Impact of Covid-19 Pandemic on Tourism Research:
A Bibliometric Analysis Using Cite Space

Gözdegül BAŞER[1]
Rüya EHTIYAR [2]

Abstract

This research aims to review the extant literature on Covid-19 using bibliometric analysis in an attempt to gauge the evolving state of tourism research since the beginning of the Covid-19 pandemic. The Thompson Reuters' Web of Science Core Collection database was chosen to collect the bibliographic data of 3179 publications for the period of 2020- February 2022. CiteSpace software was then employed to analyze and visualize the documents. Co-citation analysis and co-occurrence of keywords were carried out in terms of bibliometric analysis. The findings revealed a significant increase in the diversity of topics and subtopics addressed by researchers regarding Covid-19. This bibliometric review provides a comprehensive and objective review of Covid-19 related publications in the tourism field. It extends previous reviews by visualizing the underlying structure via CiteSpace software and adding current publications. Furthermore, this study may help researchers better evaluate and monitor research trends in tourism during the Covid-19 pandemic.

Keywords: Covid-19, Tourism Research, Bibliometric Analysis, CiteSpace, Tourism

JEL Codes: Z30, Z32, Z39

Introduction

The coronavirus COVID-19 pandemic has significantly affected 226 countries and territories, causing 517,861,581 cases and 6,278,364 deaths worldwide (Worldometer, 2022). Tourism is one of the highly vulnerable sectors heavily influenced by the Covid-19 pandemic. World Tourism Organization claimed decrease in overnight international tourist arrivals by 74% in 2020 compared to 2019 as a result of widespread travel restrictions and unprecedented

---

[1] Assistant Professor Antalya Bilim University Tourism Faculty Antalya, Türkiye, gozdegul.baser@antalya.edu.tr, ORCID: 0000-0002-1450-191X
[2] Professor Akdeniz University Tourism Faculty Antalya, Türkiye, ehtiyar@akdeniz.edu.tr, ORCID: 0000-0003-2719-2156

circumstances; a decline in international travel demand represented an approximate loss of USD 1.3 trillion in export revenues, which was more than 11 times the loss occurred during the 2009 global economic crisis (UNWTO, 2022). OECD published scenarios pointing out the potential decline in international tourism activities could range between and 60-80% (OECD, 2022). In response to measures to support and protect tourism, many countries took preventions to develop and implement appropriate recovery measures, such as executing travel restrictions, regaining traveller confidence, and restoring the tourism sector for the coming years. Consequently, the Covid-19 pandemic has been a sudden shock and crisis in terms of global economic, socio-cultural, and political systems that have had a severe impact on tourism.

Covid-19 pandemic management was quite difficult as a result of the lack of information on mainstream media. Tourism authorities had to take immediate action, build resilience, and ensure the health safety of their customers and employees, as well as build cash liquidity and protect brand image (Sigala, 2020: 319). Tourists hesitated to travel even after they could be the result of the emotional contagion of pandemic depression. Precautions such as lockdowns, reducing social contact, social distancing, minimizing travel, and avoiding crowded places were implemented during various stages of the crisis, which all contributed to unwillingness and demotivation to travel. In addition, there were changes in the servicescape as a result of hygiene precautions. Covid-19 caused various economic, socio-cultural, and psychological impacts on tourists and tourism stakeholders, which has led to many changes in practice. Covid-19 vulnerability caused many tourism employees to switch to other sectors. Digital technologies and e-tourism applications were quite popular and common, as human touch was preferred to diminish. However, there were digital inequalities among many tourists as a result of inaccessibility to the Internet or unfamiliarity with digital media. As a result, it is possible to state that during the pandemic years of 2020, 2021, and 2022, the tourism industry went through fast turbulence and change in various terms. Tourism research is expected to investigate the results and impacts of the crisis to enable stakeholders to reimagine and reset new tourism strategies.

First of all, tourism research required to analyze and clearify how and in what terms the impact of Covid-19 was on tourism stakeholders. Therefore, this research aims to identify the major research topics and fields of interest that were mostly researched during the Covid-19 pandemic as well as investigate the authors and journals that were mostly read. A bibliographic analysis was conducted using CiteSpace. Bibliographic analysis can identify and analyze a knowledge field (Chen, 2014).

The study's results will help researchers understand the development of the Covid-19 impact on tourism literature, its course, how the crisis was handled, and what was lacking as a research topic. The study provides a literature review after introducing the research, while the third section concentrates on the methodology. The fourth section presents the results and a discussion. The last section presents conclusions and suggestions for future research.

Literature Review

The Novel Coronavirus disease (COVID-19), which emerged in Wuhan, China, has spread rapidly from China to various countries in the world (Del Valle, 2020). In March 2020, with the outbreak of COVID-19, international tourism came to a halt, and as a result, domestic and international tourism took a hit (ILO, 2022). The new coronavirus was expected to create damages that could be felt for a long time in the economies, and tourism sector was directly affected by these economic losses (Acar, 2020) If the action of prevention was not managed quickly and properly, the tourism industry could face even more severe effects (Bakar and Rosbi, 2020).

Covid 19 pandemic created a shock for tourism professionals, although they had already experienced other crises in the past. The tourism industry experienced numerous crises, including the 2005 tsunami in the Indian Ocean region, the 11/9/2001 terrorist attacks in the USA, and the swine flu crisis in 2009 (Higgins-Desbiolles, 2020). However, none of these crises have caused such long-term problems. decrease in tourism activities was not even noticeable in previous crises, with only SARS at -0.4 % and the global economic crisis at -4.0%(World Bank, 2020).

According to WTTC (2021), total GDP contribution of tourism of 10,4 % in 2019 had dropped to 5.5 % in 2020, indicating a change of -49,1 in total travel and tourism GDP, whereas the total travel and tourism jobs of 334 million in 2019 decreased to 272 million jobs in 2020, indicating a drop of -18,5 % with a loss of 61,6 million people losing their jobs. As one of the most crucial events in the 21st century, Covid-19 influenced tourism industry in many aspects of the tourism industry. It is inevitable that tourism research has also been impacted and evolved differently compared to previous years.

Sigala (2020) claimed that tourism research should conduct a deeper examination and understanding of tourism stakeholders' actions, drivers, and reactions. The research was expected to investigate stakeholders' perceived Covid-19 experiences, mindfulness, consciousness, willingness, and capabilities to comprehend the crisis, since these factors could have a possible effect on their attitudes and behaviors.

Various researchers have investigated and discussed the impacts of Covid-19 on the tourism industry (Khan et al., 2021; Chan, 2021; Abbas et al., 2021). To the best of the author's knowledge, the studies by Utkarsh and Sigala (2021) and Viana-Lora and Nel-lo-Andreu (2022) are bibliometric analyzes of Covid-19 studies in the tourism field. Utkarsh and Sigala (2021) conducted a study that included co-word analysis to understand the intellectual structure of 177 studies related to Covid-19 in the field of tourism in the Web of Science database January 2020 and January 2021. In another study conducted by Viana-Lora and Nel-lo-Andreu (2022), 921 articles from the Web of Science database from 2020 to 2021 were analyzed in terms of bibliometric parameters such as main authors, countries, journals, and citations using VOSviewer software. Zopiatis et al. (2021) investigated the Scopus database and found 362 papers published between

December 2019 and March 2021. Huang and Wang (2022) concentrated on Web of Science SSCI and searched 19 journals. Sigala (2021) adopted a bibliometric analysis of co-word analysis and determined that preliminary publications tend to be descriptive, theoretical, and pre-mature.

This study, using CiteSpace software, aims to conduct a more detailed and up-to-date bibliometric analysis compared to previous studies. As a result, tourism research during the Covid-19 pandemic years could be analyzed to reconceptualize future tourism studies.

Methodology

The methodology of this study was to investigate the impact of Covid-19 on tourism research via bibliometric analysis. Bibliometric studies significantly increased in leading hospitality and tourism journals after 2008 (Koseoglu et al. 2016). This method uses a defined set of metrics to evaluate published research trends, impact, and output, and it is used to qualitatively and quantitatively analyze the effects of journals, institutions, research groups, individual researchers, or countries (Yardibi et al., 2021). According to Zupic and Čater (2015), most bibliometric studies disseminate citation analysis of a specific research area, mainly focusing on the top-N lists of the most cited authors, journals, or studies. Pritchard (1969) introduced the term bibliometrics as "the application of mathematical and statistical methods to books and other means of communication." Bibliometric analysis is based on the fact that science has a structure that can be empirically described by a measure of the link between authors, journals or documents (Galvagno, 2017).

There are several software alternatives to conduct bibliometric analysis of scientific literature, such as BibExcel, Sitkis, and SciMAT, whereas several others use Microsoft Excel to perform bibliometric analysis (Zupic and Čater, 2015). This bibliometric study used CiteSpace, which is one of the most popular software tools for analyzing co-citation networks (CiteSpace V 5.8. R3 updates the 04.01.2022 software available at http://cluster.cis.drexel.edu). The visualization maps used for bibliometric analysis in CiteSpace involve nodes and links. Node size describes the total co-occurrence frequency of an item, the thickness of the node, and the color of the ring shows the co-occurrence time periods (Chen et al., 2012). Colored lines show connections between different nodes explaining collaboration/co-occurrence or co-citations. Line thickness is linearly proportional to the frequency of co-citations, and the color of the lines indicates the first year of co-citation relationships between them (Chen et al., 2012). The structural measures used to evaluate the network's structural quality are the modularity Q index, mean silhouette score, and betweenness centrality value. If the modularity Q index is high, network clusters have fewer intercluster overlaps (Chen, 2006; Yardibi and Fırat, 2021). The mean silhouette score measures the quality of clusters and cluster homogeneity (Chen, 2006). The nodes were analyzed according to the analytic items (reference, author, journal, keyword, etc.) of CiteSpace. Structural metrics, including the average silhouette score, modularity Q-index, and betweenness centrality, were used to

evaluate the networks' structural quality. Using multidimensional methods via CiteSpace, the properties and connections of the network were described, and clusters were generated with a timeline view of the structures. This timeline view provides an overview of the evolution of clusters in the field over time and shows the changes in the field over the years (Kılıçaslan et al., 2021).

In this study, the data for bibliometric analysis were taken from the well-known academic database, Web of Science. The Web of Science Core Collection was preferred over all other databases to obtain full records (reference, author, title, abstract, and publication information). Web of Science Core Collection (update:02.02.2022) data, which consisted of 3179 publications in total, were downloaded. Search criteria were selected searching terms (Topic): "covid" or "covid19" or "covid-19" or "pandemic" or "corona" and "tourism" or "hospitality" or "hotel." Based on the determined criteria, 3179 papers were obtained and recorded in an appropriate format.

Results

1. Leading countries and institutions analysis

The results of the first analysis indicate the leading countries and institutions. The map of the country collaboration network consists of 138 nodes and 335 links. Figure 1 shows the countries and co-operation networks of the authors. Each circle represents the country's output, and each link describes its collaboration, as shown in Figure 1. Table 1 lists the top ten countries in terms of the number of publications and centrality. The United States was the most productive country (n:538, 16.92%). Turkey ranked 12th, with 93 academic studies. Germany (0.23), Sweden (0.12), and Saudi Arabia (0.10) were the top three countries by centrality, and were the main centers of country collaboration worldwide.

The network density was calculated to be 0.0839. The purple ring around the nodes indicates the magnitude of the betweenness centrality value (Chen et al., 2014).
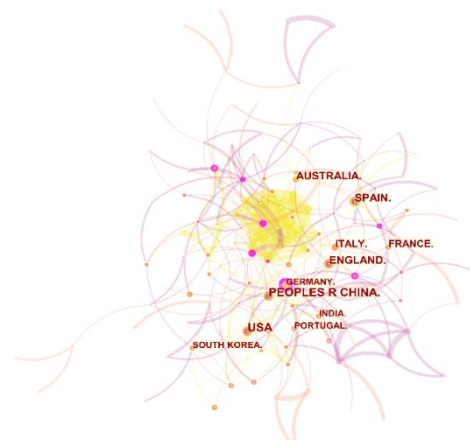
Figure 1. Maps of the country relationship (Purple colour -2020; orange – 2021; yellow – 2022)

Modularity Q reached 0.5617, and there was a reasonable structure. The silhouette score was 0.8839 and the result was valid. Figure 2 shows the cluster structure.

Figure 2. Country cluster map

Table 1. According to countries of cluster summary

Cluster ID	Size	Silhouette	Year (mean)
#0 covid-19 pandemic	26	0.826	2020
#1 organism-response approach	26	0.937	2020
#2 travel behavior	24	0.868	2020
#3 service quality	20	0.913	2020
#4 covid-19 prevention	14	0.838	2020
#5 multiple myeloma	9	0.879	2020
#6 small pacific island state	6	0.985	2020

All clusters are larger than 0.7, and it can be said that there is sufficient homogeneous and useful clustering. It is natural to include studies on the determination of risk factors by examining existing variables specifically related to the disease and treatment. The severity of the disease, the increase in risk groups, and the general clinical course have forced countries to take precautions. This is understandable, as multiple myeloma has also been associated with serious outcomes in Covid 19 positive patients.

Table 2 Top 10 countries regarding publication numbers.

Counted	Centrality	Year	Countries
538	0.10	2020	USA
473	0.03	2020	People's Republic of China
286	0.02	2020	England
271	0.06	2020	Spain
252	0.07	2020	Australia
164	0.04	2020	Italy
159	0.01	2020	France
141	0.01	2020	India
140	0.05	2020	South Korea
115	0.25	2020	Germany

Table 3 Top 10 institutions regarding centrality

Counted	Centrality	Year	Institution
59	0.04	2020	University of Paris
58	0.08	2020	Hong Kong Polytech University
40	0.04	2020	Sejong University
37	0.00	2020	Griffith University
35	0.06	2020	University of Johannesburg
34	0.01	2020	University of Cent Florida
33	0.01	2020	Hop Hotel Dieu
33	0.02	2020	Kyung Hee University
33	0.02	2020	University of Queensland
31	0.03	2020	Sorbonne University

The USA, China, and England were the top three countries in terms of publication number. Table 3 shows the top ten institutions in terms of centrality. The institution's collaboration network consists of 295 nodes, each of which represents an institution and 1020 links of nodes. Paris University (59) was the most active institution and belonged to cluster #5 (risk factor). The University of Florida had the highest betweenness centrality value (0.14) and belonged to Cluster #1 (sustainable development goal).

2. Analysis of the author

Table 4 lists the most active authors. HEESUP HAN (h-index:58) was the most active author in this field. The network consists of 202 nodes and 413 links.

Table 4. List of most active authors

Counted	Year	Authors
22	2020	HEESUP HAN
12	2020	PHILIPPE RAVAUD
10	2020	C MICHAEL HALL
10	2020	JIANJUN YANG
10	2020	GUODONG CONG
10	2020	TINGGUI CHEN
10	2021	SEONGSEOP (SAM) KIM
9	2020	ROB LAW
9	2020	JUN WEN
8	2021	IPKIN ANTHONY WONG

Table 5. List of Most Cited Author

Counted	Centrality	Year	Cited Authors
765	0.01	2020	[ANONYMOUS]
564	0.16	2020	GOSSLING S
482	0.00	2020	WHO
401	0.01	2020	UNWTO
274	0.02	2020	HALL CM
234	0.08	2020	SIGALA M
211	0.10	2020	FORNELL C
191	0.04	2020	HAIR JF
187	0.04	2020	HIGGINS-DESBIOLLES F
178	0.08	2020	WEN J

The most-cited author is listed as anonymous as the top author. When the anonymous node is examined in depth, it can be seen that there are up-to-date websites (such as the Guardian). The UNWTO and World Health Organization were the two most cited organizations. Gössling, Hall, and Sigala were the three most cited authors. The cited author network consisted of 821 nodes and 972 links, and the cluster map is shown in Figure 3.
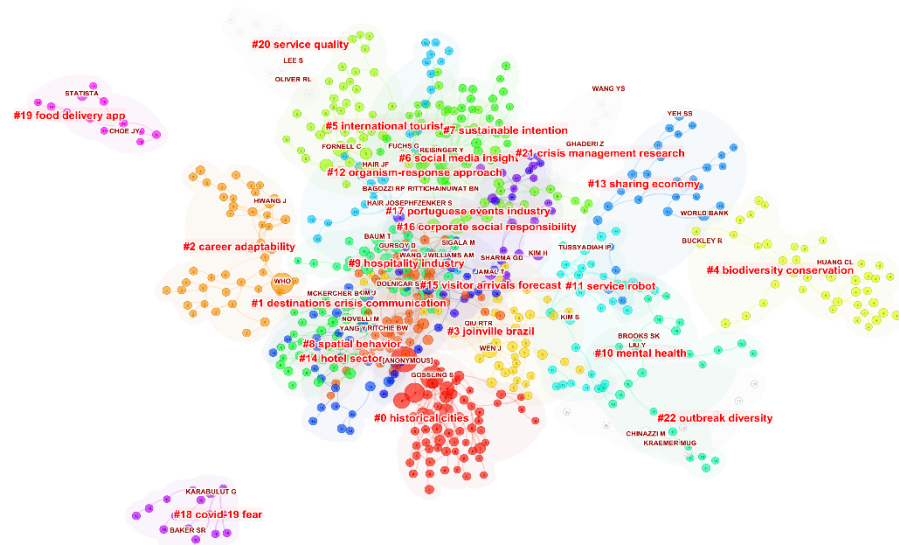
-Figure 3. Cited author cluster map

A total of 147 clusters were generated, with a Q-value of 0.7838 and silhouette values of 0.9322. Cluster analysis helps us to understand the main features of science mapping (Chen, 2016). A summary of the cluster details is presented in Table 6.

Table 6. Top 10 cited author clusters' summary

Cluster ID	Size	Silhouette	Year (mean)
#0 historical cities	62	0.919	2020
#1 destinations crisis communication	57	0.894	2020
#2 career adaptability	44	0.882	2020
#3 joinville brazil	42	0.917	2020
#4 biodiversity conservation	41	0.996	2020
#5 international tourist	41	0.944	2020
#6 social media insight	40	0.941	2020
#7 sustainable intention	39	0.899	2020
#8 spatial behavior	33	0.911	2020
#9 hospitality industry	33	0.936	2020

Clusters were studied intensively in the years 2020-2021. Cluster #0 (historical cities) and cluster #5 (international tourists) are still active clusters by 2022. These can be accepted as areas of study in the future.

3. Analysis of Cited Journal

Next, an analysis of the cited journals is demonstrated below. The analysis of cited journals can provide many benefits for academic research to produce, disseminate, and exchange academic information, rank research, inform decisions,

and notify the relative status of departments, institutions, and individuals (Hall, 2011).

Table 7. List of Cited Journal

Counted	Centrality	Year	Cited Journal
1086	0.06	2020	Tourism Management
982	0.03	2020	Annals of Tourism Research
803	0.01	2020	Journal of Sustainable Tourism
771	0.03	2020	Current Issues in Tourism
763	0.06	2020	International Journal of Hospitality Management
698	0.04	2020	Sustainability-Basel
621	0.03	2020	Journal of Business Research
599	0.02	2020	Journal of Travel Research
569	0.02	2020	International Journal of Contemporary Hospitality Management
566	0.00	2020	Tourism Geography

The results indicated that the most cited journals were Tourism Management, Annals of Tourism Research, and the Journal of Sustainable Tourism.

4. Analysis of the keywords

The analysis of keywords can provide important information about keyword co-occurrence. The method is based on words that co-occur in closely related(Zupic and Čater, 2015). Table 8 lists the 20 most frequently used keywords. The most popular keyword was "impact" (n =308), based on centrality and frequency. Keywords co-occurrence could effectively reflect frontier topics, research hotspots, and support research. The network map of keyword co-occurrence includes 446 nodes and 811 links.

Table 8. Top 20 Key Words in reference to Frequency and Centrality

Counted	Centrality	Year	Keywords
308	0.05	2020	impact
236	0.03	2020	tourism
158	0.03	2020	model
139	0.01	2020	management
138	0.03	2020	perception
138	0.00	2020	covid-19 pandemic
109	0.05	2020	satisfaction
103	0.00	2020	covid 19
99	0.01	2020	risk
99	0.01	2020	behavior
93	0.01	2020	health
88	0.06	2020	performance

87	0.01	2020	industry
84	0.01	2020	experience
83	0.06	2020	intention
83	0.05	2020	crisis management
77	0.01	2020	social media
74	0.06	2020	attitude
67	0.03	2020	crisis
63	0.02	2020	sar

Figure 4 shows the keyword cluster structure with a Modularity Q value of 0.6622 and Mean Silhouette=0.8496, and the top 10 largest clusters are defined and listed in Table 9.

Table 9. Largest 10 Clusters in the Keyword Cooccurrence Network

Size	Silhouette	Year (mean)	Cluster ID
36	0.85	2020	#0 quarantine hotel
36	0.865	2020	#1 job insecurity
34	0.84	2020	#2 tourism demand
34	0.826	2020	#3 social distancing
33	0.787	2021	#4 environmental sustainability
32	0.769	2020	#5 big data
31	0.879	2020	#6 mental health
30	0.892	2020	#7 perceived risk
30	0.789	2020	#8 tourism recovery
29	0.845	2020	#9 dynamic capabilities
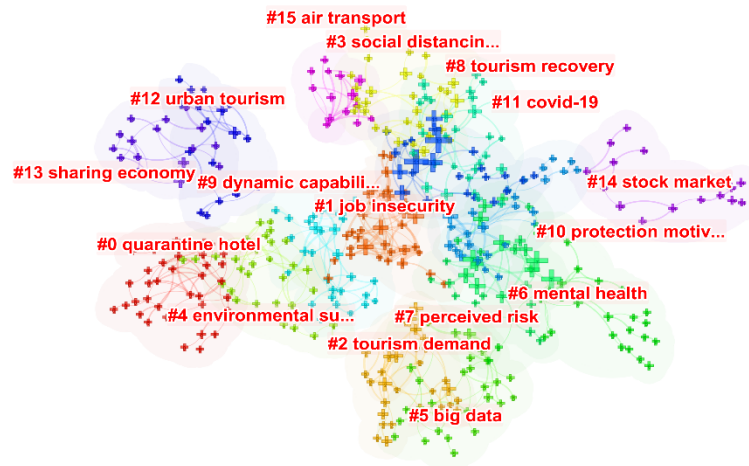
Figure 4. Keywords cluster structures

While #4 (environmental sustainability), #10 (protection motivation theory), and #11 (covid-19) clusters are still active clusters in 2022, other clusters have lost their activity.

5. Analysis of the reference and co-citation

Co-citation is the frequency with which two units are cited together (Small, 1973). Co-citation analysis assumes that items that are cited together are more likely to represent similar content (Zupic and Čater, 2015). These three leading articles had at least 493 citations. The first ten most cited references are presented in Table 10, beginning with the work of Sigala (2020).

Table 10. List of most cited references

Counted	Centrality	Year	References	Cluster
200	0.04	2020	Sigala M, 2020, J BUS RES, V117, P312, DOI 10.1016/j.jbusres.2020.06.015	2
161	0.04	2020	Hall CM, 2020, TOURISM GEOGR, V22, P577, DOI 10.1080/14616688.2020.1759131	2
132	0.04	2020	Zenker S, 2020, TOURISM MANAGE, V81, P0, DOI 10.1016/j.tourman.2020.104164	2
130	0.01	2020	Higgins-Desbiolles F, 2020, TOURISM GEOGR, V22, P610, DOI 10.1080/14616688.2020.1757748	2
129	0.18	2018	Novelli M, 2018, ANN TOURISM RES, V70, P76, DOI 10.1016/j.annals.2018.03.006	0
114	0.04	2020	Jiang YY, 2020, INT J CONTEMP HOSP M, V32, P2563, DOI 10.1108/IJCHM-03-2020-0237	4
113	0.05	2020	Qiu RTR, 2020, ANN TOURISM RES, V84, P0, DOI 10.1016/j.annals.2020.102994	2
113	0.06	2019	Ritchie BW, 2019, ANN TOURISM RES, V79, P0, DOI 10.1016/j.annals.2019.102812	3
109	0.02	2020	Nicola M, 2020, INT J SURG, V78, P185, DOI 10.1016/j.ijsu.2020.04.018	2
88	0.04	2014	Hair JosephF, 2014, MULTIVARIATE DATA AN, V7th ed., P0	5

Betweenness centrality identifies how a single node appears as a link connecting other nodes that would otherwise not be connected (Aryadoust et al., 2020). Novelli's study has a central location that connects other nodes to each other. The co-citation concept is used as a research tool to determine the degree of relationship between documents. Figure 5 shows the network map of the co-citation references consisting of 542 nodes and 2003 links (Figure 5).
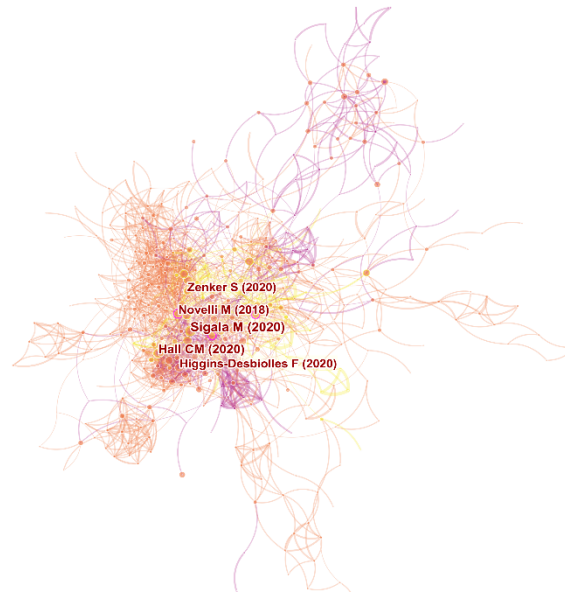
Figure 5. Network map of co-citation reference

The ring thickness can be compared with the number of citations in the aforementioned time period. Consequently, a large circle represents a highly cited unit, specified as a reference. A line between two rings indicates the co-citation link of two cited references, where the thickness represents the strength of co-citation, and color represents the time of the first co-occurrence. The general structure of the document co-citation network, with a modularity Q value of 0.649 and a silhouette value of 0.8521, is shown in Figure 6. The first four most-cited references belong to cluster #2 (halal tourism).
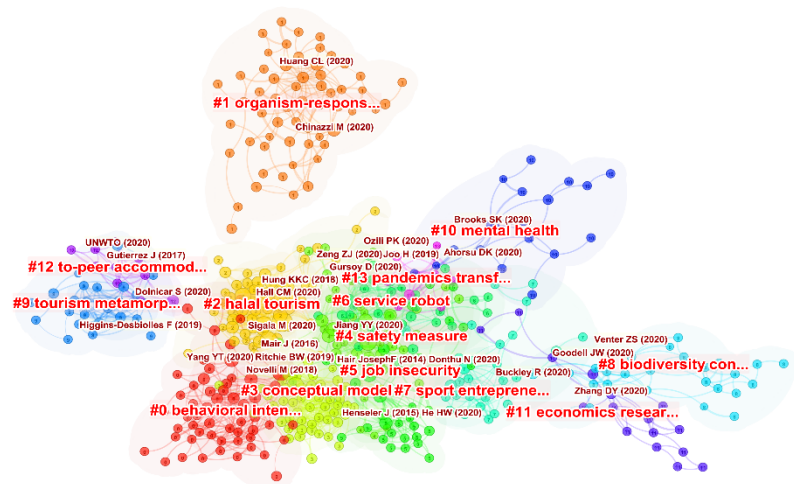

Figure 6. Co-Citation Analysis Network Map (The 14 major clusters are divided by color).

The timeline of document co-citation analysis is shown in Figure 7. As can be seen from the timeline, clusters are generally active. In particular, Cluster #2 (halal tourism) has been highlighted in recent years. Studies in this field are expected to continue in the future.
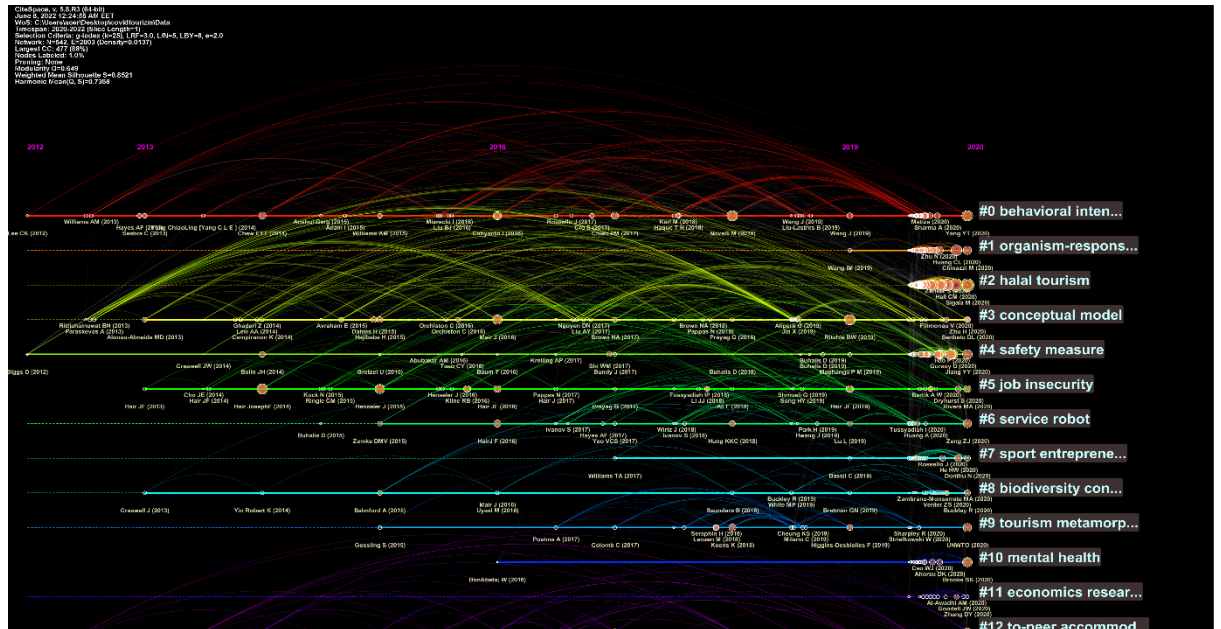

Figure 7. Document co-citation analysis timeline view.

In Figure 7 the emergence of each cluster occurs in chronological order. In addition, 14 clusters were obtained from cluster analysis (Table 10). Cluster #0 (behavioral intention) was the largest cluster, and cluster #1(organism-response approach) was the second largest cluster.

Table 11. Summary of the clusters with their silhouette values, size and mean (years) of the clusters automatically selected according to the reference.

Size	Silhouette	Year (mean)	Cluster ID
60	0.742	2018	#0 behavioral intention
58	0.905	2019	#1 organism-response approach
58	0.797	2020	#2 halal tourism
52	0.803	2017	#3 conceptual model
43	0.77	2018	#4 safety measure
40	0.833	2017	#5 job insecurity
32	0.838	2018	#6 service robot
29	0.917	2019	#7 sport entrepreneurship
26	0.952	2018	#8 biodiversity conservation
25	0.973	2018	#9 tourism metamorphosis
18	0.966	2019	#10 mental health
16	0.971	2020	#11 economics research
10	0.982	2017	#12 to-peer accommodation

10	0.98	2017	#13 pandemics transformation

Conclusion

The analysis of COVID-19 literature on tourism research in the Web of Science database presents a unique pattern. Initially, researchers addressed the diversity of topics and sub-topics related to the COVID-19 crisis. The diversity is recognized to increase exponentially, indicating that the virus has an impact on various aspects of our lives. Second, while the diversity of topics and subtopics increased, the emergence of subtopics was more significant. Therefore, the bibliometric results of this study provide evidence that COVID-19 has had an emerging impact on tourism research.

The results of this bibliometric analysis provide data on the impact of Covid-19 on tourism research. These data can be transferred to other fields of research as inputs for other quantitative statistical methods (Zupic and Čater, 2015). The findings of the study reveal the most active authors and sub-areas of research related to COVID-19 knowledge in the field of tourism research. First of all, The United States was the most productive country (n:538, 16.92%), whereas the top three countries by centrality were Germany (0.23), Sweden (0.12), and Saudi Arabia (0.10). These countries are the main centers of collaboration worldwide. Country cluster analysis indicates that clusters are formed as Covid-19 pandemic, organism-response approach, travel behavior, and service quality. These clusters represent the main country clusters.

The USA, China, England, Spain, and Australia were the top five countries in terms of publication numbers. The University of Paris, HK Polytech University, Sejong University, Griffith University, and the University of Johannesburg were the top five institutions in terms of centrality. These institutions could be considered institutions that cooperated with many other researchers worldwide and contributed to collective studies. Many researchers have suggested adopting interdisciplinary, multidisciplinary, or even anti-disciplinary research to enable creative thinking to go beyond existing preassumptions, mindsets, and concepts (Wen et al., 2020; Gössling et al., 2020, Hall et al., 2020; Sigala, 2018).

Heesup Han, Phillippe Ravaud, and C. Michael Hall were the most active authors, whereas Gössling, Hall, Sigala, and Fornell were the most cited authors. Among the most cited authors, "Anonymous' authors were cited the most, followed by the UNWTO and WHO. This could mostly be a result of the use of Internet sources. During the pandemic, Internet sources have been preferred by many researchers. These sources could include various local and/or international institutions or authorities. The UNWTO and WHO were the two most cited institutions because they provided trustworthy and rigorous information as the main authorities of tourism and health.

The cited author cluster summary showed that "historical cities", "destination crisis communication, and "career adaptability" were the top three clusters. Historical cities are popular research clusters, and crisis communication is

critical for destination management. Tourism employees had an unclear future, and topics related to "career" were frequently discussed.

Tourism Management, Annals of Tourism Research, and the Journal of Sustainable Tourism were the most cited journals, followed by Current Issues in Tourism, International Hospitality Management, and Sustainability-Basel. The top keywords in terms of frequency and centrality were "quarantine hotel", "job insecurity"," "tourism demand"," "social distancing", "environmental sustainability", "big data," and "mental health". Big data cluster involved key words like big data, panic buying, machine learning, unusual purchasing, information overload whereas "mental health" cluster involved key words like "physical activity, anxiety, depression, life satisfaction." These keywords can be defined as the most commonly used keywords along with various other concepts. Environmental sustainability, protection motivation theory and Covid-19 were found to be the active clusters. It can be assumed that there will still be more tourism research on environmental sustainability, motivational theories, and topics related to Covid-19.

The most-cited article was published in 2020 by Sigala M. The "Tourism and COVID-19: Impacts and implications for advancing and resetting industry and research" research by Sigala M. in 2020 aimed to review past and present literature to help researchers and professionals to better interpret and manage the impacts of Covid-19 on tourism and the ability to transform. The second most-cited article was from Hall C.M. in 2020. This paper presents a comprehensive overview of pandemics and its effects in analyze the Covid-19 pandemic, its impact on the sector, government bodies, and consumers (Hall et al., 2020). In addition, Novelli (2018) has a central point and connects other nodes to each other. Its centrality was the highest, it had an important location, and it belonged to the largest cluster of #0 tourism demand. Novelli's (2018) study was one of the few that explicitly focused on health-related crises in a developing country. This study analyzed the effect of the Ebola virus epidemic on Gambia. The findings highlight the importance of consumer perception while raising a debate on the indirect threat of epidemics on tourism in developing countries such as Gambia.

The first four most-cited references belonged to cluster #2 (halal tourism). Halal tourism focuses on Muslim tourists' needs according to Islamic teachings, in accordance with the Koran and Hadith (Holidah and Pasaribu, 2021). Although fear of COVID-19 has a negative effect on tourists' revisit intention, halal reputation has a positive influence on tourists' revisit intention (Wardi and Trinanda, 2022).

The study findings indicate that tourism researchers may concentrate on topics such as pandemics, risk factors, behavioral intentions, halal tourism, safety measures, and organism-response approaches. However, taking all these findings into consideration, tourism research should go beyond duplicating and reaffirming existing knowledge about Covid-19; instead focus on new things and broaden the perspective to guide the future of tourism (Sigala, 2020).

During the Covid-19 pandemic, technology has been an important tool for finding solutions to many problems. Technology is at the core of solutions for re-

opening tourism and the economy (e.g., detecting body temperature, identity controls, mobility tracing apps, social distancing, AI touchless service delivery, digital health passports, crowding control technologies, and big data for fast decision-making) (Sigala, 2020). In addition, e-tourism, social media, and digital marketing are widely used. However, the results did not show any evidence for tourism research investigating technology and its impacts during the Covid-19 pandemic. It would be interesting for future research to concentrate on topics related to technology and tourism.

As climate change and environmental problems increase, the frequency of pandemic outbreaks and epidemics is expected to emerge more commonly in the coming years (WEF, 2020). Rapidly growing digitalization, urbanization trends, industrialized worldwide food production chains, and the development of global transport networks are among the various reasons for the increasing threat (Gössling et al., 2020). It is the task of tourism researchers to propose improvements on tourism that enables human thriving, ecological recovery and sustainability (Higgins-Desbiolles, 2020). According to Sigala (2020), tourism research should inspire actors in the tourism sector to reimagine and support new mindsets, frontiers, and behaviors, such as how to use tourism to encourage a responsible and sustainable future. Research on how Covid-19 can alter the tourism sector should help reimagine, restart, and implement a humanist and responsible environment based on sustainability and well-being values (Sigala, 2020). In addition, it would be beneficial to state that Covid-19 had different impacts on tourism stakeholders. Covid-19 impacts should be investigated for different market segments and in different terms. There should be more analysis of other tourism stakeholders such as employees, tourism education, local communities, and tourism entrepreneurs. In addition, social entrepreneurship has received more attention in tourism research over the last decade (Sigala, 2019).

This study makes several theoretical contributions. First, this study presents a comprehensive and integrative approach by analyzing tourism research in 2020 and 2022. The research proposals can help future tourism research to focus on promising research areas and develop theoretical concepts. Bibliometric studies have generated new research avenues and directions for various fields in which researchers can identify gaps in literature and practice (Koseoglu et.al, 2016). Finally, this study contributes to the literature by using bibliometric co-citation analysis.

This study is expected to shed light on future research by presenting detailed literature information and raising awareness. In addition, the study will contribute to future research directions by increasing awareness of how tourism researchers will direct their work and the parameters discussed. This bibliometric study focused only on a specific database to analyze data, but the exclusion of other databases, such as EBSCO, Google Scholar, and PubMed, may have affected data representation. Consequently, future studies should cover various other databases and gather more data to gain a better understanding.

Declaration of Interest: The authors report there are no competing interests to declare.

References

Abbas, J., Mubeen, R., Iorember, P. T., Raza, S., & Mamirkulova, G. (2021). Exploring the impact of COVID-19 on tourism: transformational potential and implications for a sustainable recovery of the travel and leisure industry. *Current Research in Behavioral Sciences, 2*, 100033.

Acar,Y. (2020). Yeni Koronavirüs (COVID-19) salgını ve turizm faaliyetlerine etkisi. *Güncel Turizm Araştırmaları Dergisi*, *4*(1), 7-21.

Aryadoust, V., Zakaria, A.,Lim, M.H. & Chen, C. (2020). An extensive knowledge mapping review of measurement and validity in language assessment and SLA research. *Front. Psychol.* , 11, 1941

Bakar, N. A., & Rosbi, S. (2020). Effect of Coronavirus disease (COVID-19) to tourism industry. *International Journal of Advanced Engineering Research and Science*, *7*(4).

Chan, C. S. (2021). Developing a conceptual model for the post-COVID-19 pandemic changing tourism risk perception. *International Journal of Environmental Research and Public Health, 18*(18), 9824.

Chen C. (2006). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for Information Science and Technology 57*(3), 359-377.

Chen, C. (2016). *CiteSpace: a practical guide for mapping scientific literature* (pp. 25-33). Hauppauge, NY: Nova Science Publishers.

Chen C., Hu Z., Liu S. & Tseng H. (2012). Emerging trends in regenerative medicine: a scientometric analysis in CiteSpace. *Expert Opinion on Biological Therapy, 12*(5), 593-608.

Chen, C. (2014). The Citespace Manual. *College of Computing and Informatics*, *1*, 1-84.

Del Valle A.S. (2020). The Tourism Industry and the Impact of Covid-19, Scenarios and Proposals, *Global Journey Consulting*, comm@worldshoppingtourism.com.

Ersoy, A. (2022). Turizm ve Covid-19: Uluslararası Alanyazın Üzerine Bibliyometrik bir Analiz. *Fırat Üniversitesi Sosyal Bilimler Dergisi*, *32*(3), 1067-1080.

Galvagno, M. (2017). *Bibliometric literature review: An opportunity for marketing scholars*. Bibliometric literature review: an opportunity for marketing scholars, 5-15.

Gössling, S., Scott, D., & Hall, C. M. (2020). Pandemics, tourism and global change: a rapid assessment of COVID-19. *Journal of Sustainable Tourism, 29*(1), 1-20.

Hall, C. M. (2011). Publish and perish? Bibliometric analysis, journal ranking and the assessment of research quality in tourism. *Tourism Management*, *32*(1), 16-27.

Hall, C. M., Scott, D., & Gössling, S. (2020). Pandemics, transformations and tourism: Be careful what you wish for. *Tourism Geographies*, *22*(3), 577-598.

Higgins-Desbiolles, F. (2020). Socialising tourism for social and ecological justice after COVID-19. Tourism Geographies, *22*(3), 610-623.

Holidah, S., & Pasaribu, M. (2021). Halal Tourism On Mandailing Natal Is Hampered Due To The Covid-19 Pandemic. *Proceeding International Seminar Of Islamic Studies*, *2*(1), 816-823.

Huang, S. S., & Wang, X. (2022). COVID-19 two years on: A review of COVID-19-related empirical research in major tourism and hospitality journals. *International Journal of Contemporary Hospitality Management*, (ahead-of-print).

ILO (2022). COVID-19 and employment in the tourism sector: Impact and response in Asia and the Pacific, Retrieved July, 7, 2022, from https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/briefingnote/wcms_742664.pdf

Khan, K.I., Nasir, A. & Saleem, S. (2021). Bibliometric analysis of post Covid-19 management strategies and policies in hospitality and tourism. Frontiers in Psychology, 12, 769760

Kiliçaslan, Ö. F., Nabi, V., Yardibi, F., Tokgöz, M. A., & Köse, Ö. (2021). Research Tendency in Lumbar Spinal Stenosis over the Past Decade: A Bibliometric Analysis. *World Neurosurgery*, *149*,71-84.

Koseoglu, M. A., Rahimi, R., Okumus, F., & Liu, J. (2016). Bibliometric studies in tourism. *Annals of tourism research, 61*, 180-198.

Novelli, M., Burgess, L. G., Jones, A., & Ritchie, B. W. (2018). 'No Ebola… still doomed'–The Ebola-induced tourism crisis. *Annals of Tourism Research*, *70*, 76-87.

OECD, (2022), Retrieved July 08, 2022, from https://www.oecd.org/coronavirus/policy-responses/tourism-policy-responses-to-the-coronavirus-covid-19-6466aa20/

Pritchard, A., 1969. Statistical bibliography or bibliometrics. *J. Doc. 25* (4), 348–349.

Sigala, M. (2019). A market approach to social value co-creation: Findings and implications from "Mageires" the social restaurant. *Marketing Theory*, *19*(1), 27-45.

Sigala, M. (2020). Tourism and COVID-19: Impacts and implications for advancing and resetting industry and research. *Journal of Business Research*, *117*, 312-321.

Sigala, M. (2021). A bibliometric review of research on COVID-19 and tourism: Reflections for moving forward. *Tourism management perspectives*, *40*, 100912.

Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, *24*(4), 265–269.

UNWTO (2022), UNWTO World Tourism Barometer and Statistical Annex, January 2021, Retrieved July 5, 2022, from https://www.e-https://www.unwto.org/news/2020-worst-year-in-tourism-history-with-1-billion-fewer-international-arrivals

Utkarsh and Sigala, M. (2021), A bibliometric review of research on COVID-19 and tourism: reflections for moving forward. *Tourism Management Perspectives*, *40*,100912.

Viana Lora, A., & Nel-lo Andreu, M. G. (2020). Alternative metrics for assessing the social impact of tourism research. *Sustainability*, *12*(10), 4299.

Yardibi, F., Firat, M. Z., & Teke, E. C. (2021). Trend topics in animal science: a bibliometric analysis using CiteSpace. *Turkish Journal of Veterinary and Animal Sciences*, *45*(5), 833-840.

Yardibi, F., & Fırat, M. (2021). A Bibliometric Analysis of Publications During The Last Decade on Growth Performance In Animal Science. *Hayvansal Üretim*, *62*(2), 99-108.

Zenker, S., & Kock, F. (2020). The coronavirus pandemic–A critical discussion of a tourism research agenda. *Tourism Management*, *81*, 104164.

Zopiatis, A., Pericleous, K. and Theofanous, Y. (2021), COVID-19 and hospitality and tourism research: an integrative review. *Journal of Hospitality and Tourism Management*, *48*, 275-279.

Zortuk, M. (2009), Economic Impact of Tourism on Turkey's Economy: Evidence from Cointegration Tests", *International Research Journal of Finance and Economics*, *25* (3), 231–239.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational research methods*, *18*(3), 429-472.

Wardi, Y., & Trinanda, O. (2022). Halal tourism and coronavirus: understanding the influence of halal reputation and fear of COVID-19 on tourist's revisit intention. *Journal of Islamic Accounting and Business Research*, Emerald Publishing Limited 1759-0817, DOI 10.1108/JIABR-11-2021-0290

WEF, World Economic Forum (2020). Retirieved May 15, 2021, https://www.weforum.org/agenda/2020/03/coronavirus-global-epidemics-health-pandemic-covid-19/

Wen, J., Kozak, M., Yang, S., & Liu, F. (2020). COVID-19: potential effects on Chinese citizens' lifestyle and travel. *Tourism Review*, *76*(1), 74-87.

World Bank (2020).International Tourism, number of arrivals. Retrieved April 4, 2020, from https://data.worldbank.org/indicator/ST.INT.ARVL

Worldometer (2022). Retrieved May 10, 2022, from
https://www.worldometers.info/coronavirus/?zarsrc=130

WTTC (2021), Retirieved May 16, 2021, from
https://wttc.org/Research/Economic-Impact