JOURNAL OF TOURISM INTELLIGENCE AND SMARTNESS

Year (Yıl): 2020 Volume (Cilt): 3 Issue (Sayı): 1 Pages (Sayfa): 1/15

REVIEW OF SMART TOURISM LITERATURE BY BIBLIOMETRIC AND VISUALIZATION ANALYSIS

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Article Info:

Received: *19-03-2020*
Accepted: *01-04-2020*

Keywords:
Smart Tourism
Social Network Analysis
Bibliometrics

Abstract

The aim of the research is to examine the publications about smart tourism published in 1980-2019 with bibliometric analysis and to reveal the trends in this subject. For this purpose, the Web of Science Core Collection database was searched under the title of 'smart tourism' within the scope of 'hospitality, leisure and toruism'. The bibliometric data of 145 publications, determined from the database, were downloaded. Social network analysis employed in the context of publication year, publication language, publication types, country collaborations, document joint-citation network, journal joint-citation network, author joint-citation network, topic and keyword trends. According to the findings, it can be said that interest in smart tourism has increased significantly since 2015. Publications are mainly articles and conference proceedings. The language of the publications was English, Spanish and Portuguese respectively. America, England and South Korea have been shown to play an important role in the country collaboration. Journal of Travel Research was the most frequently cited journal and Dimitrios Buhalis was the most cited author. Mobile guest behavior, destination website, open data and intelligent systems are the most studied topics. The most commonly used keywords in the publications were smart tourism, tourism, technology, model, social media, experience and information technology.

Year (Yıl): 2020 Volume (Cilt): 3 Issue (Sayı): 1 Pages (Sayfa): 1/15

1. INTRODUCTION

The term of 'smart' have begun to enter into all areas of our lives with the fourth industrial revolution. The adjective of 'smart' is used for the areas where new generation technologies are applied. In this context, the concept of smart city emerged with the application of new generation technologies to cities. Smart city infrastructures have also affected the tourism industry (Jin et al., 2014). Regardless of the purpose of visiting the destination, tourists can benefit from city services during their stay in the destination. Furthermore, in relation to service innovation in smart cities, the tourism industry uses 18.5% of all services offered in smart cities (Information Systems Intelligence, 2017). Therefore, the infrastructure of a city can support tourism activities (Um et al., 2019). In this context, the concept of smart tourism has emerged with the application of new generation technologies to the tourism industry.

Smart tourism not only maximizes the use of tourism resources, it also manages tourism destinations, protects tourist attractions and improves interaction between tourists and local residents (Gretzel et al., 2015).. Since technology is combined with tourism, tourism destinations have become more competitive, which has benefited those involved in tourism mobility (Buhalis, 1997). Smart devices, tourism-related platforms and information and communication technologies (ICT) can affect the entire tourism experience of tourists from travel planning to post-travel (Buhalis et al., 2015). Furthermore, as the number of tourists planning and preparing their travels with technology increases, so does the confidence in smart tourism technologies (Koo et al., 2013). Especially the generation Z tourists use the technology at an advanced level and they want to see these technologies in their destinations, accommodation facilities and restaurants.

Kim and Law (2015) reviewed 104 articles (published between 2000-2013) on smartphones in tourism marketing. Liang et al (2017) examined 92 articles (published between 2002-2015) on mobile tourism bibliometrically. In line with the findings of these two studies, examining the new publications on technology in tourism leads to technology research in rapidly increasing tourism. In this context, it may be seen as important to examine the publications related to smart tourism. One method of this is bibliometric and visualization analysis.

Bibliometric and visualization analysis is the application of statistical and mathematical methods to published studies in a certain year (Pritchard, 1969). In bibliometric studies, certain features of publications are included in the analyzes and findings related to scientific networks are revealed (Al and Coştur, 2007). Bibliometric studies are carried out in order to

reveal the tendencies in a certain subject by analyzing the literature on a certain subject and examining the words determined (Kasemodel et al, 2016). Therefore, bibliometric and visualization analysis can be conducted in countries, journals, authors, etc., which guide research on a particular subject and provides a road map for the researches to be conducted (Aydın, 2014). One of the methods used to identify and visualize common citation networks and country collaborations in bibliometric research is social network analysis (Karagöz and Yüncü, 2013).

2. LITERATURE REVIEW

Smartphones have become an integral part of everyday life. Today people wiling to use the latest technologies. Smartphones are a powerful tool of smart tourism because they provide mobile applications that facilitate the travel of tourists (Law et al., 2018; Tan et al, 2017). Travel-based mobile apps are one of the most downloaded app categories, and smartphone users prefer travel apps to plan travel because tourism mobile applications help users in travel planning, routing, ticketing, accommodation and transportation reservations (Dickinson et al., 2014).

Smart tourism is a new concept used to describe the dependence of tourism destinations, businesses and tourists on big data and ICT-based tools (Li et al., 2017). Smart tourism enables users to integrate information from various sources into their mobile devices, personalize their profiles using social networks and build relationships with their own environment (Buhalis and Foerste, 2015). Unlike electronic tourism (e-tourism), each party participating in smart tourism may have producer, consumer, intermediary and other roles depending on the information and connections it has (Gretzel et al., 2015).

Law et al (2018) considering the increasing importance of mobile technologies, examined 92 articles published in tourism journals in order to examine the latest researches on this subject. According to the results, it was determined that most of the research focused on tourism experience and hotel industry. The researches did not adopt quantitative research methods and used theories in the field of information system as a basis.

Dorcic et al (Dorcic et al., 2019) conducted a comprehensive systematic literature review of academic research published in 2012-2017 on mobile technologies and applications in smart tourism. Based on a keyword-focused search and content analysis, 126 articles were identified in accordance with the study and selected publications were analyzed. As a result, the authors identified three thematic categories: consumer perspective, technological perspective and provider perspective.

Year (Yıl): 2020 Volume (Cilt): 3 Issue (Sayı): 1 Pages (Sayfa): 1/15

Centobelli and Ndou (2019) conducted a systematic literature review to analyze the accumulation of knowledge and analytical knowledge in the tourism industry from an information management perspective. Citation network analysis method was used to determine the content of the articles. The authors identified some relevant headings for future research on big data for tourism by revealing findings on the impact of big data analysis on tourism businesses, the impact of management and innovation practices, and the role of big data in guest information management.

3. METHODOLOGY

The aim of the study was to analyze publications on smart tourism which were published in the Web of Science (WoS) database and published between 1980-2019. In the WoS database "smart tourism" terms scanned under the subtitle "Hospitality, Leiusure and Tourism". There was 145 publications. Years of publication, publication language, publication types, authors, publication titles, origin countries, abstracts, keywords, bibliographic information, and how many references and how many references were scanned in WoS in terms of 145 publications. The data was downloaded on 30 September 2019.

Social network analysis was carried out in order to reveal the collaborations among the country joint-citation networks, authors joint-citation networks, publications joint-citation networks, journals joint-citation networks, topics and keyword trends. CiteSpace II scoial network statistic programme was used. The data of 145 publications obtained from the WoS database were uploaded to the Citespace II program and analyzed. CiteSpace II is a Java application that is used to visualize trends and analyze them (Chen et al, 2010).

Network density, modularity and mean silhouette values of the network were calculated with the analyzes performed. Network density reveals how much of the potentially available connections are used in any network (Al and Doğan, 2012). The modularity value determines whether any network can be divided into independent clusters and takes a value between 0 and 1. A low modularity means a network that cannot be reduced to clusters with clear boundaries, while a high modularity value means a well-structured network. The mean silhouette value is between (-1) and (1) (Chen et al., 2010) and is used to determine the maximum number of clusters, the value is greater than 0.7 indicates a strong cluster (Simovici, 2007).

In this research, country joint-citation networks, authors joint-citation networks, publications joint-citation networks, journals joint-citation networks, topics and keyword trends were examined according to their centrality values. The centrality value indicates the

level of connection a node has to other nodes that are not connected to each other. The high centrality value of a node indicates that it is a bridge connecting the other nodes (Ni et al, 2017). Log probability ratio (LLR) algorithm was used to determine the topic tendencies of the publications.

4. FINDINGS

Distributions of the Reviewed Publications

Table 1 shows the distribution of publications from the WoS database by year of publication. There are 145 publications on smart tourism in the period 2004-2019. While the first publication was in 2004, there was a rapid increase in smart tourism related publications as of 2015.

Table 1. Distribution by Years of Publication

Year	N	%
2019	44	30.3
2018	25	17.2
2017	27	18.6
2016	25	17.2
2015	14	9.7
2014	3	2.1
2013	1	0.7
2012	2	1.4
2011	2	1.4
2010	1	0.7
2004	1	0.7
Total	**145**	**100**

The types of publications examined in the scope of the study are given in Table 2. The most common type of publication is articles (116 publications). The article is followed by 21 conference paper (21 publications) and book chapters (12 publications). The reason for the fact that the total distribution of the publication type in Table 2 is higher than the distribution total in Table 1 is due to the fact that some publications are classified as more than one publication type in the WoS database.

Table 2. Distribution by Type of Publication

Type	N	%
Article	116	70.7
Conference Paper	21	12.8
Book Chapter	12	7.3
Editorial Material	10	6.1
Review	3	1.9
Book	1	0.6
Book Review	1	0.6
Total	**164**	**100**

The reviewed publications cited 1,274 references. 145 publications examined within the scope of the study have been cited 972 times by other publications. The average number of citations of 145 publications per publication is 8.79. The h-index value of the studies was 18. According to the H-index, there are 18 publications with at least 18 citations related to smart tourism.

Table 3 shows the distribution of languages of smart tourism publications. While 93.8% of the publications were written in English, 6 publications were written in Spanish and 3 in Portuguese.

Table 3. Distribution by Publication Language

Yıllar	**N**	**%**
English	136	93.8
Spanish	6	4.1
Portuguese	3	2.1
Total	**145**	**100**

When we analyzed the countries of origin, the top five countries are China (20 publications), America (20 publications), Italy (17 publications), Australia (13 publications) and the United Kingdom (13 publications). There is only 1 publication from Turkey.

Country Collaborations

Social network analysis was carried out in order to determine the studies carried out by researchers from different countries. Countries are visualized according to their degree of centrality as shown in Figure 1. According to the findings of the social network analysis, a country collaboration network of 20 connections and 17 nodes was obtained. There are 6 clusters of country collaborations networks. The density of the cluster was calculated as 0.147. Each node in the network represents a country of origin, while each link represents transnational cooperation. The size and thickness of the pink circles around the nodes indicate that the degree of centrality of the nodes is higher than that of the other nodes (Ukşul, 2016). The modularity value of the network was calculated as Q = 0.44 and the mean silhouette value was calculated as 0.41.

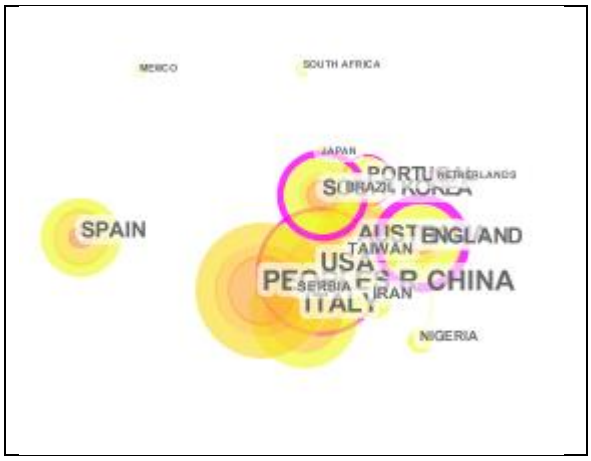

Figure 1. Country Collaborations

Table 4 shows the network values of the top 10 countries that have an important place in the network.

Table 4. Top 10 Countries of Collaboration and Centrality

Country	F	Year	Cluster#	Country	Centrality	Year	Cluster#
China	17	2015	0	England	0.61	2016	1
America	15	2016	0	South	0.46	2016	0
İtaly	14	2016	0	Korea	0.33	2019	2
Avutralia	11	2016	0	Holland	0.26	2016	0
South	10	2016	0	America	0.18	2018	2
Korea	10	2016	1	Portugal	0.07	2015	0
England	10	2015	0	China	0.07	2016	0
Spain	6	2018	2	Avustralia	0.04	2018	1
Portugal	5	2016	0	Taiwan	0.00	2016	0
Iran	4	2018	1	Italy	0.00	2015	0

China is the most cooperating country with 17 publications. China is followed by America (15 publications) and Italy (14 publications). According to the centrality values, England is the central country. South Korea is the second and Holland is the third. When both the cooperation and centrality values in Table 4 are evaluated in general, it can be said that America, England and South Korea are the main countries in the development of publication cooperations related to smart tourism among other countries.

Journal Joint Citation Network

The results of the social network analysis applied to reveal the journals in which the publications are commonly cited to and which include important publications related to smart tourism are visualized according to the degree of centrality as shown in Figure 2.

Year (Yıl): 2020 Volume (Cilt): 3 Issue (Sayı): 1 Pages (Sayfa): 1/15

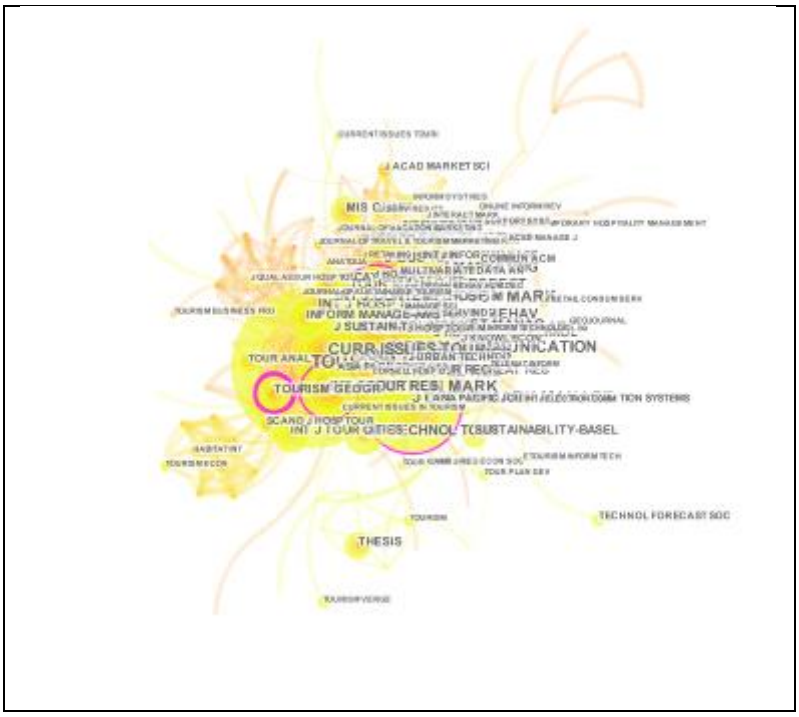

Figure 2. Journal Joint Citation Network

According to the findings of the social network analysis, the journal citation network consisting of 606 links and 173 nodes was obtained. The journal citation network has 26 clusters. The density of the cluster was calculated as 0.041. The size and thickness of the pink circles around the nodes indicate that the degree of centrality of the nodes is higher than that of the other nodes (Ukşul, 2016). The modularity value of the network was calculated as Q = 0.49 and the average silhouette value as 0.41. Table 5 summarizes the network values of the top 10 journals, which have an important place in the network.

Table 5. Top 10 Journals of Joint Citation Network

Journal	F	Year	Cluster#
Journal of Travel Research	104	2015	0
Tourism Management	103	2014	0
Annal of Tourism Research	78	2014	0
Information Communication	61	2015	0
Journal of Destination Marketing Management	53	2015	0
Electronic Markets	47	2016	4
Current Issues in Tourism	47	2015	0
Journal of Travel and Tourism Marketing	43	2015	0
Computers in Human Behavior	36	2016	0
International Journal of Tourism Research	33	2015	0

'Journal of Travel Research' is the most frequently cited journal (104 citations) of research published on smart tourism. In second rank is 'Tourism Management' (103 citations) and in third rank is Annal of Tourism Research (78).

Author Joint-Citation Network

Year (Yıl): 2020 Volume (Cilt): 3 Issue (Sayı): 1 Pages (Sayfa): 1/15

The authors are visualized as shown in Figure 3 according to the degree of centrality obtained by the social network analysis applied to reveal the author joint-citation network.

According to the findings of the social network analysis, an author citation network consisting of 852 connections and 301 nodes was obtained. The density of the cluster was calculated as 0.018. The size and thickness of the pink circles around the nodes indicate that the degree of centrality of the nodes is higher than that of the other nodes (Ukşul, 2016). The modularity value of the network was calculated as Q = 0.72 and the mean silhouette value was calculated as 0.40.

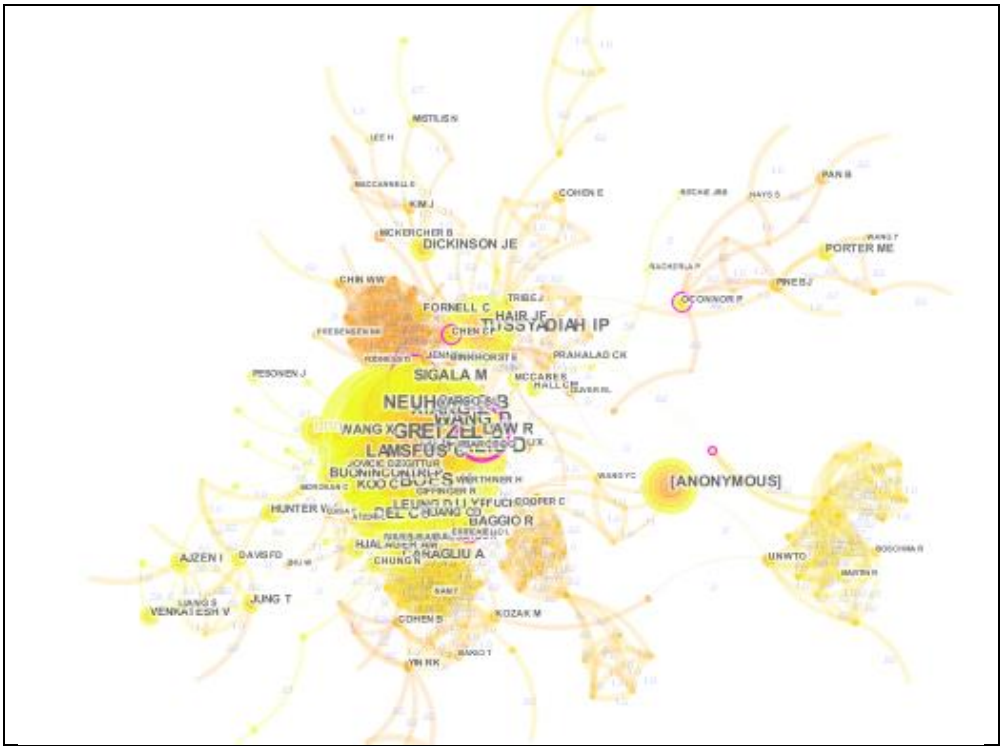

Figure 3. Author Joint-Citation Network by Degree of Centrality

Table 6 shows the network values of the top 10 authors, which have an important place in the network.

Table 6. Number of Citations and Centrality of the Top 10 Authors

Author	F	Year	Cluster#	Author	Centrality	Year	Cluster#
Buhalis D	76	2015	0	Law R	0.20	2015	0
Gretzel U	65	2016	0	Baggio R	0.16	2015	6
Wang D	50	2015	0	Sigala M	0.13	2015	1
Boes K	38	2016	0	Oconnor P	0.11	2016	7
Xiang Z	38	2015	0	Chen CF	0.11	2016	1
Neuhofer B	35	2015	0	Xiang Z	0.10	2015	0
Tussyadiah IP	31	2016	2	Modica M	0.10	2018	4
Lamsfus C	26	2015	0	Dickinson JE	0.08	2017	2
Anonymous	25	2015	5	Errichiello L	0.08	2017	3
Sigala M	21	2015	1	Govers R	0.08	2016	1

According to the findings in Table 6, Buhalis was the first cited author with 76 citations and Gretzel was cited with 65 citations. Law, Baggio and Sigala rank first in terms of centrality.

Document Citation Network

According to the results of the social network analysis conducted in order to reveal the common citations of the publications examined in the study, the document citations network consists of 216 nodes and 603 connections. The document citation network is visualized as in Figure 4.

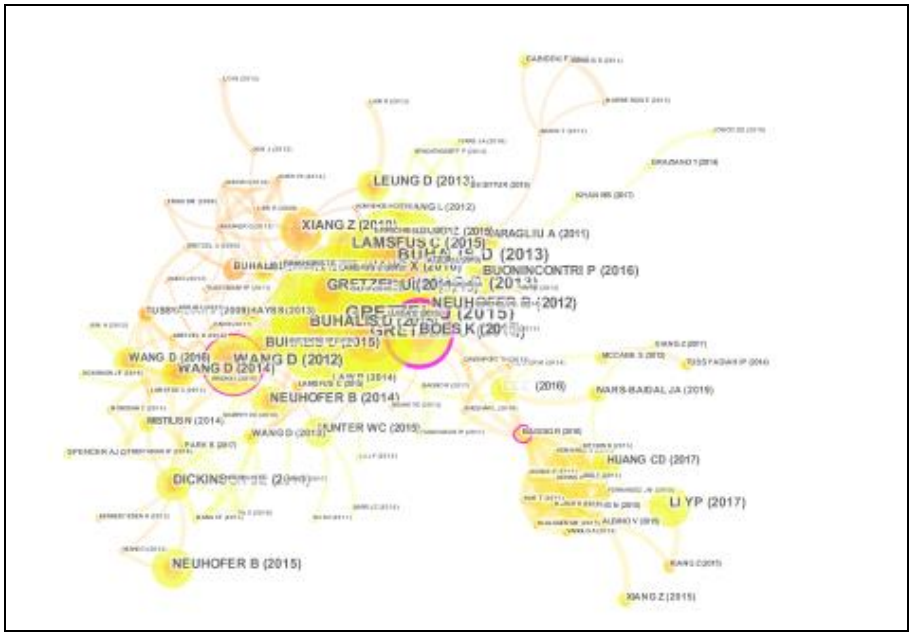

Figure 4. Document Citation Network by Centrality Degrees

According to result network consists of 60 clusters. The density of the cluster was calculated as 0.026. The modularity value of the network was found as Q = 0.77 and the mean silhouette value as 0.47. The network values of the first 5 publications, which are important in the network, are given in Table 7.

Table 7. Citations Received by Citation Sources (First 5 Publications)

Publication Title	F	Cluster#
Gretzel, U., Sigala, M., Xiang, Z., Koo, C. (2015). Smart tourism: foundations and developments. Electronic Markets, 25, 179-188.	45	1
Buhalis, D., Amaranggana, A. (2013). Smart tourism destinations. In Z. Xiang and I. Tussyadiah (ed.), Information and Communication technologies in tourism 2014 (pp. 553-564). Switzerland: Springer.	32	1
Wang, D., Li, X. R., Li, Y. (2013). China's "smart tourism destination" initiative: A taste of the servicedominant logic. Journal of Destination Marketing & Management, 2(2), 59-61.	27	1
Gretzel, U., Werthner, H., Koo, C., Lamsfus, C. (2015). Conceptual foundations for understanding smart tourism ecosystems. Computers in Human Behavior, 50, 558-563.	27	1
Buhalis, D., Amaranggana, A. (2015). Smart tourism destinations enhancing tourism experience through personalisation of services. In I. Tussyadiah and Inversini, A. (ed.), Information and Communication technologies in tourism 2015 (pp. 377-389). Switzerland: Springer.	23	1

Year (Yıl): 2020 Volume (Cilt): 3 Issue (Sayı): 1 Pages (Sayfa): 1/15

As seen in Table 7 the most cited publication related to smart tourism is the publication of 'Gretzel et al.' published in 2015. The second is the book section published by Buhalis and Amaranggana in 2013. It is seen that the oldest studies, which took place in the first five and received the most citation, were published in 2013.

Smart Tourism Topic Clusters

The document citation network of the publication obtained in the study can also reveal trend themes in an area. The fact that different researches in a particular area are referred to a specific research many times cited that these studies have similar themes (Ukşul, 2016). Identified smart tourism clusters are summarized in Table 8.

Table 8. Topic Clusters of Smart Tourism

Label	LLR p-value	Cluster#	Size	Silhuet	Year
Mobile guest behavior	30,77. 1,0E-4	0	19	0.774	2018
Destination website	28,84. 1,0E-4	1	16	0.777	2017
Open data	27,26. 1,0E-4	2	16	0.721	2017
Smart system	24,20. 1,0E-4	3	10	0.730	2016
Smart destination management	13,48. 1,0E-4	4	9	0.879	2016
Visitor adaptation	25,13. 1,0E-4	5	9	0.939	2018
Geographical analytics	20,29. 1,0E-4	6	3	0.969	2015

When the topic clusters were examined, it was found that the highest number of clusters was mobile guest behavior with 19. The silhouette value of the cluster with mobile guest behavior theme is 0.774 and it can be said that it is homogeneous. The researches in the cluster cited the documents published in the years of 2015, 2016, 2017 and 2018.

Keyword Analysis

According to the results of the social network analysis, a keyword network consisting of 84 nodes and 266 connections was obtained. There are 9 clusters in the keyword network. The density of the network is 0.076, the modularity value is Q = 0.49 and the mean silhouette value is calculated as 0.49.

Table 9 summarizes the first 10 common keywords used in publications in terms of frequency and centrality. According to the result, the top three keywords are smart tourism, tourism and technology, while the top three keywords are smart tourism destinations, stakeholders and tourism in terms of centrality degree.

Table 9. Common Keywords and Centrality Values Used in Publications (Top 10)

Keyword	**F**	**Year**	**Keyword**	**Centrality**	**Year**
Smart tourism	38	2015	Smart tourism destination	0.30	2015
Tourism	24	2016	Stakeholder	0.22	2015
Technology	22	2015	Tourism	0.19	2016
Model	21	2015	Adaptation	0.17	2018
Social media	18	2015	Image	0.15	2016
Experience	15	2016	Co-production	0.15	2015
Information technology	14	2018	Smart tourim	0.13	2015
Internet	11	2017	Future	0.12	2018
Smart tourism destinastion	11	2015	Social media	0.11	2015
ICT	10	2018	Experience	0.11	2016

5. CONCLUSION

The bibliometric and visualization analysis of 145 researches on smart tourism published in the WoS database in the period 1980-2019 was performed. While the first publication on smart tourism was in 2004, there was a rapid increase in smart tourism related publications as of 2015. It can be said that interest in smart tourism has increased since 2015. The most common type of publication type is article. The average number of citations per publication is 8.79. The h-index value of the studies was 18. The language of 93.8% of the publications is English.

According to the results of the country collaboration analysis, it can be said that America, England and South Korea are the main countries in the development of publications cooperations related to smart tourism among other countries. The Journal of Travel Research is the most cited journal (104 citations) of research on smart tourism. In 145 published studies on smart tourism, Buhalis was the first to be cited with 76 citations, and Gretzel with 65 citations.

When the topic clusters were examined, it was found that the highest number of clusters was mobile guest behavior with 19 frequency. Current research topics in this area are destination websites, open data, smart systems, smart destination management and visitor adaptation. The most used keywords were determined as smart tourism, tourism, technology, model and social media. The keywords with the highest degree of centrality are smart tourism destinations, stakeholders, tourism, adaptation and image.

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