social sciences, the research of mobile technology in tourism needs further exploration, which must refer to related research in the areas of Transportation and IT to expand the perspective of research. Top journal analysis, journal co-citation analysis, author co-citation analysis, and collaboration network analysis reveal the most representative journals, authors, institutions, and countries/regions in this research field. This finding provides a valuable reference for scholars in this field. Additionally, this research also grasped the hot and cutting-edge topics in this field through the analysis of keywords in this field. Finally, the clustering of co-citation references presents the knowledge base of mobile technology research in the tourism field: mobile technology, travel mode, mobile instrument, travel behavior research, mobile applications, and geo-based technology.

mobile technology tourism hospitality bibliometric analysis CiteSpace

1. Introduction

With the increasing popularity of fifth-generation mobile communication technology (5G), mobile technology will further change people's lifestyles and the operation mode of many industries. Among them, the influence of mobile technology on tourism is very significant [1]. With the support of mobile-related devices (smartphones, glasses, or other wearable devices), technology, data and services, multiple travel concepts, and travel modes including mobile tourism [2], smart tourism [3], e-tourism [4], and sustainable tourism [5] have emerged or developed further. Mobile technology is touted as the next technology wave that can fundamentally change tourism and hotels [6]. Moreover, mobile technology is playing an increasing role in the travel experience, and increasing travel research is concentrated in this field [7]. Among them, review research can lay the foundation for academic inquiry in this field by summarizing previous work, testing hypotheses, expanding theories, and evaluating critically [8]. These studies can help readers quickly understand the research structure, the latest developments, and the marginal gaps in existing research in the field of mobile technology [9,10]. Law et al. [11] collected and analyzed 92 mobile technology-related articles published in tourism and hospitality journals from the perspective of suppliers and

consumers, based on multiple research backgrounds and theoretical use. The dimension is extensively examined in this field. Wang et al. [12] reviewed the application, promotion, and challenges of mobile phone data in travel behavior research to promote the adoption of mobile phone data in travel behavior research. Ukpabi and Karjaluoto [4] reviewed 71 articles published during 2005–2016 on consumer acceptance or adoption of e-travel and completed the following tasks: determined the precursors that affect the acceptance and use of consumer e-tourism; provided a classification framework for consumers to adopt e-tourism; determined the relevant research theories, models, and frameworks; determined the behavioral dynamics of consumers adopting information and communications technology in tourism. Dorcic, Komsic, and Markovic [3] conducted a comprehensive systematic literature review of 126 articles related to mobile technology and applications in smart tourism published from 2012 to June 2017, respectively, from the perspectives of consumers, technology, and suppliers. The study conducted a descriptive statistical analysis of the source of the literature, publication year, research area, and research method. Simultaneously, a keyword cluster analysis was performed using VOSviewer software. Liang, Schuckert, Law, and Masiero [2] analyzed 92 mobile tourism-related articles published from 2002 to 2015 through the paradigm funnel method and classified the articles into different funnels. This study helps researchers and practitioners understand the research trends of empirical and conceptual research. Kim and Kim [5] used a different software to analyze various data, such as patents, articles, news, and mobile travel application reviews, and the definition and role of mobile technology in tourism. Moreover, the relationship between mobile technology and smart tourism and its future development direction are discussed in the study.

The above review papers have made important contributions to the research field of mobile technology in tourism. The predecessors either comprehensively reviewed the application of mobile technology in tourism or discussed a certain angle involved in mobile technology. Most of them used content analysis and descriptive statistics, focusing on the investigation of the relationship among the authors, research topics, and research data. However, these reviews lack thorough research of network work and thus may lack accuracy and objectivity in mapping the scope and structure of the research field, determining the most authoritative papers, and discovering key parts of the research [13]. Meanwhile, mobile technology is changing rapidly, and related academic research has also substantially increased in the past two years. This event has not only increased the difficulty of tracking related documents in the field [14] but also required a comprehensive review of related articles (specifically the latest articles) in the field. The present research adopts a bibliometric analysis method to review the related research of mobile technology in tourism to solve the above problems. Bibliometric analysis is a method of examining literature materials from a quantitative perspective. This analysis can dissect and classify rich data and information according to different variables, such as journals, institutions, and countries [15]. Moreover, the credibility of research is known to be usually directly related to the method used [16]. The bibliometric analysis introduces objectivity into the evaluation of the literature. Furthermore, it greatly increases the rigor of the scientific literature, avoids or reduces the bias of researchers on literature review [14], and also increases the credibility of the research by summarizing the research of many scholars in the research field. This analysis method can analyze the research of mobile technology in tourism from a highly comprehensive and objective perspective. Bibliometric analysis can provide a quantitative perspective for the field, supplement previous studies, and point out potential future research directions [17]. What is more, as far as the researchers know, in the current research in tourism

and mobile technology, almost no scholars used bibliometric analysis to conduct a comprehensive review of the literature from multiple angles. This study applies the well-established research method to a new research field, namely the application of bibliometric analysis to mobile technology in tourism, and provides a valuable reference for the exploration of bibliometric and visualized analysis in related fields.

2. Tourism and Mobile Technology

Mobile technology has become a necessity for tourists [11]. People are assisted by various mobile devices and can travel more freely and conveniently than ever before through mobile technology [18]. Linton et al. [19] pointed out that during travel, maps or navigation apps are the most common activities that people use on their mobile devices. Moreover, people check the weather, find restaurants, look for things to do, participate in social media (particularly sharing photos), read restaurant recommendations, find local stores, research hotel services, and conduct booking, which are roughly the basic activities in regular travel. In addition, Szark-Eckardt [20] believed that travel-related mobile applications generate added value through the synergy and mutual influence of a healthy lifestyle, travel passion, and modern technology. Such an added value is one of the factors that increase the attractiveness and usability of tourism. For example, with the introduction of location-based sensing functions (e.g., Global Positioning System) on mobile devices, related applications can provide tourists with customized services that meet their needs based on their current location [1]. As a result, tourists can obtain a richer, more beneficial, and immersive experience than before. Therefore, the new development of mobile technology enables the recommendation system to combine the user's personal situation and preferences, using numerous opportunities to provide highly accurate and effective travel recommendations [21]. Mobile connections also adopt new methods to connect with social networks, gradually integrating online and offline, and tourists can interact with the Internet across space and time [22]. This connection improves their chances of sharing in the user community of social networks [23] while extending travel to virtual spaces. The virtual reality and augmented reality (AR) devices that have been widely used in travel in recent years are mostly based on mobile technology [24]. In conclusion, mobile technology has improved people's travel experience and provided them with many new reasons to travel: it makes them highly informed; it is capable of using additional types of physical spaces and designing or modifying plans in real-time; it allocates travel time and resources efficiently [25]. To a certain extent, the initiative and sense of control brought by mobile technology might make tourists worry that the travel experience will be weakened, thereby causing them to avoid or reduce the use of a mobile device. However, in today's period of the rapid adoption of new technologies and social transformation, the application of mobile technology will only become increasingly common [7,26]. Furthermore, if people have accepted the current communication model through the use of social networking technology, then their enthusiasm for extensive information sharing is likely to continue as mobile applications and devices continue to develop [27].

Mobile technology is increasingly being adopted by travel suppliers, their practitioners, and related government departments. In terms of tourism suppliers and their practitioners, first, tourism is a special stage of technology use, and mobility-oriented services are becoming increasingly important [28]. Second, mobile technology provides unprecedented opportunities and challenges for companies to successfully attract consumers' attention and

convey market information to target audiences [29,30]. Therefore, understanding mobile applications as an emerging marketing platform is crucial for travel suppliers and their practitioners. From a marketing perspective, the biggest advantage of mobile communications and commerce is that it provides suppliers with a channel for direct communication with consumers via mobile devices at any time and place [31]. From this, such technology reduces the supplier's product promotion expenses and information transmission costs and also improves its service quality and competitiveness [32]. Therefore, mobile technology has not only become an important marketing tool for tourism and hotel suppliers but can also increase shareholder returns to a certain extent [33]. In tourism-related government departments, mobile technology can help them in their overall planning and management. For example, the transportation department can use a range of mobile technologies, including advertising travel routes, online travel planning applications, and travel training applications to solve or alleviate the traffic burden caused by the increase in the number of tourists [34]. Scenic area management departments can also play the role of network and mobile technology and use social media to promote the personal and emotional connection between tourists and nature and promote their environmental awareness and behavior [35].

3. Methodology

Web of Science can link publications and researchers with interdisciplinary databases through citation and control indexes and provide more complete citations, indexes, and researcher relationships than other databases [36]. It has become the gold standard for research discovery and analysis [36]. Simultaneously, the Web of Science Core Collection includes a wide range of publications from Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index: Science, Conference Proceedings Citation Index: Social Science & Humanities, Emerging Sources Citation Index, Current Chemical Reactions and Index Chemicus, which cover more scientific and authoritative literature than other databases. Therefore, the present study was based on the literature related to hotel/tourism and mobile communication in the Web of Science Core Collection and compiled a data set for bibliometric analysis. First, to comprehensively review the literature related to the research field, the researchers used the combination of "tourism" or "travel" or "hospitality" or "hotel" or "tourist" and "mobile technology" or "mobile service" or "mobile communication" or "mobile device" or "mobile application" or "smartphone" or "apps" or "mobile data" or "mobile database" or "mobile internet" or "mobile web" or "mobile computing" as keywords to conduct topic studies [2,11], while only retaining the journal paper, having a total of 1234 papers. Second, the researchers eliminated articles that were not relevant to the research field by carefully examining the titles, keywords, and abstracts of 1234 papers. Finally, the retained documents were de-duplicated, and duplicate documents were merged. The final data set was composed of 803 papers, including 773 articles, 29 reviews, and 1 letter.

CiteSpace (version 5.7.R1) software was used to conduct a bibliometric analysis of research related to mobile technology in tourism. CiteSpace was chosen as the analysis tool because it can analyze and visually present the potential knowledge, knowledge structure, knowledge rules, and distribution of specific research topics in the literature. Therefore, the software has become one of the most popular bibliometric analysis tools [37]. In this study, the parameters of CiteSpace were set as follows: time slicing was from 2000 to 2020, years per slice was

one year, click pruning sliced networks, and keep the default values for text processing and links. In addition, in the cluster map, the Modularity Q value indicates the closeness of the relationship between clusters, and the Mean Silhouette value reveals the consistency or similarity of the cluster network. Modularity Q > 0.4 is acceptable; when Mean Silhouette is closer to 1, the homogeneity of the literature content in the cluster is higher [38]. Based on this, when the node types select a keyword, the selection criteria are selected as Top N%, set N = 13; when the node types select reference, cited author, and cited journal, the selection criteria are selected as g-index, set k = 14. Under other node types options, selection criteria are kept as default values.

Specifically, this research conducted a visual bibliometric analysis from several levels of research trends, research areas, top journals, cooperation networks, the most popular research topics, and research foundations of mobile technology research in tourism.

4. Findings and Discussion

4.1. Analysis of Research Trends and Research Areas

As shown in Figure 1, the research on mobile technology in tourism can be divided into three stages. The first stage is from 2000 to 2011. At this stage, scholars conducted very limited research in this field. The second stage is from 2012 to 2014. During these three years, the number of related studies increased, but the growth was still slow. The third stage is from 2015 to the present, and the number of related studies has shown a steady and rapid growth trend. After analysis, the research of mobile technology in tourism and the development of mobile technology are synchronized to a certain extent. The beginning of the fourth-generation mobile communication (4G) era is 2010. From this period, mobile technology has gradually been used more widely in various areas. Therefore, the adoption of mobile technology in tourism has increased, and the number of related studies has also increased. Now that people have ushered in the 5G era, the concept of the Internet of Everything will be further reflected in people's daily life and work. Thus, research on mobile technology in tourism may continue to rise, and new research perspectives will emerge. Furthermore, iPhone appeared in 2007 and Android in 2008, with smartphones becoming popular as of 2011 [39]. That explains, to a large extent, the little literature in this research field before 2012. That is, the use of advanced mobile technologies in tourism was much more limited before a large part of tourists had a smartphone.

Analyzing the research area of the literature on mobile technology research in tourism, the research area of transportation accounts for the largest proportion, nearly a quarter. The number of studies in the area of social sciences only ranks second, with 22.79%. Moreover, the social sciences area published the first study on mobile technology in tourism in 2008 (Table 1). This result shows that in the area of social science research, the research on mobile technology in tourism is limited and requires further exploration. The tourism academic area should strengthen the research on mobile technology and appropriately combine the research related to the transportation area and the IT area to expand the research perspective.

4.2. Journals Analysis

The 803 papers reviewed were published in 361 journals. Table 2 shows the 10 journals that have contributed the most to the research field of mobile technology research in tourism. The top ten journals contain 21.05% of the papers in this research field. Although research on mobile technology in tourism is widely published in a variety of journals, related research is published in the top-ranked journals with a high degree of concentration. This finding provides a valuable reference for scholars in this research field to select target journals in the future.

4.3. Collaboration Network Analysis

A total of 2352 authors wrote 803 studies related to mobile technology in tourism. This study analyzed the top authors in the number of publications, and some high co-occurrence counts author collaboration networks. The top three authors with the largest number of publications are Wang, D., Law, R., and Zhao, F. Furthermore, although Xiang, Z.'s number of publications in this research field ranks fifth, his articles are highly cited, indicating that he has a relatively prominent contribution in this field. Notably, among the top 13 authors, Dickinson, J. E., Cherrett, T., Davies, N., Norgate, S., and Speed, C. have a very close cooperative relationship. They studied the application or role of smartphone apps in travel [23,40,41,42,43] and tourism social networks [22]. Wang, D. and Xiang, Z. also have a relatively stable cooperative relationship. They studied the application of smartphones in tourism or hotel environments [6,28,44] and also defined context concepts related to mobile technology environments for travelers [45]. This research field has formed a relatively extensive cooperative relationship, represented by the authors with the most publications.

In the reviewed literature, approximately 982 institutions have participated in the research of mobile technology in tourism. Hong Kong Polytechnic University has outstanding performance in many research areas including engineering, computer science, and materials science. Moreover, this university has achieved good results in the research of mobile technology in tourism. The institution has published the largest number of articles in this research field and has 12 years of Half Life, which shows that it has a long-term influence on this research field. The burst value indicates the emergency situation of the institution during the review period. Generally, the institution has published several studies in the research field or has had a greater influence on the research field in a period of time. Among the top 12 institutions in the number of publications, the University of Central Florida has a high burst value (3.64). Figure 2 presents the institution collaboration network in this research field. On the whole, although a relatively stable institution cooperation network exists, many organizations still only cooperate within their organizations or with people from a fixed organization. Among them, the institutions with the most publications often have extensive cooperation relationships with other institutions. For example, the important partners of Hong Kong Polytechnic University are Virginia Polytechnic Institute and State University, Arizona State University, Zhejiang University, and Northeastern University. The University of California-Berkeley has established cooperation with eight organizations: the American University of Beirut, The Ohio State University, CIBER Epidemiology and Public Health, Melonic Technology Limited, Museo Galileo, INRIA Rennes Bretagne Atlantique, Heritage Malta, and Aalto University.

In the past two decades, a total of 48 countries/regions have conducted research on the field of mobile technology in tourism. The text labels in Table 3 show the top 17 countries in the number of publications. The larger the label

font (the larger the node, the larger the label font), the more the number of publications, and vice versa. It can be seen that the United States of America, the People's Republic of China (including Hong Kong and Macau), and England are the top three countries in the number of publications. These three countries also have a high centrality, which shows that they are important contributors to this field of research. In addition, South Korea has a burst value of 3.37, which means that the country has provided strong power in this field for a certain period of time. Figure 3 also shows a cross-cooperative relationship with many countries/regions. A connecting line between two nodes represents a cooperative relationship between the two countries. The thicker the connecting line, the closer the relationship between them, and vice versa. To a certain extent, this result explains that scholars from all over the world having established extensive and close cooperative relations may be because the research field is relatively mature.

4.4. Analysis of the Most Popular Research Topics

One can grasp the research hotspots and frontiers in this field by interpreting the visualized knowledge mapping of keywords in mobile technology research in tourism. Figure 4 describes the top 20 keywords of mobile technology research in tourism, which to a large extent represent research hotspots in this field. "Smartphone," "mobile application," and "user acceptance" are the three most frequent and meaningful words, representing the three most popular topics in this field. In addition, "model" indicates that in the research of mobile technology in tourism, researchers often combine theoretical models for related research. After the analysis, the technology acceptance model is the most commonly used theoretical model.

Figure 5 reflects the changes in the main research content of this field over time. The red text labels on the right side of the figure are the cluster labels of keywords, and the black text labels on the left horizontal line are some of the main keywords in the keyword cluster. The larger the node corresponding to a keyword, the more research that has been conducted around the keyword. In addition, the position of the keywords on the horizontal line corresponds to the year when these keywords first appeared. For example, "user acceptance" is located below 2010; it reveals that the keyword first appeared in 2010. "Big data" roughly corresponds to the period between 2017 and 2018, pointing out that the first time it attracted widespread attention was in 2017; "gamification" is located below 2019, indicating that it has gradually attracted the attention of academia in 2019. The findings of the study clarify that before 2012, research on mobile technology in tourism was limited, and the main focus was on mobile devices, technologies, and services and the attitude and acceptance of users. After 2012, scholars have gradually increased their research in this field, and the types of keywords have become increasingly diverse. The keywords after 2017 present the current research frontiers in this field, such as "gamification," "big data," "smart tourism," and "perceived risk."

4.5. Knowledge Base Analysis

Co-citation analysis is one of the key parts of bibliometric analysis. This analysis can simultaneously make an accurate analysis of the knowledge structure of the research field by exploring the frequency of two documents being co-cited and determine the most influential thoughts and schools of thought and their relationships [46,47]. Several studies have confirmed its effectiveness in finding out the intellectual structure of a research field [48].

A total of 803 references cited 28,652 references. Keyword information was extracted to generate a co-citation cluster map of the literature on mobile technology research in tourism. Modularity Q = 0.7957 > 0.4 and Mean Silhouette = 0.663 > 0.5 of the cluster map indicate that the clustering results are of quality. Figure 6 depicts the largest subnet of co-cited references. The cluster label points out that mobile technology, travel mode, mobile instrument, travel behavior research, mobile applications, and geo-based technology are the foundations of mobile technology research in tourism. The Mean Silhouettes of the six clusters are all greater than 0.7, indicating that the clusters have high homogeneity (Table 3).

Figure 7A,B respectively shows the top ten authors with the most co-citation counts and the strongest co-citation centrality. The darker the color of the label (the larger the node, the darker the color of the label), the more citations/centrality. As shown in Figure 7, Wang, D., Davis, F. D., and Buhalis, D. are the three most-cited authors, whereas Wang, D., Shoval, N., and Asakura, Y. are the top three authors of centrality. They have made great contributions to the research foundation in this field. Among them, Wang, D.'s co-citation frequency and centrality value rank first, which illustrates that this scholar plays an important role in this field. In addition, the color of the connecting line between the two nodes represents the time when the author represented by the two nodes was first co-cited. The change in line color from a cool blue to a warm red represents a change in time from early to recent. The lines in Figure 7 are rich in color, reflecting that the authors have been co-cited over a large time span and cover many time points.

Figure 8A,B respectively illustrates the top ten journals with the most co-citation counts and the strongest co-citation centrality. The depth of the label color and the size of the node demonstrate that *Tourism Management*, *Transportation Research Record*, and *Transportation Research Part A: Policy and Practice* are among the top three in terms of co-citation counts; the top three journals in terms of centrality are *Communications of the ACM*, *Annals of Tourism Research*, and *Lecture Notes in Computer Science*. These journals have a great influence on the research foundation of mobile technology in the tourism field. Similarly to Figure 7, Figure 8 also has a variety of line colors, which indicates that journals have also been co-cited over a relatively long time and at multitudinous points in time.

5. Implications and Future Research

From the perspective of the overall research trend of mobile technology in tourism and the changes in keywords on the timeline, the research of mobile technology in tourism is synchronized with the development of mobile technology. Since the third generation of mobile communication technology, mobile technology has gradually been applied to tourism, and related research has also developed simultaneously. In the early phase, the research topics tended to focus on a macro level, focusing on exploring mobile devices, technologies, and their services and users' attitudes and acceptance of technologies. With the emergence of 4G, tourism and mobile technologies have been more closely integrated. The number of related studies has increased, the types of research topics have been gradually increased and refined, and multi-angle research, such as online consumption, social media networks, and location-based services, has emerged. In addition, mobile technology can often provide vitality to tourism. Specifically, first, mobile technology can innovate traditional tourism modes. For instance, the application of AR

technology to cultural heritage tourism can effectively enhance the experience of tourists while maintaining the integrity of the attractions [49]. Second, the development of mobile technology or the emergence of new mobile technologies can bring new application functions and research content to tourism. For example, this development has promoted the concept of smart tourism and the development of sustainable tourism. However, in the field of social science research, a lag in the research of mobile technology in tourism exists. Moreover, the three stages of new mobile technology from the advent to being used in tourism to being paid attention to by academia have a gap. In summary, within ten years, as 5G and related technologies are increasingly used, the number of studies on mobile technology in tourism and the types of research topics will continue to increase. In the meantime, new 5G-related technologies, including the Internet of Things, the Internet of Vehicles, and high-definition video, will be gradually applied to tourism, bringing additional opportunities and challenges to tourism and becoming new research directions. Moreover, this research predicts that when entering the era of sixth-generation mobile communication technology (6G), that is, approximately 2030, the research on mobile technology in tourism will usher in the next period of rapid growth.

Journal citation and co-citation analyses, including collaboration network analysis and author co-citation analysis, provide a good reference for future researchers to carry out research on mobile technology in tourism. In this research, the journal citation analysis and journal co-citation analysis show the journals that have contributed the most to this field. In both parts, the following four journals appeared: *Transportation Research Record*, *Transportation Research Part C: Emerging Technologies*, *Tourism Management*, and *Journal of Travel Research*. This notion indicates that they play an important role in cited and co-cited articles. Author collaboration network analysis, author co-citation analysis, institution collaboration network analysis, and country/region collaboration network analysis explore the most prominent authors, institutions, and countries in the field of research and their respective cooperative relations. Wang, D., Hong Kong Polytechnic University, and the United States of America are the most representative author, institution, and country in this research field, respectively. Therefore, if relevant personnel in academia and industry want to understand the research of mobile technology in tourism, then they can start with the relevant literature of the above journals, authors, institutions, and countries. Furthermore, the research of mobile technology in tourism has developed to relatively mature in the past two decades. Therefore, extensive and in-depth cooperation relationships between authors, institutions, and countries/regions exist. Notably, in this research field, most of the countries/regions, institutions, and authors that play an important role in the volume of publications and partnerships are countries/regions with great economic levels or come from these countries/regions. This event might be because economically developed countries/regions can invest additional funds for the development and use of mobile technologies, and they also need the support of various new technologies. Therefore, this research speculates that with the development of this research field, countries, institutions, and authors will form an extensive and close cooperation network in the world. Furthermore, countries with high levels of mobile technology development (they are most likely to be countries with high economic levels) or institutions and authors from these countries are likely to occupy a core position in these relationships.

The co-citation clustering of references shows that mobile technology, travel mode, mobile instrument, travel behavior research, mobile application, and geo-based technology constitute the knowledge base of mobile

technology research in tourism. The clustering results are largely consistent with the research topics presented by the keywords with the highest co-occurrence frequency. The mobile technology dimension discusses the application and role of mobile technology in tourism and related industries from various angles. For instance, Dickinson, Ghali, Cherrett, Speed, Davies, and Norgate [42] and Wang, Xiang, and Fesenmaier [44] analyzed the use, mechanism, and impact of smartphones in travel from a comprehensive perspective. Molz et al. [50] studied mobile ties and the role of online social media and network technologies in travel and communication. With regard to the travel mode dimension, mobile communication technology can fundamentally change the travel mode, particularly breaking through travel time and space constraints [42]. The time-use efficiency of tourists is improved, and tourists' cognition and use of space are expanded by improving or introducing many aspects including intelligent transportation, tourism space interaction, and multitasking of travel. In the dimension of the mobile instrument, Asakura et al. [51] pointed out that with the rapid development of mobile communication technology, the equipment that can be used for travel measurement will increase. On this basis, this research believes that equipment and services that increase travel experience and provide travel services will also develop rapidly. For example, robot services in hotels or scenic spots and wearable devices will be used to provide virtual travel experiences. The travel behavior research dimension explores the effect of mobile technology on tourist behavior and the acceptance and perception of mobile technology by tourists. Travel behavior occurs at a specific stage or time in the travel process, including the behavior, perception, feeling, and any related content considered by the tourist [45]. Mobile technology influences these elements by intervening. In addition, external and internal motivations, cognitive beliefs, contextual promotion, past experience of using smartphones during travel, and experience of using smartphones in daily environments directly affect tourists' acceptance and perception of mobile technology [44]. The mobile application dimension mainly focuses on the research of travel-related mobile applications. Users can download personalized applications to their mobile devices and use the information and services provided by these applications throughout the journey, such as mobile e-guide applications and travel recommendation system applications [52,53]. These applications can help tourists adapt to the uncertainty in travel planning and coordinate the "fluidity" of time/space arrangements [54]. In terms of geo-based technology dimensions, on the one hand, the use of location-based technologies (e.g., navigation systems, location-based portable recommendation systems, and geographic-based software) can help travelers obtain the necessary knowledge for travel and form geographic-related behaviors and experience and simultaneously enhance their travel experience [55]. On the other hand, geographic-based technology can track visitor-related information and provide data support for the management and service of suppliers or governments [56]. This research considers that in future research, big data may be closely integrated with this research dimension.

6. Conclusions and Limitations

This study used bibliometric analysis and visualization to comprehensively explore the research trends, research areas, top journals, top authors and their collaboration networks, top institutions and their collaboration networks, top countries and their collaboration networks, research topics, and knowledge bases in mobile technology research in tourism. Research findings show that, first, the research of mobile technology in tourism can be divided into three phases and to a certain extent is synchronized with the development of mobile technology. Second, in

the area of social sciences, the research of mobile technology in tourism needs further exploration, which must refer to related research in the areas of Transportation and IT to expand the perspective of research. Top journal analysis, journal co-citation analysis, author co-citation analysis, and collaboration network analysis reveal the most representative journals, authors, institutions, and countries/regions in this research field. This finding provides a valuable reference for scholars in this field. Additionally, this research also grasped the hot and cutting-edge topics in this field through the analysis of keywords in this field. Finally, the clustering of co-citation references presents the knowledge base of mobile technology research in the tourism field: mobile technology, travel mode, mobile instrument, travel behavior research, mobile applications, and geo-based technology.

The main contributions of this research are as follows. First, this research used bibliometric analysis to provide a quantitative perspective for the study of mobile technology in tourism in the past two decades, supplement previous review studies, and point out potential future research directions with a systematic, comprehensive, and objective method. Second, combined with visualization, on the basis of network work analysis as accurate and objective as possible, visualization figures and tables of mobile technology research in tourism were drawn from multiple angles. The limitation of this research is the limited statistical analysis of the methodology and theories used by mobile technology research in tourism. Moreover, the study only reviewed journal papers in the Web of Science Core Collection. Future research may be supplemented with methodological and theoretical statistical and visual analysis while expanding the scope of the literature reviewed.

Retrieved from https://encyclopedia.pub/entry/history/show/5366