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Exploring The Intersection of Big Data and Hospitality: A Bibliometric Analysis

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ABSTRACT

Purpose – The term big data has been become one of the most discussed issue not only in the computer science disciplines but also in other disciplines as well. Due to that reason, it has become an interdisciplinary term. Tourism is one of those disciplines where this term is highly studied as the tourism industry has been using big data recently. However, this term has never been studied with the term hospitality via bibliometrics and scientometrics. The main aim of this study is to reveal the bibliometric findings about the studies related to these two keywords.

Design/Methodology/Approach – Two different software programs were used during the analysis because they both have advantages and disadvantages. Data (n=120) were collected from WOS database.

Results – Two research questions were answered. Results about the trends in scientific publications on the concepts of "big data" and "hospitality" worldwide have shown us that 120 documents were published so far and first paper about these two keywords were published in 2014. Annual Growth Rate was found as 44,49% and 2021 is an important year as it is the peak point for the number of publications about these two keywords. 2015 is the year with the highest average citations per year. Data, hospitality, and tourism are the most important terms because they have the highest frequencies. International Journal of Contemporary Hospitality Management has 20 publications and Mariani, M. has 7 articles.

Discussion – 4 potential directions were proposed for future studies. At the end of the study, Theoretical and Practical Implications were proposed as well.

1. INTRODUCTION

In recent years, the rise of big data has been transforming various industries, including the hospitality industry (Yallop & Seraphin, 2020). Big data refers to the massive amounts of structured and unstructured data that are generated by various sources such as social media, online reviews, customer transactions, and other digital channels (Kitchens et al., 2018; Yudono et al., 2023). Big data has become a hot topic for debate and research not only in the fields of computer science but also in many other interdisciplinary fields (Bibri, 2019). Its widespread use highlights its significance and transformational potential. The hospitality industry is not an exception to this trend, with more focus being placed on leveraging big data's analytical capabilities to improve decision-making and client experiences (Del Vecchio et al., 2018). The hospitality industry has seen a significant revolution in an era marked by digital transformation and characterized by an extraordinary rate of information generation (Pencarelli, 2020).

The integration of big data and hospitality has opened new opportunities for businesses to optimize their operations, enhance customer experiences, and gain a competitive advantage (Turktarhan et al., 2021). By utilizing big data analytics, businesses can collect, process, and analyze large amounts of data to identify patterns, trends, and insights that can inform decision-making and improve business performance (Jin & Kim, 2018).

Decision-makers are then given the ability to optimize service offerings, customize marketing plans, and improve client experiences (Verma et al., 2002). Big data also has an impact on sustainability initiatives,

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resource allocation, and destination management, in addition to having an impact on corporate operations (Gupta et al., 2018). With a thorough understanding of its transformational potential, this paper intends to shed light on the varied significance of big data in the hospitality industry. Also, this paper aims to explore the current state of research on big data and hospitality by conducting a bibliometric analysis of relevant literature. By synthesizing and analyzing the literature, we aim to identify the key themes, trends, and research gaps in the field. This study will contribute to a better understanding of the implications of big data for the hospitality industry and provide insights into future research directions.

2. LITERATURE REVIEW

2.1 Big Data and Hospitality

Almost every industry is being impacted by big data and machine learning. The application of machine learning methods like artificial neural networks, support vector machines, and deep learning to tasks involving natural language processing, particularly sentiment analysis, is not unique to the tourist and hospitality sectors. The 1970s and 1980s saw the development of many of these methods, but large data and advances in computer processing power have led to their resurgence and widespread use in a variety of industries, including natural language processing (Burges, 1998; LeCun et al., 2015). According to Muritala et al. (2020), these techniques will become more widely used in the text processing of online reviews, particularly in the deployment of novel sub-techniques as they are created, as has previously occurred, i.e., in novel ways to build neural networks.

Big Data has become a significant game-changer for businesses across various industries, including the hospitality industry (Stylos et al., 2021). The hospitality industry generates a vast amount of data, including customer data, transaction data, and operational data (Mariani & Borghi, 2021; Bagherzadeh et al., 2021). Analyzing this data can help hospitality businesses to make data-driven decisions, enhance customer experience, and improve business operations.

One significant effect of Big Data on the hospitality industry is the ability to personalize customer experiences (Sakas et al., 2022). By analyzing customer data, hospitality businesses can gain insights into customer preferences, behavior, and needs (Mnyakin, 2023). They can use this information to offer tailored recommendations, personalized promotions, and customized services to enhance the customer experience (Dekimpe et al., 2020). For example, hotels can use customer data to personalize room preferences, food, and beverage offerings, and even provide customized travel itineraries.

Big Data can also help hospitality businesses optimize their operations (Gupta et al., 2017). For example, analyzing operational data can help identify areas of inefficiency, allowing businesses to optimize their processes and reduce costs. It can also help businesses to forecast demand and make strategic decisions about staffing levels, inventory management, and pricing (Rygielski et al., 2002).

Furthermore, Big Data can also help hospitality businesses to improve their marketing and customer engagement strategies (Delanoy & Kasztelnik, 2020). By analyzing customer data, businesses can identify target markets, optimize marketing campaigns, and improve customer engagement through social media and other channels. This can help businesses to attract and retain customers, ultimately leading to increased revenue and profitability.

In summary, Big Data has a significant impact on the hospitality industry, from personalized customer experiences to optimized operations and marketing strategies. By leveraging Big Data, hospitality businesses can make data-driven decisions, enhance customer experiences, and ultimately, increase their bottom line.

2.2 Bibliometric in Hospitality

Bibliometric studies have become increasingly popular in the field of hospitality, as they provide valuable insights into the existing literature and help identify research gaps and emerging trends. Bibliometric studies involve analyzing the bibliographic data of published articles, including citation analysis, co-citation analysis, and co-authorship analysis (Martínez-López et al., 2018; Şimşek & Kalıpçı, 2022b; Toker & Kalıpçı, 2022). Bibliometric studies in hospitality have helped to identify the most influential articles and authors in the field, as well as the key concepts and theories used in hospitality research (Peighambari et al., 2016; Strandberg et al., 2018). Bibliometric studies can also help to identify emerging trends and research directions in the field of

hospitality. For example, a bibliometric study may reveal that there has been a recent increase in research on the use of social media in destination marketing, indicating an emerging trend in the field. Ülker, Ülker and Karamustafa (2023) have found out that the two research areas where bibliometric studies are conducted most frequently are "tourism management" and "tourism and hospitality". Most research employed evaluative techniques, but fewer employed relational techniques including co-word, co-author, co-citation analysis, and bibliographic coupling. Relational approaches show that the terms "bibliometric analysis" and "tourism" are commonly employed jointly in the research under consideration.

Overall, bibliometric studies in hospitality provide valuable insights into the existing literature and help identify areas for future research. By analyzing the bibliographic data of published articles, researchers can gain a deeper understanding of the key concepts and theories used in hospitality research, as well as emerging trends and research directions in the field. To be able to do that researchers aim to find answer to Research Questions below:

RQ1 What are the trends in scientific publications on the concepts of "big data" and "hospitality" worldwide?

RQ2 How have authors, institutions and countries interacted with each other in scientific publications related to the concepts of "big data" and "hospitality" in the field of tourism?

3.METHODOLOGY

This study uses bibliometric analysis. The main purpose of bibliometric analysis is to recognize, evaluate and understand the literature (or part of the literature) in a given scientific field. Bibliometric analysis is the process of obtaining various findings on scientific communication as a result of analyzing publications in a certain field or in a certain academic journal with the help of numerical analysis and statistics on some bibliometric indicators (such as the number of articles published over the years, the most studied topics, the universities with the most publications, the journals that lead the field, the authors with the most studies, the number of citations, the keywords used. In this respect, bibliometric analysis is a method used to map the intellectual structure of any field of study and/or discipline, the development in the field, and the relationships between authors, subjects, and studies (Al & Coştur, 2007; Öztürk & Gürler, 2021). According to Koseoglu et. al. (2016), Zupic and Čater (2015) categorize bibliometric into three groups which are review studies, evaluative studies, and relational studies and they were shown in the Figure below.

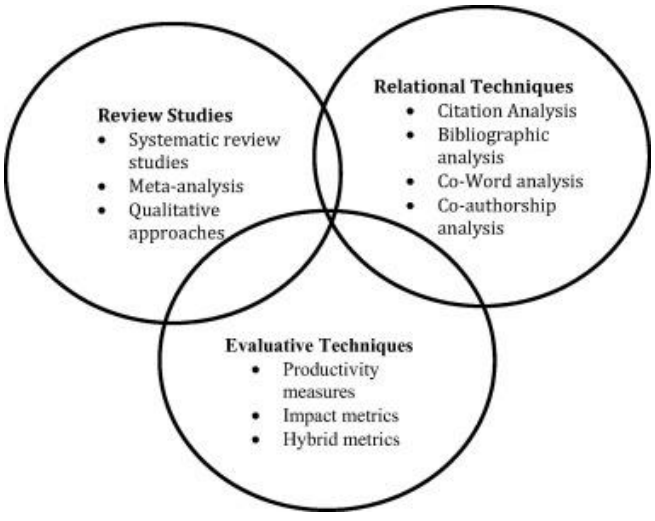

Figure 1. Bibliometric Methods (Koseoglu et. al., 2016)

When the figure above is examined, it can be understood that this study belongs to the relational studies as this paper contains techniques such as co-authorship of authors, organizations, and countries.

3.1 Selection, Data Collection, Data Analysis and Conclusion Process

The dataset was obtained from WOS database, as most of the researchers who has prestigious papers in the SSCI and ESCI indexed journals uses WOS database for their bibliometric studies (Jiménez-García et. al., 2020; Şimşek & Kalıpçı, 2022a; Şimşek & Kalıpçı, 2022b; Toker & Kalıpçı, 2022; Ülker et al., 2023). Two keywords,

whose importance were explained in the literature part were used in this research. As a result, 120 studies were found and used in the analysis process. Only two criteria were used. First one is excluding 2023, as more publications will emerge during this period after that research. The second one is using those keywords in the abstracts. Because researchers did not want to miss any details about the papers related to keywords. The illustration which were shown below summarizes the Selection, data collection, analysis, and conclusion process.

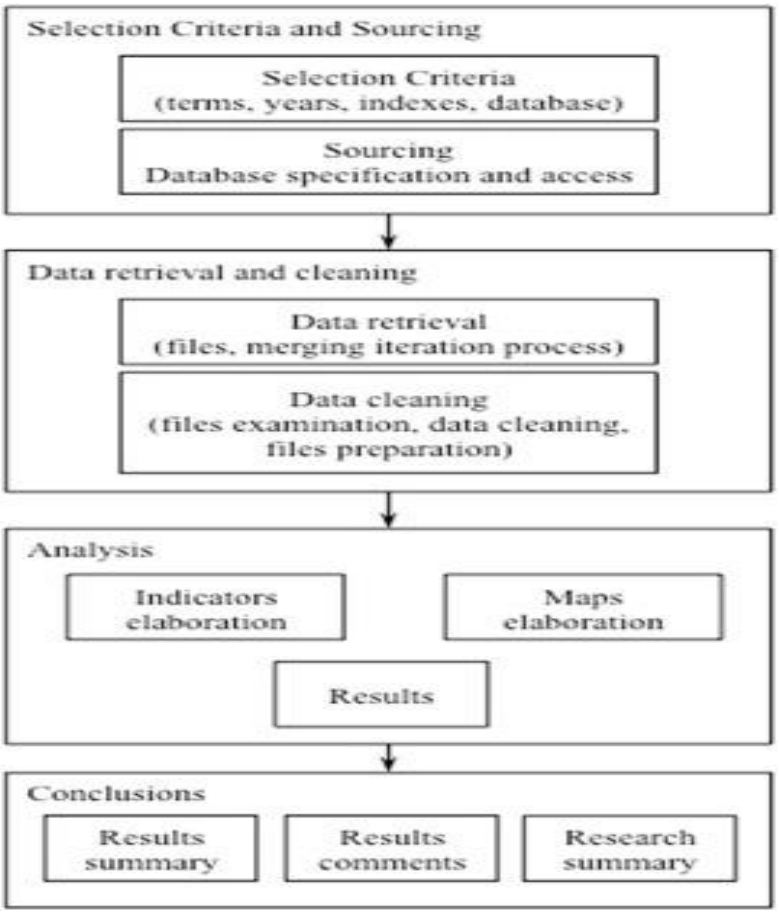

Figure 2. Selection, data collection, analysis, and conclusion process. (Danvila-del-Valle et al., 2019)

Many bibliometric software tools are available for researchers. They were presented in the figure below.

Tools	Analyzed version	Year	Developer	Operative System	User interface
Bibexcel	2017	2017	*University of Umeå* (Sweden)	*Win*	Desktop
Biblioshiny		2019	*University of Naples Federico II* (Italy)	*Runs in R*	Web
BiblioMaps	3.2	2018	*University of Lyon* (France)	*Runs* in *Python*	Web
CiteSpace	5.5.R2	2019	*Drexel University* (USA)	*Win*	Desktop
CitNetExplorer	1.0.0	2014	*Leiden University* (The Netherlands)	*Win, OSX, Linux*	Desktop
SciMAT	1.1.04	2016	*University of Granada* (Spain)	*Win, OSX, Linux*	Desktop
Sci² Tool	1.3	2018	*Cyberinfrastructure for Network Science Center* (USA)	*Win, OSX, Linux*	Desktop
VOSviewer	1.6.13	2019	*Leiden University* (The Netherlands)	*Win, OSX, Linux*	Desktop

Figure 3. Bibliometric Software Tools Comparison (Moral-Muñoz et. al., 2020)

All of the software tools have both advantages and disadvantages. Due to that reason, researchers tried to use 2 different software tools simultaneously in this study. Bibliometrix and its Shiny platform contain the more extensive set of techniques implemented. VOSViewer offers a great visualization and can load and import data from many sources (Moral-Muñoz et. al., 2020). So, these software tools were used at the same time in this study as mentioned above. When the literature is reviewed, using more than one software in a bibliometric

study can be seen recently. This technique is used rarely but effectively in a few studies (Cao & Alon, 2020; Jiménez-García et. al., 2020).

4. FINDINGS

When the table of Main Information About Data is examined, it is understood from the timespan that first paper about these two keywords were published in 2014. The number of the sources for publications were found as 65. 108 documents were found, 63 of them are articles, 23 of them reviews, 17 of them proceedings papers. 313 Keywords Plus (ID) and 388 Author's Keywords (DE) were found. 288 authors appeared 334 times meaning that most of the authors have multi-authored documents (n=278) while a few of them have single-authored documents (n=10). This proves that Documents per Author is 0,375 and Authors per Document 2,67. The other results can be seen in the table below.

Table 1. Main Information About Data (Own elaboration, done with Bibliometrix software)

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2014:2022
Sources (Journals, Books, etc)	65
Documents	108
Average years from publication	3,56
Average citations per documents	30,93
Average citations per year per doc	6,131
References	5054
DOCUMENT TYPES	
article	63
article; book chapter	3
editorial material	2
proceedings paper	17
review	23
DOCUMENT CONTENTS	
Keywords Plus (ID)	313
Author's Keywords (DE)	388
AUTHORS	
Authors	288
Author Appearances	334
Authors of single-authored documents	10
Authors of multi-authored documents	278
AUTHORS COLLABORATION	
Single-authored documents	10
Documents per Author	0,375
Authors per Document	2,67
Co-Authors per Documents	3,09
Collaboration Index	2,84

Annual Growth Rate was found as 44,49% in this study. When the figure showing Annual Scientific Production is examined, it is easily seen that there is a fluctuation in the figure. The year 2021 is the peak point for the number of publishing about these two keywords (n=24). As it was mentioned in the findings of Main Information About Data, first paper about big data and hospitality belongs to the year 2014 (n=1). As the publications in 2023 were not included in the dataset, the chart ends with 2022. The figure was presented below.

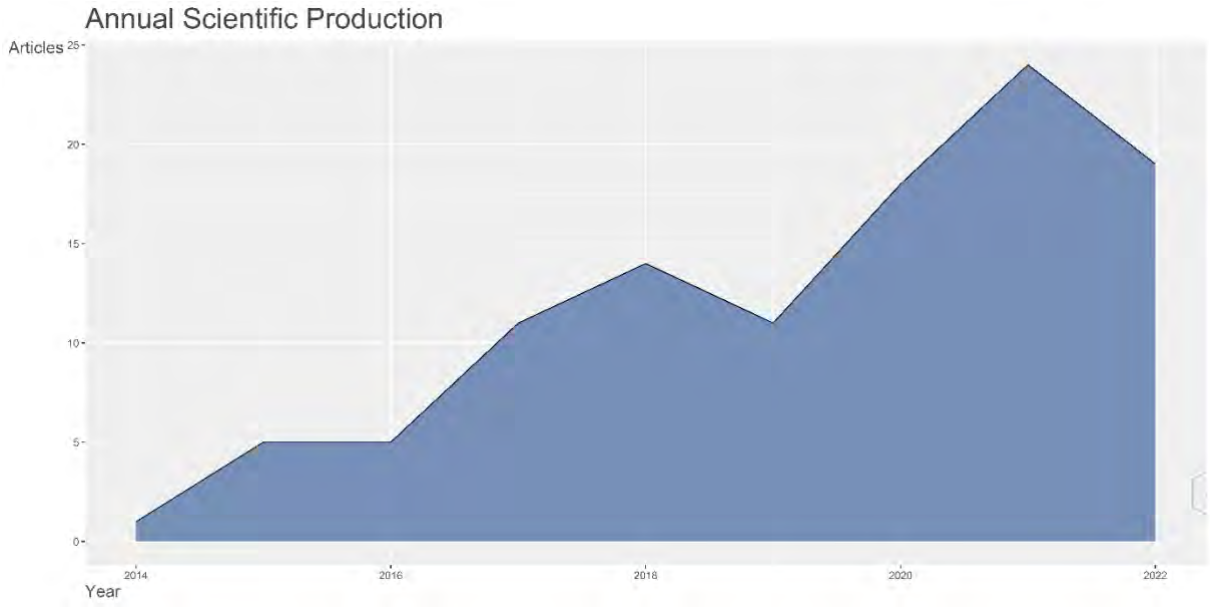

Figure 4. Annual Scientific Production (Own elaboration, done with Bibliometrix software)

The Figure 5 contains information about Average Citations per Year. According to the figure, 2015 is the year with the highest average citations per year (13.875). This year is followed by 2019 (13,545) and 2018 (10,128) respectively. The figure was shown below.

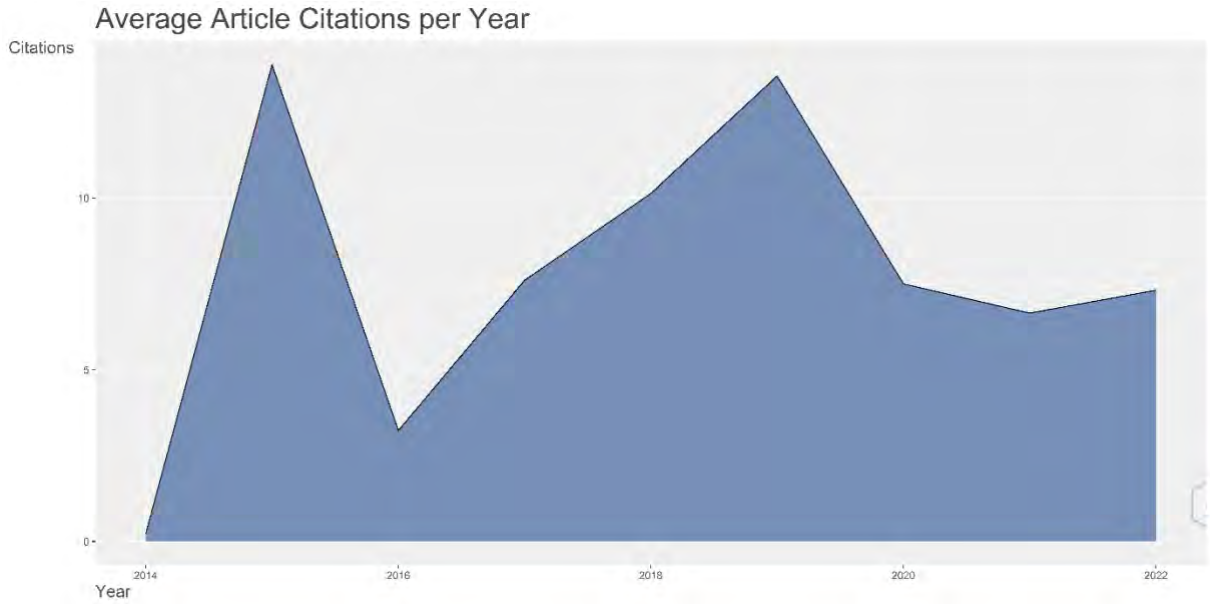

Figure 5. Average Publication Citations per Year (Own elaboration, done with Bibliometrix software)

As the first research question is about trends in scientific publications, trend topic analysis is important to be able to comment on this. Keywords Plus was set as a method parameter in the field. Results were given in the Figure 6. Trend topics of Keywords Plus can be seen year by year and the size of the blue dots shows the frequency of the topics. While management, hospitality, and tourism have the same frequency (f=15), impact (f=13), experience, big data, and word-of-moth have different values (f=12). The figure 6 below contains more information about the topics.

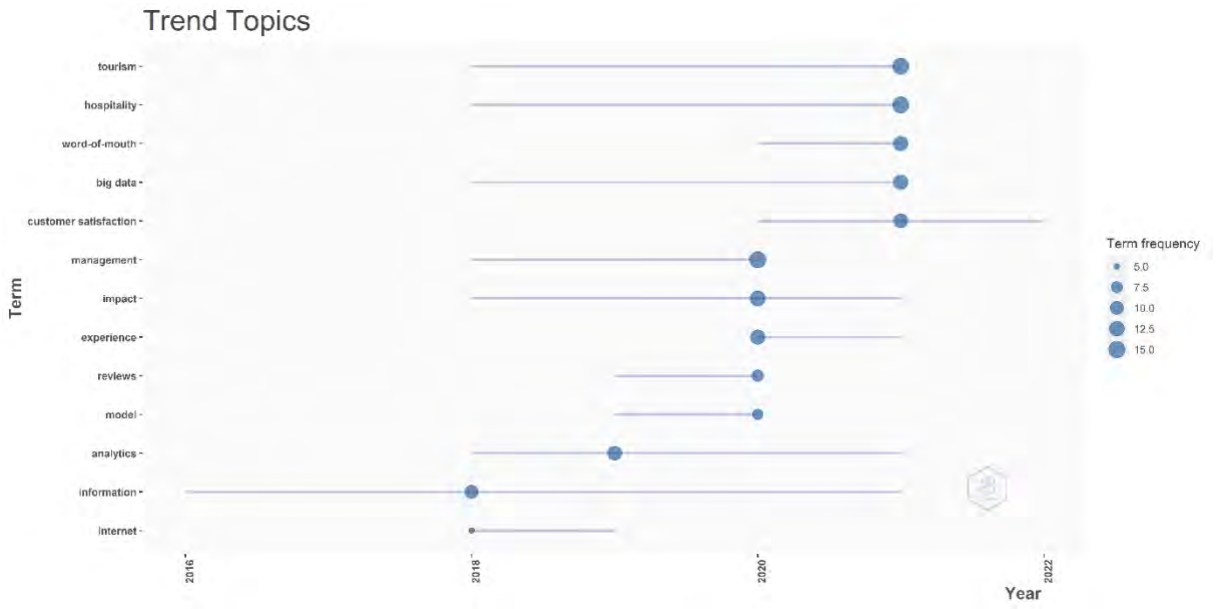

Figure 6. Trend Topics (Own elaboration, done with Bibliometrix software)

The wordcloud is one of the algorithms belonging to Bibliometrix, which enables researchers to comment of the published papers and their topics (Aria & Cuccurullo, 2017). Titles of the publications were chosen for the field and Unigrams parameters were chosen. The results were displayed in the figure below. Unsurprisingly, the terms data (f=67), hospitality (f=47), and tourism (f=29) were found first, second, and third consecutively. The other terms can be seen in the figure below as well.

Figure 7. Wordcloud (Own elaboration, done with Bibliometrix software)

When the table of Most Relevant Sources is viewed, International Journal of Contemporary Hospitality Management has 20 publications, whereas International Journal of Hospitality Management has 7 and Journal of Hospitality and Tourism Technology has 5 publications. The others which has less than 5 publications were presented in the table.

Table 2. Most Relevant Sources (Own elaboration, done with Bibliometrix software)

Sources	Publications
International Journal of Contemporary Hospitality Management	20
International Journal of Hospitality Management	7
Journal of Hospitality and Tourism Technology	5
Tourism Review	4
Journal of Travel & Tourism Marketing	3
Sustainability	3
Tourism Management	3
Applied Sciences-Basel	2

The Table 3 shows the Most Relevant Authors about "Big Data" and "Hospitality". Mariani, M. has 7 articles and other authors have 3 articles.

Table 3. Most Relevant Authors (Own elaboration, done with Bibliometrix software)

Authors	Publications
Mariani, M.	7
Borghi, M.	3
Buhalis, D.	3
Gonzalez-Serrano, L.	3
Lee, M.	3
Munoz-Romero, S.	3
Rojo-Alvarez, J.L.	3
Soguero-Ruiz, C.	3
Talon-Ballestero, P.	3
Xiang, Z.	3

Co-authorship of authors

Knowing the researchers who have utilized bibliometric analysis in related domains and the results of earlier studies is crucial for future study that will use this method (Ülker et al., 2023). For this reason, Co-authorship analysis are important. When the number of documents belonging to an author was set "1" and number of citations belonging to the authors was set "3" 230 items were found. However, 13 of them have the largest set of connected items and they were included in the analysis. According to the results, Schwartz, ZVI (n of citations=504, Total Link Strength=7), Xiang, Zheng (n of citations=497, Total Link Strength=8), Gerdes, John H., Jr. (n of citations=464, Total Link Strength=3) and Uysal, Muzaffer (n of citations=464, Total Link Strength=3) are connected with each other. Although, Mariani, Marcello has 10 documents about topic and 315 citations has no connection in the network.

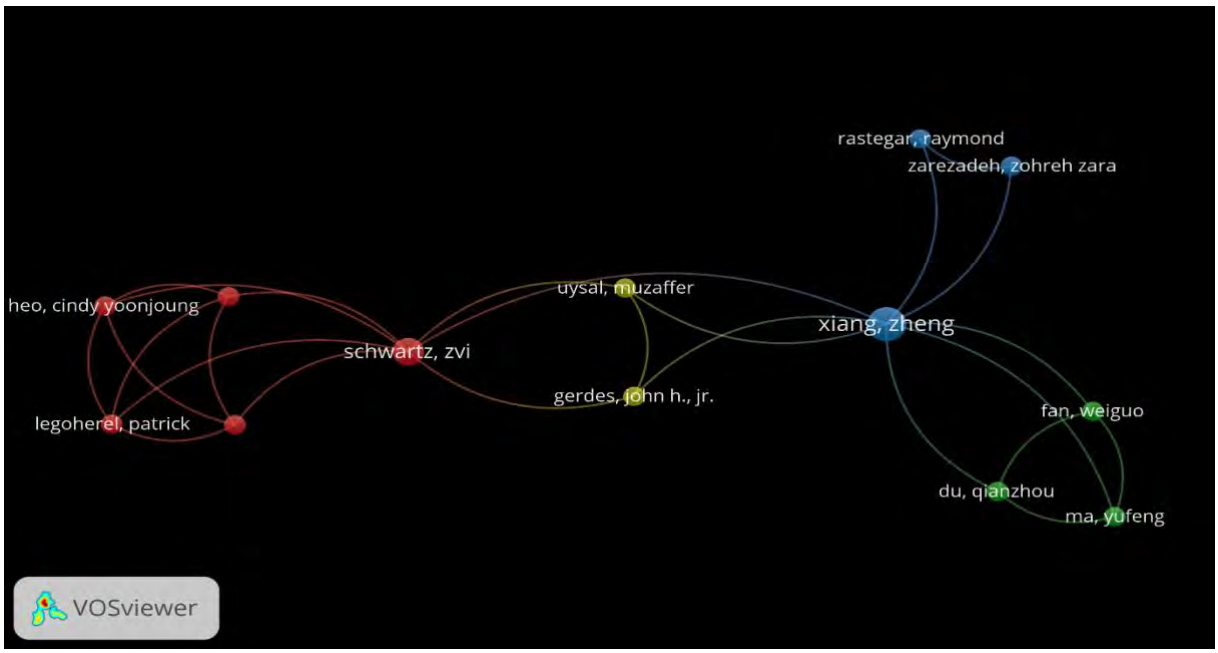

Figure 8. Co-authorship of authors (Own elaboration, done with VOSViewer software)

Co-authorship of organizations and their network can be seen clearly in the figure below. Parameters were set "1" for number of documents belonging to the organizations and "3" for number of citations belonging to the organizations. Hong Kong Polytech University has the biggest point in the figure as it has the highest total link strength (n of citations=54, Total Link Strength=12), followed by University Reading (n of citations=331, Total Link Strength=11) Bournemouth University (n of citations=420, Total Link Strength=10).

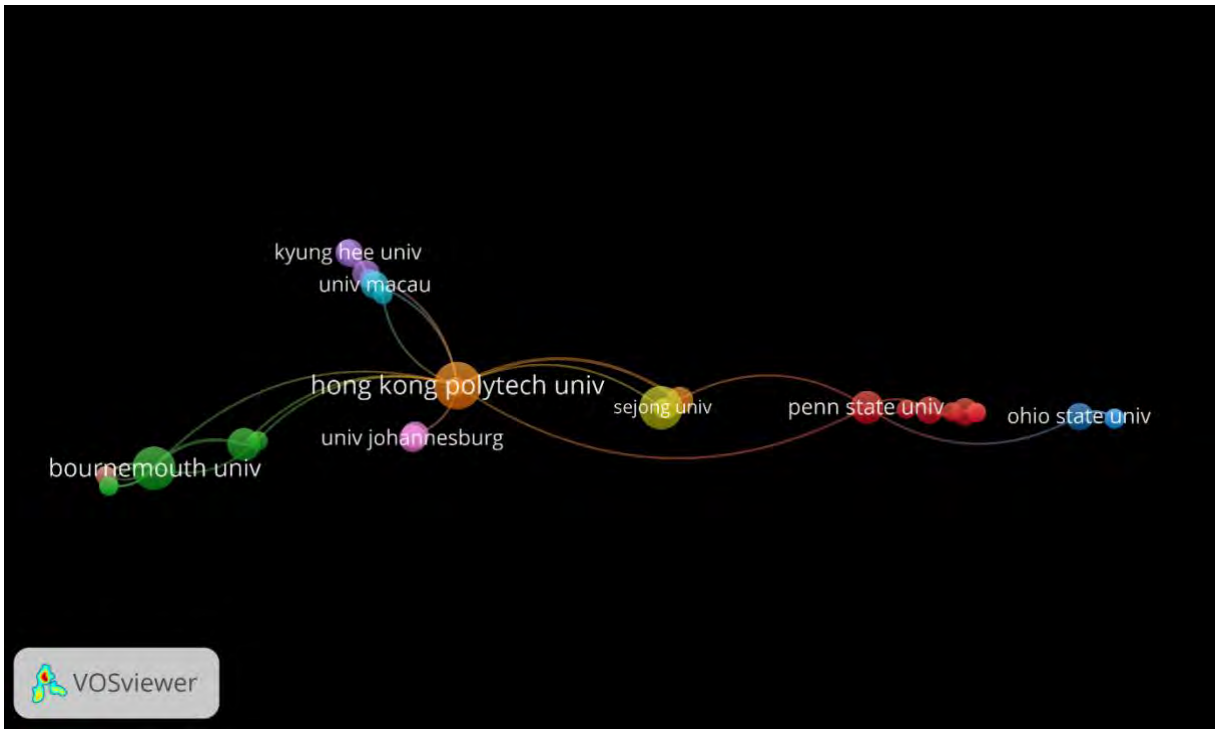

Figure 9. Co-authorship of organizations (Own elaboration, done with VOSViewer software)

Co-authorship of countries were analyzed, and the results of analysis were shown below. 36 countries met the criteria which was set "1" for number of documents belonging to the countries and "3" for number of citations belonging to the countries. But only 26 of them has connection. USA (n of citations=1591, Total Link Strength=21), England (n of citations=968, Total Link Strength=33), and People R China (n of citations=297,

Total Link Strength=23) are the first three countries. Those countries are placed in the center of the network as it can be seen in Figure 10.

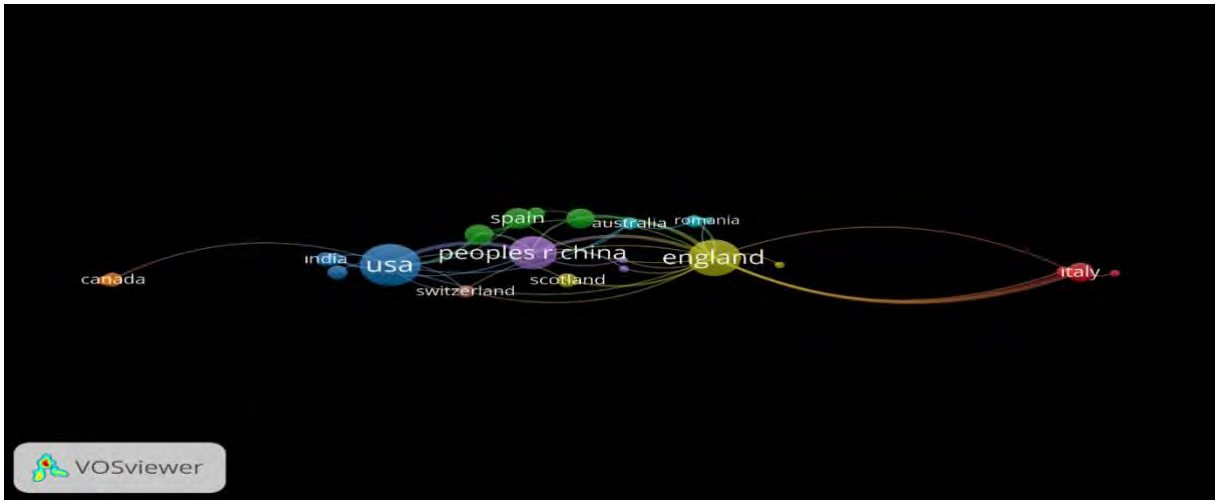

Figure 10. Co-authorship of countries (Own elaboration, done with VOSViewer software)

Co-citation of Cited Sources

Minimum number of citations of a source was set to 20. And 49 met the threshold. Tourism Management is ranked 1st (n of citations=536, Total Link Strength=22420), International Journal of Hospitality Management is ranked 2nd (n of citations=415, Total Link Strength=16758), International Journal of Contemporary Hospitality Management is ranked 3rd (n of citations=309, Total Link Strength=14239). The other journal whose citations less than 200 and whose total link strength less than 10000 can be seen in the network below.

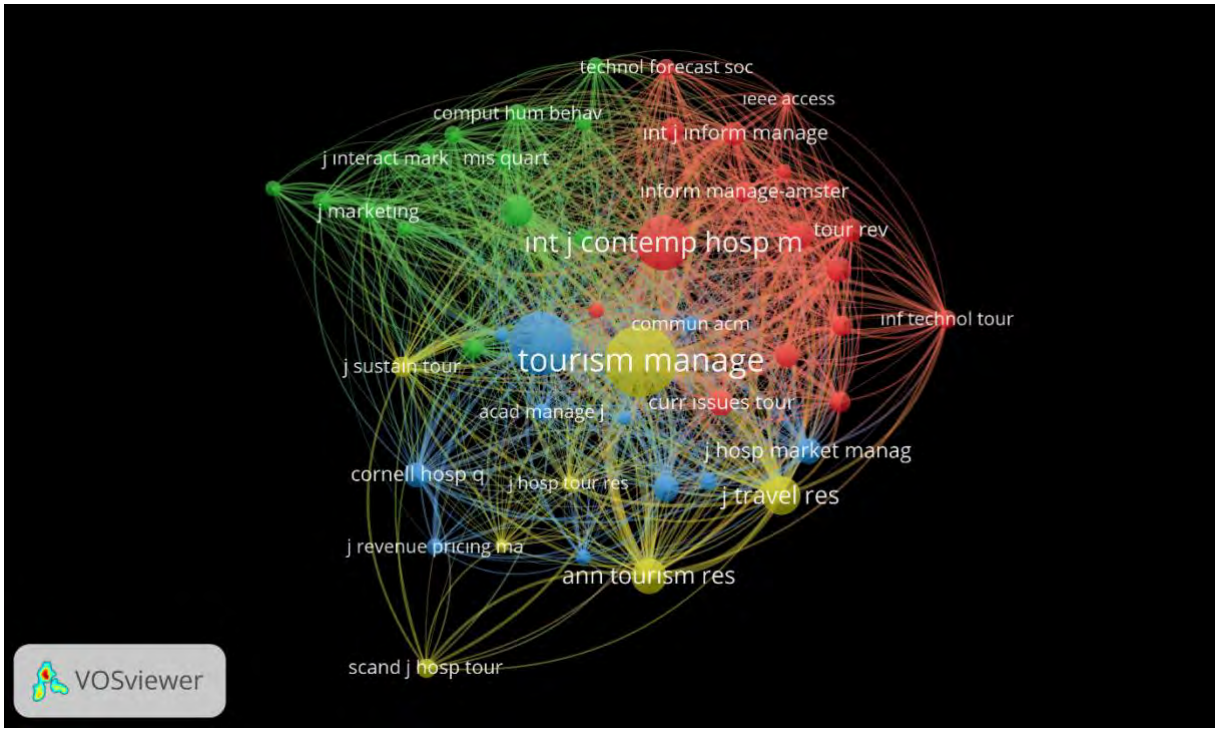

Figure 11. Co-authorship of Co-citation of Cited Sources (Own elaboration, done with VOSViewer software)

5. CONCLUSION

This study aims to provide insight about big data and hospitality within the tourism industry by using bibliometric methods and analysis. To be able to perform that, two research questions were asked. Owing to containing more analysis related to the first research question, they were computed via Bibliometrix software. Results about the trends in scientific publications on the concepts of "big data" and "hospitality" worldwide

have shown us that 120 documents were published so far and first paper about these two keywords were published in 2014. Annual Growth Rate was found as 44,49% and 2021 is an important year as it is the peak point for the number of publications about these two keywords. 2015 is the year with the highest average citations per year. Data, hospitality, and tourism are the most important terms because they have the highest frequencies. International Journal of Contemporary Hospitality Management has 20 publications and Mariani, M. has 7 articles.

The second research question tries to find answers how authors, institutions and countries have interacted with each other in scientific publications related to the concepts of "big data" and "hospitality". For this reason. VOSViewer software was used. While Schwartz, ZVI and Xiang, Zheng are the leading figures in Co-authorship of authors, Hong Kong Polytech University is the most active institution in Co-authorship of organizations. USA, England, and China are the most dominant countries in Co-authorship of countries, whereas Tourism Management has the highest citations in Co-citation of Cited Sources analysis.

6. DISCUSSION

Although, there is no study combining the big data and hospitality in the tourism literature, many studies have been published about big data and tourism. Li et al. (2018) states that assessing tourists' satisfaction with tourism-related goods or places, internet textual data (conveying tourist sentiment) proved useful. Tourism demand forecast and internet marketing have improved as a result of web search data (directly indicating public attention toward tourism markets and correlating to anticipated demands). Due to the significance of weather in the tourist industry, meteorological data (recorded weather elements) have been used to quantify the effects of weather on tourism and provide the corresponding travel advice. Online travel marketing has primarily used transaction data, especially those capturing visitor online activity. Xiang and Fesenmaier (2017) claimed that big data analytics encourages collaboration, open innovation, and value co-creation in the travel and tourism sector in addition to helping us understand the consumer market better. According to Samara et al. (2020), the literature argues that Big Data and Artificial Intelligence can offer increased efficiency, productivity, and profitability to tourism businesses. Weaver (2021) in his study pays attention to the usage of big data. When data analytics become a particularly dominant method of knowing and earning, tourism and capitalism as they are practiced on a human scale run into issues. Despite how intriguing the results may seem, there are reasons to exercise caution when using big data. Tourism is characterized by tensions and inconsistencies, such as those relating to authenticity, sustainability, and commodification. The crisis of analysis is another manifestation of this phenomenon: the tendency to quantify through big data clashes with countertendencies that are more people centered. The results of Mariani and Baggio's study (2022) indicated that researchers studying tourism and hospitality are becoming more familiar with and utilizing big data techniques to acquire, gather, analyze, report, and visualize their data. However, as both sets of methodologies and technologies need to be improved, there are a variety of ways to enhance the application and interpretation of big data and big data analytics. Additionally, big data analytics promise to improve a number of data-dependent digital tourism and hospitality technologies including Artificial Intelligence and The Internet of Things.

Tourists and travelers can easily communicate knowledge via social media and online forums to get the information and inspiration they need for their vacation plans (Fauzi, 2023). Digital and virtual technology has a big impact on the market. The human element in tourism has developed toward a fully technology-enabled orientation as a result of how technology has changed society (Law et al., 2020). Although self-service technology and robots have been widely used in the hospitality supply chain and operations, the industry is still commonly acknowledged to be one that relies heavily on human labor (Murphy et al., 2017). Tourism research is becoming seriously interested in digital technologies thanks to smartphone technology, internet of things' adoption, machine learning, and artificial intelligence (Singh & Bashar, 2021).

Knani, Echchakoui, and Ladhari (2022) highlighted the importance of privacy and security concerns related to big data and analytics in tourism in their bibliometric study. Concerns regarding unresolved legal and ethical issues grow as a result of the rapid progress and implementation of artificial intelligence (AI) technologies, few research in tourism and hospitality have addressed questions of information sharing and privacy in relation to the usage of AI. Tourists respond to multiple demands for personal information from the pre-trip through the post-trip phases (such as those from airlines, travel agencies, hotels, and location-based services,

as well as significant usage of smart technology). As a result, personal and sensitive data (such as sociodemographic, geographic, behavioral, and biometric data) are collected, handled, and shared, raising privacy concerns and issues (Ioannou et al., 2020; Tussyadiah, 2020).

7. THEORETICAL AND PRACTICAL IMPLICATIONS

The findings of this research show that the annual number of publications on big data and hospitality has started to increase steadily after 2019 indicating that attention to the studies related to these two key words will increase in future. As the most prolific countries and journals are from USA and England, more publications from those two countries are expected in future research. Additionally, this indicates a strong domination of both countries in terms of citations and publication volume.

To help the practitioner community identify the major priority areas for a smooth transition to a digitally changed organization, our study offers pertinent insights on the present state of research, important future trends, and various schools of thought. Managers can brilliantly secure the success of their DT initiatives by utilizing this acquired knowledge in many practical aspects, such as assessing the current organizational status of digital transformation, strategically choosing the best fit digital applications, their organizational implications, associated risks, and their mitigation plans (Chawla & Goyal, 2022).

8. LIMITATIONS AND SUGGESTIONS FOR FUTURE STUDIES

As stated above, this study uses only WOS database. This may be one of the limitations about this study. Using other databases about these terms in the upcoming years may enlighten to the tourism literature. Also, including other bibliometric software programs into the analysis might contribute to the literature as well.

Based on the results of our bibliometric analysis and the existing literature, here are some potential directions for future studies.

1. The impact of Big Data on sustainability practices in the hospitality industry. This could include investigating how Big Data can be used to reduce energy consumption, water usage, and waste in hospitality businesses.
2. The use of Big Data in revenue management for the hospitality industry. This could include investigating how Big Data can be used to forecast demand, optimize pricing, and maximize revenue for hotels and other hospitality businesses.
3. The role of Big Data in improving customer loyalty and satisfaction in the hospitality industry. This could include investigating how personalized experiences and customized services based on Big Data can improve customer loyalty and satisfaction.
4. The impact of Big Data on employee training and development in the hospitality industry. This could include investigating how Big Data can be used to identify areas for employee.

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