THE IMPLEMENTATION OF VIRTUAL TOURISM: A BIBLIOMETRIC AND VISUALIZATION ANALYSIS

[1]Tran Tuyen & [2]Nguyen Thi-Van Hanh

[1&2]University of Social Sciences and Humanities,
Vietnam National University, Ho Chi Minh

[2]Corresponding author: nguyenthivanhanh@hcmussh.edu.vn

ABSTRACT

Technology is a crucial part of the tourism industry; supporting businesses with daily operations, while improving customer experiences. Virtual reality (VR) has garnered considerable attention as an emerging technology with the potential to bring about substantial transformations in the tourism industry. Consequently, the concept of virtual tourism has emerged as a contemporary and contentious issue, generating diverse discussions. In the context of tourism digitalization and the growing trend of virtual tourism, a review for exploring the state of the art of this new kind of tourism is essential. This study employed systematic and narrative reviews to explore research domains and highlight an up-to-date insight into the current state of research on virtual tourism. Based on performance mapping and intellectual mapping, keywords and clusters analysis were implemented to explore the current state of research on virtual tourism and suggest some implications for future research agenda. The five clusters included (1) Visualization with computer graphics in cultural heritages; (2) Tourism issues, COVID-19, and virtual reality technology; (3) Virtual reality technology and application in tourism; (4) Virtual tourism characteristics and user experience; and (5) Cyber tourism, internet and information technology. Some implications for future research agenda had been introduced through the analysis of bibliographic coupling depicted by visualization of similarities (VOS) viewer application.

Keywords: Virtual Tourism, Bibliometric and Visualization Analysis, Review, Virtual Reality.

INTRODUCTION

Technology has played a pivotal role in supporting daily operations and enhancing customer experiences in the tourism sector. Over the years, technological advancements have driven significant developments in tourism, shaping the strategies and competitiveness of businesses and destinations (Buhalis et al., 2019). Among the emerging technologies with transformative potential, virtual reality (VR) has garnered substantial attention (Beck et al., 2019). The implementation of VR in travel and tourism is considered the most recent innovation reshaping the global tourism industry (Jude & Ukekwe, 2020). Furthermore, virtual tourism has become an increasingly vital aspect of the tourism industry, particularly in light of the COVID-19 pandemic and evolving consumer behavior.

There have been many significant advantages of virtual tourism pointed out in tourism literature (Tuyen & Hanh, 2021), and it is considered a tool for improving the travel quality and life while reducing the personal, social, medical, environmental, or financial risks associated with extensive travel, especially in the era of the COVID-19 (Rao & Krantz, 2020). Virtual tourism is quickly becoming recognized for its significant position, benefits, and function in tourist demands; it is considered an alternative kind of tourism product and complements smart tourism (Tuyen & Hanh, 2021).

The increasing importance of technology in tourism and its effects have led scholars to be more interested in the field. In turn, the multidisciplinary nature of tourism necessitates quantitative and qualitative bibliometric analysis. Bibliometrics is the application of mathematical and statistical methods to documents (Garrigos-Simon et al., 2018), allowing the determination of the level of quality of the studies in a particular field, assessing the theories, and defining the trends, thereby assisting scholars in grasping the understanding of major studies (Güzeller, 2018). In many cases, a bibliometric analysis captures research trends and academic relationships of prominent publications, keyword frequencies, etc, thereby enabling scholars to pay attention to new and undiscovered research topics (Mavric et al., 2021).

Recently, the importance of bibliometric studies has increased in tourism literature. Consequently, numerous scholars specialising in tourism research have undertaken bibliometric studies to explore various aspects within this field (Mavric et al., 2021; Salimi et al., 2019), including basic and popular subjects like tourism research in general (Güzeller, 2018), tourism and sustainability (Garrigos-Simon et al., 2018), tourism-environmental degradation nexus (Shahbaz et al., 2021), hospitality management and specific subjects such as slow tourism (Mavric et al., 2021), wellness tourism (Suban, 2022), trust in the field of hospitality and tourism (Palácios et al., 2021) and even novel issues related to COVID-19 and tourism (Utkarsh & Sigala, 2021).

Together with the increase of technology applications in tourism and its research (Ulker-Demirel & Ciftci, 2020; Yung & Khoo-Lattimore, 2019), there have also been bibliometric studies on fields such as technology in tourism in general (Martins & Costa, 2022), e-tourism (Singh & Bashar, 2021), information systems management tools in tourism sector (Paula et al., 2020), smart tourism (Chen et al., 2021; Johnson & Samakovlis, 2019) technology acceptance in tourism, artificial intelligent in tourism (Kirtil & Aşkun, 2021), etc. Important and promising as it is, virtual tourism also attracts numerous researchers and must be subjected to bibliometric analysis too.

To conduct a bibliometric analysis of virtual tourism research, this study can further contribute to a clear understanding of the potential and importance of virtual tourism. Additionally, conducting a comprehensive review of the subject matter can offer contemporary perspectives on the ongoing research endeavours in the field of virtual tourism. This, in turn, facilitates a more thorough understanding of virtual tourism and garners substantial backing and encouragement from various stakeholders for its advancement and growth. This study aims to provide an overview of virtual tourism research by conducting bibliometric and visualization analysis. Specifically, it examines the status and evolution of virtual tourism, identifies the main cited papers in this field, analyses keywords and clusters, and discusses bibliographic coupling.

METHODOLOGY

The systematic review methodology employed in this study aims to strengthen the credibility and reliability of the research findings and provide a solid foundation for future research and decision-making in virtual tourism. Utilizing a systematic review approach in this study offers numerous advantages, including comprehensiveness and rigor (Petticrew & Roberts, 2008; Shahbaz et al., 2021). By following a systematic review methodology, the researchers were able to conduct a thorough and unbiased assessment of the existing literature on virtual tourism. This approach involved a systematic search strategy, meticulous screening and selection of relevant studies, and a rigorous analysis of the findings. Additionally, a systematic review allows for the synthesis and comparison of findings from multiple studies, enabling the identification of patterns, trends, and gaps in the existing knowledge.

The data for this study was obtained from Scopus; the world's largest database of peer-reviewed reputable literature (Verma et al., 2022). Other previous literature reviews also used Scopus as the primary database (Sánchez et al., 2017). A systematic review is mainly employed to explore the current state of virtual tourism research that can be accessed from the Scopus database, from 1999 to the end of 2022. The concept of virtual tourism was first mentioned in an article in 1999. Moreover, the utilization of narrative reviews in conjunction with cluster analysis can effectively overcome the inherent limitations of each individual method. The systematic review research process consists of three primary steps (Charband & Jafari Navimipour, 2016) as follows:

Step 1: Using the Scopus system for advanced search.
Three keywords were used to identify publications directly related to virtual tourism, and the search criteria were: TITLE-ABS-KEY ("virtual tourism") OR TITLE-ABS-KEY ("cyber tourism") OR TITLE-ABS-KEY ("virtual reality tourism"). A total of 241 scholarly papers addressing the topic of virtual tourism were retrieved from the Scopus system using the specified methodology.

Step 2: Thorough document checking.
 This step involved a meticulous evaluation process to ensure transparency and comprehensiveness. All papers were carefully screened by examining their titles and abstracts to determine their relevance to the research topic. Furthermore, efforts were made to standardize different keywords and search terms to ensure consistency. As a result, a domain-specific to virtual tourism comprising 210 papers published in Scopus was established.

Furthermore, to complement the papers obtained from the Scopus database, additional high-quality sources by Google Scholar were also extensively reviewed. These sources included reputable journals such as Sustainability (Switzerland) (Akhtar et al., 2021; Oncioiu & Priescu, 2022), Journal of Service Management (Buhalis et al., 2019), and Journal of Hospitality and Tourism Technology (Chang & Chiang, 2022; Johnson & Samakovlis, 2019), etc. This review aimed to gather relevant papers that needed to be captured in the Scopus database, ensuring a comprehensive evaluation.

Step 3: Selective reading to clarify different research topics.
The final step is reading carefully all the papers for narrative review and preparing bibliographic data of these papers for bibliometrics review (science mapping and intellectual structure mapping). This paper utilized the visualization of similarities (VOS) viewer application, which is widely recognized and extensively employed in bibliometric reviews (Leung et al., 2017; Utkarsh & Sigala, 2021). By employing descriptive analysis of the Scopus system, this study examined performance mapping and intellectual mapping of research literature.
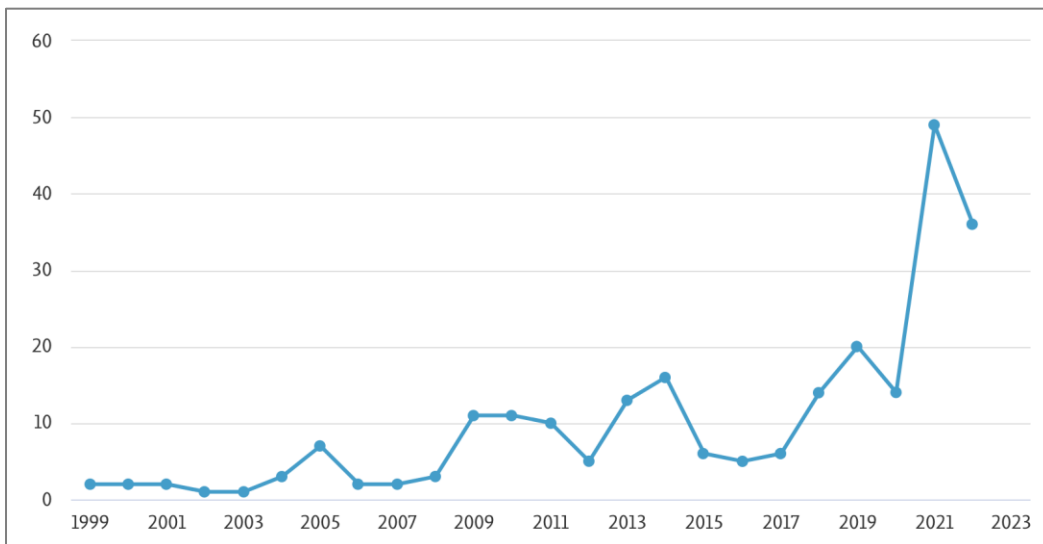
RESULTS AND DISCUSSION

Status and Evolution of Virtual Tourism in The Literature

Documents by Year

Figure 1

Number of Publications Related to Virtual Tourism (Source: Scopus)

In the late 20th century, the literature of Scopus contained several papers that discussed virtual reality applications and the potential threat of virtual reality to the tourism industry. Notable papers from that
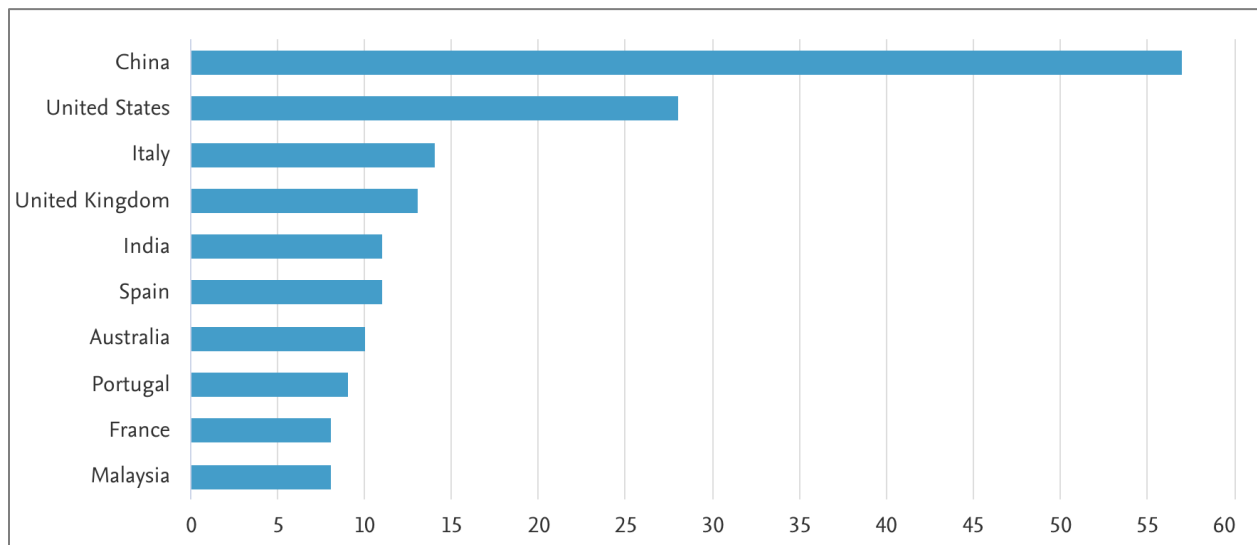
period included "The virtual threat to Travel and tourism: (Cheong, 1995), "Virtual Reality: A new horizon for the tourism industry" (Hobson & Williams, 1995), and "Virtual Reality and tourism: fact or fantasy?" (Williams & Hobson, 1995). However, it was not until 1999 that the first two papers directly addressing virtual tourism were published in the Scopus database. These papers were commentary pieces titled "Virtual tourism - the ultimate ecotourism?" and "Sustainable tourist space: From reality to virtual reality?". In the first paper, virtual tourism was seen as the second-best alternative to real trips and was believed to have potential impacts on visitors (Bristow, 1999). Similarly, the second paper expressed hope for the feasibility of virtual tourism, suggesting that it could be enhanced to meet the demands of tourists and combined with real experiences to make mass tourism more sustainable (Dewailly, 1999).

Since then, the number of publications relating to this subject has significantly increased. In the year 2020, a total of 14 scholarly papers were published. However, by 2021, this Figure had risen to 49 (Figure. 1). Many scholars have paid attention to this topic due to the COVID-19 pandemic outbreak (Lu et al., 2022a; Roman et al., 2022; Schiopu et al., 2021; Utkarsh & Sigala, 2021) and virtual tourism has been empirically demonstrated to serve as a viable alternative to physical tourism, as supported by the findings of multiple studies (Akhtar et al., 2021; El-Said & Aziz, 2022; Tuyen & Hanh, 2021). In the context of the COVID-19 pandemic recovery, from January to August of 2022, there have been 36 papers researching virtual tourism; this proves that it has continuously discussed thanks to its excellent support to physical tourism marketing and its impact on tourist intention to visit destinations in person (Kim et al., 2022).

Documents by Countries (Based on the Affiliation of the First Author)

Figure 2

Number of Publications Related to Virtual Tourism by Country (Source: Scopus)
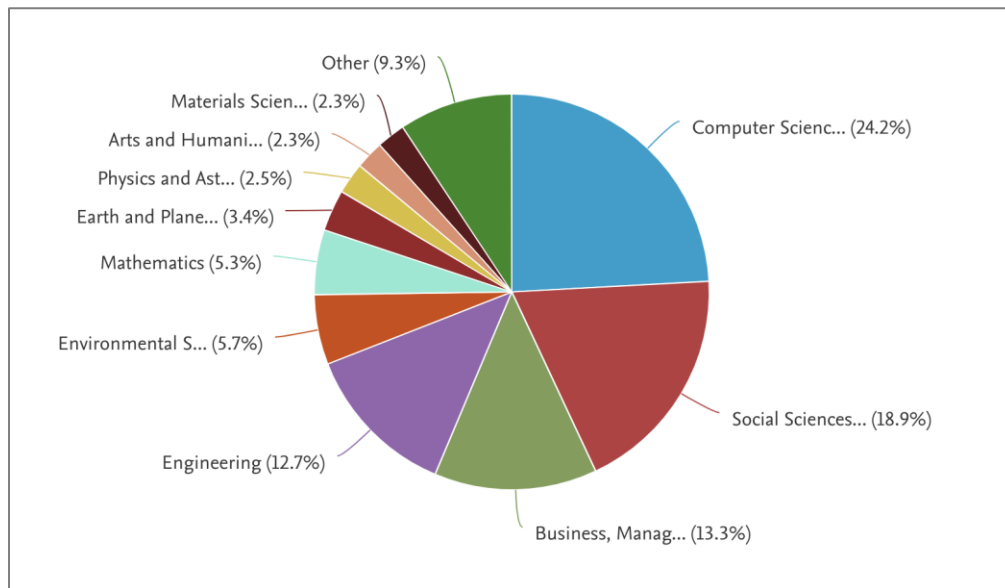

China is the country with the most research on this topic (57 papers), followed by the United States (28 papers) and Italy (14 papers). The middle of the list consisted of countries with rapid technological advancement and technology applications in tourism (Figure 2). 'Processing and Visualization of 3D

Models in Digital Heritage' is the only related study found on Vietnam. This paper shows the application of virtual and augmented reality to build a virtual museum simulation for the Cham Sculpture Museum in Danang, Vietnam (Tran et al., 2021). Nevertheless, this is not formal research on virtual tourism; it is only virtual reality for tourism destinations.

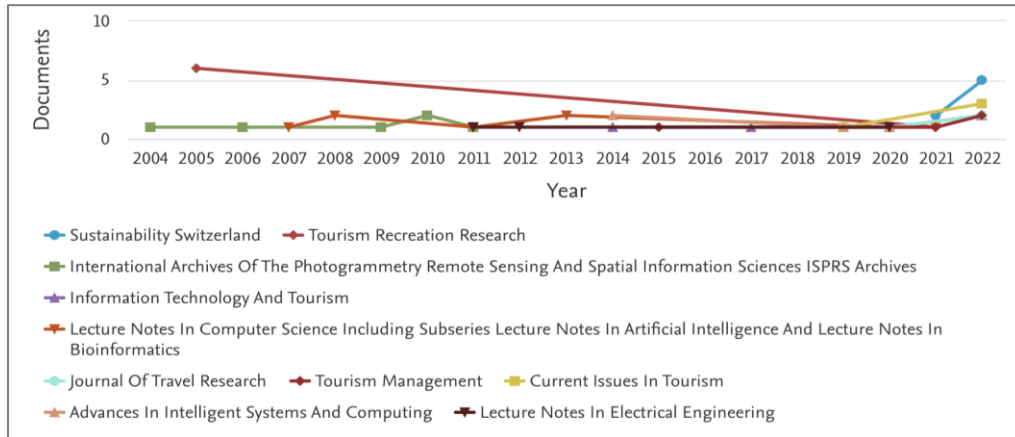***Documents by Subject Area***

Figure 3

Publication Rate Related to Virtual Tourism by Sector (Source: Scopus)

The disciplines with the highest percentage of related research are computer science (24.2%), followed by social science (18,9%), and business, management, and accounting (13.3%) (Figure 3).
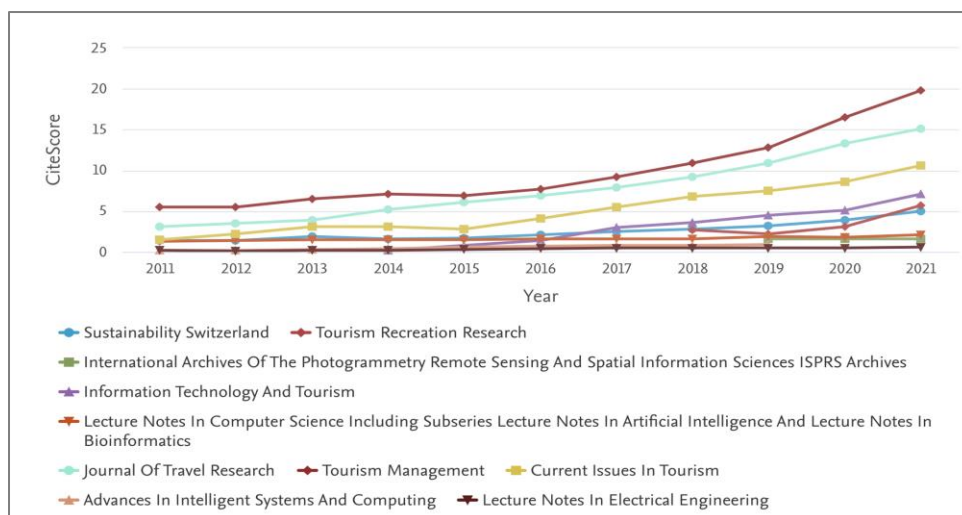
Figure 4

Publication Rate Related to Virtual Tourism by Publisher (Source: Scopus)'

The present compilation presents a list of the 10 most prominent sources for publications on virtual tourism. The source that exhibits the greatest number of papers is Lecture Notes in Computer Science, which encompasses subseries such as Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics, with a total of 8 papers. Following closely are Sustainability Switzerland and Tourism Recreation Research, both with 7 papers each (Figure 4). However, from 2021 to the first eight months of 2022, articles on virtual tourism research have increased in a number of journals, including Sustainability Switzerland (from 2 to 5 papers); Current issue in tourism (from 0 to 3 papers); Tourism management (from 1 to 2 papers); Journal of travel research (from 1 to 2 papers); etc. Regarding CiteScore, Tourism management, the Journal of travel research, and Current issues in tourism had the highest CiteScores in 2021, and their CiteScores have steadily increased from year to year (Figure 5).

Figure 5

CiteScore of Top 10 Publishers Having Papers Related to Virtual Tourism (Source: Scopus)

Main Cited Papers in Virtual Tourism

Virtual tourism has been regularly discussed ever since it first appeared on Scopus. To date, the top 10 papers with the most citations in virtual tourism are listed in Table 1 below:

Table 1

Most Cited Papers of Virtual Tourism Publication on Scopus

No	Documents/ Journal	Year	<2020	2020	2021	2022	Total
1	New realities: a systematic literature review on virtual reality and augmented reality in tourism research *Current Issues in Tourism*	2019	11	59	88	87	245
2	Exploring the Implications of Virtual Reality Technology in Tourism Marketing: An Integrated Research Framework *International Journal of Tourism Research*	2016	71	55	36	53	216
3	Exploring Consumer Behavior in Virtual Reality Tourism Using an Extended Stimulus-Organism-Response Model *Journal of Travel Research*	2019	5	20	83	100	206
4	A hedonic motivation model in virtual reality tourism: Comparing visitors and non-visitors *International Journal of Information Management*	2019	4	24	33	45	106
5	The role of electronic commerce in creating virtual tourism destination marketing organizations *International Journal of Contemporary Hospitality Management*	2000	73	8	1	1	83
6	Sustainable tourist space: From reality to virtual reality? *Tourism Geographies*	1999	31	14	11	10	66
7	Mobile-mediated virtual experience in tourism: Concept, typology, and applications *Journal of Vacation Marketing*	2009	42	8	6	7	63

8	'Authentic but not too much: exploring perceptions of authenticity of virtual tourism	2017	4	8	10	22	44
	Information Technology and Tourism						
9	Journeys in Second Life' - Iranian Muslim women's behavior in virtual tourist destinations	2015	25	5	6	7	43
	Tourism Management						
10	Comparing Virtual Reality Tourism to Real-Life Experience: Effects of Presence and Engagement on Attitude and Enjoyment	2018	1	5	13	14	33
	Communication Research Reports						

(Source: Scopus)

The article by Yung and Khoo-Lattimore (2019): 'New realities: A systematic literature review on virtual reality and augmented reality in tourism research' was ranked first in the number of citations in virtual tourism research. This article employed a review method to capture some of the growing topics in new reality applications in tourism (virtual reality and augmented reality). The result showed that marketing and tourism education emerged as the most common contexts, and some suggestions for future research agenda included: awareness of the technology, usability, and time commitment (Yung & Khoo-Lattimore, 2019). Research overview on virtual reality and tourism area has increased these recent years because of various virtual reality applications and tourists' complex experiences and behavior towards a new kind of tourism (Beck et al., 2019; Liang & Elliot, 2021; Tuyen & Hanh, 2021; Wu et al., 2020).

The second most cited article is 'Exploring the Implications of virtual reality technology in tourism marketing: An integrated research framework' by Huang, et al., (2016). This research article used an integrated TAM model in a 3D virtual tourism site to explore tourists' experiences in the virtual environment. The result suggested that implementing interactive virtual destinations can attract potential online and real-world tourists (Huang et al., 2016). The growth of information technology in the tourism sector has driven many new theoretical models or frameworks to explore tourists' perceptions, experiences, and behavior (Gangwar et al., 2015; Huang et al., 2016; Kim & Hall, 2019). These tools significantly contribute to clarifying contemporary tourism issues in the era of technology and digitalization.

'Exploring consumer behavior in virtual reality tourism using an extended stimulus-organism-response model' ranked third in terms of the number of citations. A framework based on stimulus-organism-response (SOR) theory was developed in this research to explore factors impacting consumers' intention to visit destinations presented by virtual reality. Cognitive, affective responses and authentic experience are essential factors affecting tourists' intention to visit the destinations shown in the virtual environment. This result revealed crucial support of virtual tourism for real tourism marketing and destination attraction (Adachi et al., 2020; Chang & Chiang, 2022; Griffin et al., 2022; Huang et al., 2016). The rest of the papers are very diverse in terms of the topics and authors.

Keywords and Clusters Analysis

The authors used specific keywords below the abstract to highlight their main topics, so analysis of these keywords is crucial to capture the most relevant research topics in virtual tourism. This paper used a Bibtex file of 240 selected articles to be analyzed using VOS viewer software. There were 1711 keywords, and 79 of them appeared four times. The following table lists the most important keywords along with their frequency and total link strength (author keyword co-occurrences link) (Table 2).

Table 2

The Top Author Keywords Co-Occurrence of Virtual Tourism Publication

Rank	Keyword	Occurrences	Total link strength
1	Virtual reality	78	277
2	Virtual tourism	80	217
3	Tourism	55	170
4	COVID-19	22	82
5	Tourist destination	15	80
6	Three-dimension computer graphics	17	76
7	Cultural heritage	14	72
8	Augmented reality	15	72
9	Tourism development	10	54
10	Visualization	12	48
11	Sustainable development	7	44
12	Virtual reality technology	11	44
13	Virtual tour	13	42
14	3D modeling	9	40
15	Marketing	8	40

The most common keywords revealed some upcoming topics on virtual tourism research, including Virtual reality; Virtual tourism; Tourism; COVID-19; Tourist destination; Three dimension computer graphics; Cultural heritage; Augmented reality; Tourism development; Visualization; Sustainable development; Virtual reality technology; Virtual tour; 3D modeling; Marketing. Figure 6 depicts the visualization of the intellectual framework of the 210 papers as generated by VOS viewer. The author's keywords have been categorized into five distinct clusters, each represented by a different color (green, blue, yellow, red, and violet), as depicted in Figure 6. The interconnecting lines among the nodes also unveiled certain associations between the keywords. The frequency of a keyword's occurrence across multiple papers is directly proportional to the thickness of the lines representing the keyword. The longer the distance between the nodes, the weaker their connection (the number of papers that two keywords appear in together) (Leung

et al., 2017; Utkarsh & Sigala, 2021). Figure 7 depicts the density visualization of keywords related to virtual tourism research generated by VOS viewer. The font size in the visualization corresponds to the level of density, with larger fonts indicating higher levels of density (Utkarsh & Sigala, 2021).

Figure 6

Network Visualization of Keywords Related to Virtual Tourism Research by VOS Viewer (Source: Authors)
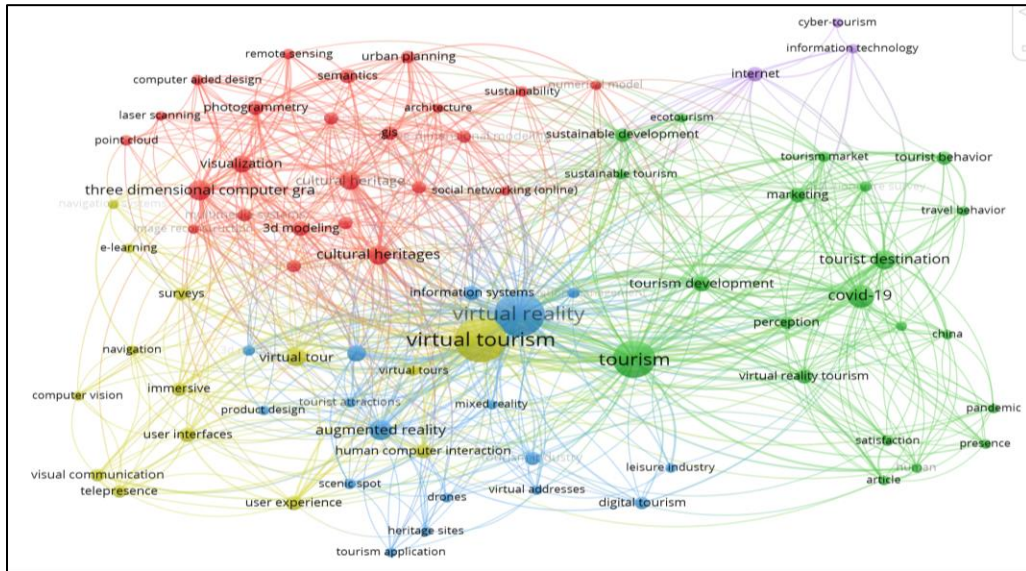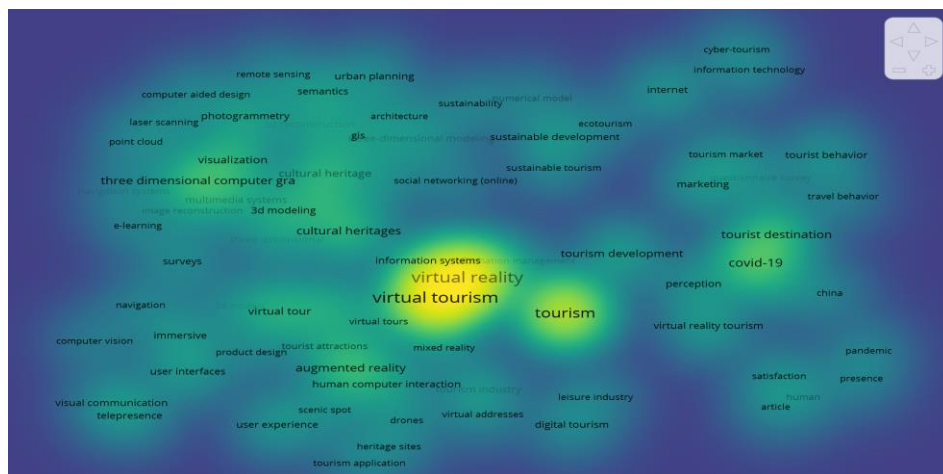

Figure 7

Density visualization of keywords related to virtual tourism research by VOS viewer, (Source: Author)

The co-occurrence analysis was conducted to identify the intellectual structure of the 210 articles associated with virtual tourism. The results of this analysis are shown in Table 3, in which, the themes, the sub-themes, and the keywords are related to the themes. Five clusters with five main themes are depicted and discussed in Table 3 below.

Table 3

Main Topics and Keywords Related to Virtual Tourism Research

Cluster	Main themes	Sub-themes
1	Visualization with computer graphics in cultural heritages	Tools for visualization: 3D modeling, photogrammetry, remote sensing, laser scanning, etc
		Visualization with urban planning and sustainability
2	Tourism issues, COVID-19 and virtual reality technology	Tourism development with virtual reality technology
		Destination marketing with virtual reality technology
		COVID-19 and virtual tourism
3	Virtual reality technology and application in tourism	Virtual reality technology: Virtual reality, augmented reality, mixed reality
		Virtual reality technology and product design
4	Virtual tourism characteristics and user experience	Virtual tours and its characteristics
		Tourist behavior, perception and satisfaction with virtual tourism
5	Cyber tourism, internet, and information technology	Cyber tourism, internet and / information technology

(Source: Author)

Bibliographic Coupling Discussion and Implication for Future Research

This analysis is based on the findings in Table 3, which provide an overview of the main topics and keywords related to virtual tourism research. There were five distinct clusters of research as follows:

Cluster 1: Visualization with computer graphics in cultural heritages
Cluster 2: Tourism issues, COVID-19, and virtual reality technology
Cluster 3: Virtual reality technology and application in tourism
Cluster 4: Virtual tourism characteristics and user experience
Cluster 5: Cyber tourism, internet, and information technology

By examining the bibliographic coupling among these clusters, this discussion aims to uncover connections, trends, and potential avenues for future research in virtual tourism.

Cluster 1: Visualization with Computer Graphics in Cultural Heritages

Many documents discussed some computer technologies that can support cultural heritage visualization. These technologies are 3D modeling, photogrammetry, remote sensing, laser scanning, point cloud, computer software, etc (Cao et al., 2014; de Maggio et al., 2010; Liu, 2019; Tsokota et al., 2019). With these tools, virtual-related technology could capture and depict cultural heritages and become more accessible to a wide range of tourists. This method is vital to conserve and maintain the nature of cultural heritages, especially in inaccessible or no longer existing areas (Beck et al., 2019; Sussmann & Vanhegan, 2000), conservation of tourism resources, application to archaeological tourism (Jude & Ukekwe, 2020) and environmentally sustainable tourism solutions (Mofokeng & Matima, 2018; Wiltshire & Clarke, 2017; Zirbes, 2021). Visualization with previously mentioned tools can support urban planning and sustainable development (Grecea et al., 2016; Talwar et al., 2022). Urban areas often require long-term planning to effectively manage their development. Utilizing visualization techniques can provide valuable insights into the future state of these areas, both before and after specific projects are implemented. This predictive approach aids in identifying and mitigating potential risks, particularly in the context of tourism development.

This cluster presents potential avenues for future research, highlighting the importance of sustainable tourism planning in urban settings through the utilization of visualization tools. Additionally, it emphasizes the significance of visualizing historical and cultural heritage sites as a means to preserve them and enhance their accessibility.

Cluster 2: Tourism Issues, COVID-19 and Virtual Reality Technology

Recently, many contemporary issues have developed in the tourism industry. Virtual reality technology has been underlined as the second-best alternative and great support for real tourism (Lu et al., 2022b). Virtual reality not only provides a competitive advantage but also valuable support for tourism development and tourism management. Cheng (1995) has proven that tourism planners and managers can apply this technology in developing a tourist destination (Wu et al., 2020).

Virtual reality technology has been proven to be a notable tool for destination marketing because it can boost motivation to visit a tourist destination (Beck et al., 2019). Huang et al. (2013, 2016) suggested that the intention to visit a destination in the future is formed during the period of finding information about the places, and the visualization will attract tourists more effectively (Kim et al., 2020; Lo & Cheng, 2020; Oncioiu & Priescu, 2022; Wang et al., 2022).

In the era of the COVID-19 pandemic, virtual tourism has served as a vital travel substitute to deal with traveling demand because of the policy of social distancing and border closure worldwide (Kinseng et al., 2022; Liyushiana et al., 2022; Pourmoradian et al., 2021). Moreover, many kinds of virtual tours have been developing during this period, contributing to the prospect of virtual tourism in the tourism recovery context

(Roman et al., 2022). However, many scholars disagreed with the points that virtual tourism is regarded as a travel substitute. Rather, it is regarded as a new kind of tourism and can support real tourism in various certain aspects, especially in the context of digitalization and the 4.0 technology revolution (Beck et al., 2019; Guttentag, 2010; Tuyen & Hanh, 2021; Verma et al., 2022; Yung & Khoo-Lattimore, 2019).

Scholars should conduct more research on virtual tourism and tourism resilience after the COVID-19 pandemic to determine how tourists are affected by marketing methods. Virtual tourism can also be discussed as a potential sustainable tourism management and planning tool.

Cluster 3: Virtual Reality Technology and Application In Tourism

Recent research on virtual reality technology has gradually concentrated on some advanced kinds of technologies, namely augmented reality (AR), mixed reality (MR), and extended reality (XR) (Srinivasa Rao & Krantz, 2020). While augmented reality is a view of the real world with added computer-generated embellishments, virtual reality is an interactive, computer-generated representation of a real or artificial world. At a higher level, mixed reality is an interactive representation or view of elements from the real world and computer-generated content. Furthermore, Extended Reality (XR) is a leading-edge technology; it refers to immersive augmented reality technologies that merge the real and virtual worlds. In general, XR is a term that combines virtual reality, augmented reality, and mixed reality (Fan et al., 2022; Yung & Khoo-Lattimore, 2019).

Virtual tourism and its tools can be applied to many tourism sectors: trip planning, general management, marketing and PR, tourism information, new ways to entertain, education and training, access to limited tourist attractions or destination conservation, as well as during or after the trip (Beck et al., 2019; Guttentag, 2010; Tuyen & Hanh, 2021; Yung & Khoo-Lattimore, 2019). Virtual reality has been recognized as having the potential to aid formulating and implementing tourism policy.

The applications of virtual tourism in the tourism industry should be high on the future research agenda of tourism scholars. Virtual tourism can become an effective tool for preparing trips and enhancing the trip. Besides, virtual tourism can contribute to developing tech-based sustainable tourism, destination conservation, and forecasting tourism trends. Therefore, virtual tourism is considered a great support to develop smart tourism.

Cluster 4: Virtual Tourism and User Experience

Tourists are motivated to use virtual tourism because of its significant advantages, some of which are lower cost (Tussyadiah et al., 2018), unrestricted transport (Beck et al., 2019), safer travel condition, no translation, immigration, weather concern (Drianda et al., 2021), accessibility to inaccessible or no longer available areas, conservation of tourism resources, and sustainable tourism support (Caciora et al., 2021; Guttentag, 2010). However, some limitations of virtual reality tourism in the literature include not providing real experiences on food testing, health, community cultural activities, etc (Mura et al., 2017; Wagler & Hanus, 2018).

The existing literature on virtual tourism has a limited scope in terms of research on perception, behavior, and satisfaction. Most of the papers focus on topics such as "virtual," "immersing," "presence," or visitor "emotions" related to virtual reality experiences. However, there is a lack of attention given to the initial fundamental perceptions in this area (Mura et al., 2017; Raja Kamal et al., 2023; Zhang et al., 2020). Some documents focused on detailed virtual experiences with certain destinations, such as cultural heritage sites, museums, and parks (Liu et al., 2021; Park et al., 2018; Pourmoradian et al., 2021). Therefore, it is imperative for future studies to delve into and analyze the factors influencing tourists' acceptance of virtual tourism, their behavioral patterns in relation to their actual visit intentions, and their levels of satisfaction upon physically visiting the destinations subsequent to engaging in virtual travel experiences.

Cluster 5: Cyber Tourism, Internet And / Information Technology

Cyber tourism is a new experience conducted through information technology applications, especially virtual reality technology (Prideaux, 2005). Some papers in the literature discuss cyber tourism with virtual reality support, such as space tourism (Prideaux & Singer, 2005). Therefore, cyber tourism can be considered virtual tourism if virtual reality is the main technology used to create virtual tourist experiences. Currently, there is a need for further improvement in the cyber tourism concept, as it is essential to provide a clear understanding of the specific technologies that are utilized in this domain.

CONCLUSION

The objectives of this study are to explore and analyze literature related to virtual tourism on Scopus and provide a general descriptive analysis, performance mapping, and intellectual mapping of research literature. A systematic review and narrative reviews were both employed. The result highlighted an up-to-date insight into the current state of research on virtual tourism, and some implications for future research agenda were introduced.

The descriptive analysis illustrated the status and evolution of virtual tourism in the researcher domain. There is a trend of virtual tourism publications, especially in the context of the COVID-19 pandemic and tourism digitalization. However, computer science disciplines had the highest percentage of related research, and social science ranked second. Current Issues in Tourism, Tourism Management, and Journal of Travel Research are the three journals that have recently witnessed an increase in publishing and have had the highest CiteScore. The top 10 papers with the most citations in virtual tourism were also introduced.

Based on performance mapping and intellectual mapping, keywords and clusters analyses were implemented to explore the current state of research on virtual tourism and suggest some implications for future research agenda. The five clusters included (1) Visualization with computer graphics in cultural heritages; (2) Tourism issues, COVID-19, and virtual reality technology; (3) Virtual reality technology and application in tourism; (4) Virtual tourism characteristics and user experience; (5) Cyber tourism, internet, and information technology.

Nevertheless, this paper reveals some limitations. The utilization of selective keywords and Scopus is limited in its ability to encompass a subset of the papers pertaining to virtual tourism within the broader

domain of tourism literature. Nevertheless, the study endeavored to compile additional pertinent literature for the purpose of conducting a narrative review. Subsequent investigations in this field may employ Scopus in conjunction with other databases, such as WoS and Google Scholar, to broaden the scope of research domains and conduct a comprehensive analysis of the present state of virtual tourism research. In addition to utilizing the VoS viewer, it is advisable for scholars to incorporate other software tools in order to enhance their research endeavors.

Generally, this study is among the first papers to employ the bibliometrics review method on virtual tourism research, and these findings contribute to highlighting, and clarifying the most recent understanding of the existing body of research on virtual tourism.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of this study are available from the corresponding author upon request.

CONFLICT OF INTEREST

We declare that we have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

Adachi, R., Cramer, E. M., & Song, H. (2020). Using virtual reality for tourism marketing: A mediating role of self-presence. *Social Science Journal*. https://doi.org/10.1080/03623319.2020.1727245

Akhtar, N., Khan, N., Mahroof Khan, M., Ashraf, S., Hashmi, M. S., Khan, M. M., & Hishan, S. S. (2021). Post-covid 19 tourism: Will digital tourism replace mass tourism? *Sustainability (Switzerland)*, *13*(10). https://doi.org/10.3390/su13105352

Beck, J., Rainoldi, M., & Egger, R. (2019). Virtual reality in tourism: a state-of-the-art review. In *Tourism Review* (Vol. 74, Issue 3, pp. 586–612). Emerald Group Holdings Ltd. https://doi.org/10.1108/TR-03-2017-0049

Bristow, R. S. (1999). Commentary: Virtual tourism - the ultimate ecotourism? *Tourism Geographies*, *1*(2), 219–225. https://doi.org/10.1080/14616689908721311

Buhalis, D., Harwood, T., Bogicevic, V., Viglia, G., Beldona, S., & Hofacker, C. (2019). Technological disruptions in services: lessons from tourism and hospitality. *Journal of Service Management*, *30*(4), 484–506. https://doi.org/10.1108/JOSM-12-2018-0398

Caciora, T., Herman, G. V., Ilieș, A., Baias, Ș., Ilieș, D. C., Josan, I., & Hodor, N. (2021). The use of virtual reality to promote sustainable tourism: A case study of wooden churches historical monuments from Romania. *Remote Sensing*, *13*(9). https://doi.org/10.3390/RS13091758

Cao, J. K., Zhou, R. Q., & Wu, L. H. (2014). Hainan virtual tourism GIS based on speech interface. *Advances in Intelligent Systems and Computing*, *254*, 315–324. https://doi.org/10.1007/978-3-319-03449-2_29

Chang, H. H., & Chiang, C. C. (2022). Is virtual reality technology an effective tool for tourism destination marketing? A flow perspective. *Journal of Hospitality and Tourism Technology*. https://doi.org/10.1108/JHTT-03-2021-0076

Charband, Y., & Jafari Navimipour, N. (2016). Online knowledge sharing mechanisms: a systematic review of the state of the art literature and recommendations for future research. *Information Systems Frontiers*, *18*(6), 1131–1151. https://doi.org/10.1007/S10796-016-9628-Z/TABLES/5

Chen, H., Li, L., & Chen, Y. (2021). Explore success factors that impact artificial intelligence adoption in the telecom industry in China. *Journal of Management Analytics*, *8*(1), 36–68. https://doi.org/10.1080/23270012.2020.1852895

Cheong, R. (1995). The virtual threat to travel and tourism. *Tourism Management*, *16*(6), 417–422. https://doi.org/10.1016/0261-5177(95)00049-T

de Maggio, M., Ndou, V., & Schina, L. (2010). Supporting and promoting tourism network systems through ICT applications. *Digital Culture and E-Tourism: Technologies, Applications and Management Approaches*, 105–122. https://doi.org/10.4018/978-1-61520-867-8.ch008

Dewailly, J.-M. (1999). Sustainable tourist space: From reality to virtual reality? | L'espace touristique durable: Du réel au virtuel. *Tourism Geographies*, *1*(1), 41–55. https://doi.org/10.1080/14616689908721293

Drianda, R. P., Kesuma, M., & Lestari, N. A. R. (2021). The Future of Post-COVID-19 Urban Tourism: Understanding the Experiences of Indonesian Consumers of Hallyu with South Korean Virtual Tourism. *International Journal of Technology*, *12*(5), 989–999. https://doi.org/10.14716/ijtech.v12i5.5221

El-Said, O., & Aziz, H. (2022). Virtual Tours a Means to an End: An Analysis of Virtual Tours' Role in Tourism Recovery Post COVID-19. *Journal of Travel Research*, *61*(3), 528–548. https://doi.org/10.1177/0047287521997567

Fan, X., Jiang, X., & Deng, N. (2022). Immersive technology: A meta-analysis of augmented/virtual reality applications and their impact on tourism experience. *Tourism Management*, *91*. https://doi.org/10.1016/J.TOURMAN.2022.104534

Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management*, *28*(1), 107–130. https://doi.org/10.1108/JEIM-08-2013-0065

Garrigos-Simon, F. J., Narangajavana-Kaosiri, Y., & Lengua-Lengua, I. (2018). Tourism and Sustainability: A Bibliometric and Visualization Analysis. *Sustainability 2018, Vol. 10, Page 1976*, *10*(6), 1976. https://doi.org/10.3390/SU10061976

Grecea, C., Herban, S., & Vilceanu, C. B. (2016). WebGIS Solution for Urban Planning Strategies. *Procedia Engineering*, *161*, 1625–1630. https://doi.org/10.1016/J.PROENG.2016.08.637

Griffin, T., Guttentag, D., Lee, S. H., Giberson, J., & Dimanche, F. (2022). Is VR always better for destination marketing? Comparing different media and styles. *Journal of Vacation Marketing*. https://doi.org/10.1177/13567667221078252

Guttentag, D. A. (2010). Virtual reality: Applications and implications for tourism. *Tourism Management*, *31*(5), 637–651. https://doi.org/10.1016/j.tourman.2009.07.003

Güzeller, C. O. (2018). Bibliometric Analysis of Tourism Research for the Period 2007 - 2016. *Advances in Hospitality and Tourism Research (AHTR)*, *6*(1), 1–22. https://doi.org/10.30519/ahtr.446248

Huang, Y. C., Backman, K. F., Backman, S. J., & Chang, L. L. (2016). Exploring the Implications of Virtual Reality Technology in Tourism Marketing: An Integrated Research Framework. *International Journal of Tourism Research*, *18*(2), 116–128. https://doi.org/10.1002/jtr.2038

Jingen Liang, L., & Elliot, S. (2021). A systematic review of augmented reality tourism research: What is now and what is next? *Tourism and Hospitality Research*, *21*(1), 15–30. https://doi.org/10.1177/1467358420941913

Johnson, A. G., & Samakovlis, I. (2019). A bibliometric analysis of knowledge development in smart tourism research. *Journal of Hospitality and Tourism Technology*, *10*(4), 600–623. https://doi.org/10.1108/JHTT-07-2018-0065

Jude, O. C., & Ukekwe, C. (2020). Tourism and virtual reality (VR) in developing nations. *African Journal of Hospitality, Tourism and Leisure*, *9*(2), 1–16.

Kim, J., Shinaprayoon, T., & Ahn, S. J. (2022). Virtual Tours Encourage Intentions to Travel and Willingness to Pay via Spatial Presence, Enjoyment, and Destination Image. *Journal of Current Issues and Research in Advertising*, *43*(1), 90–105. https://doi.org/10.1080/10641734.2021.1962441

Kim, M. J., & Hall, C. M. (2019). A hedonic motivation model in virtual reality tourism: Comparing visitors and non-visitors. *International Journal of Information Management*, *46*, 236–249. https://doi.org/10.1016/j.ijinfomgt.2018.11.016

Kim, M. J., Lee, C.-K., & Preis, M. W. (2020). The impact of innovation and gratification on authentic experience, subjective well-being, and behavioral intention in tourism virtual reality: The moderating role of technology readiness. *Telematics and Informatics*, *49*. https://doi.org/10.1016/j.tele.2020.101349

Kinseng, R. A., Kartikasari, A., Aini, N., Gandi, R., & Dean, D. (2022). COVID-19 and the emergence of virtual tourism in Indonesia: A sociological perspective. *Cogent Social Sciences*, *8*(1). https://doi.org/10.1080/23311886.2022.2026557

Kirtil, İ. G., & Aşkun, V. (2021). Artificial Intelligence in Tourism: A Review and Bibliometrics Research. *Advances in Hospitality and Tourism Research (AHTR)*, *9*(1), 205–233. https://doi.org/10.30519/AHTR.801690

Leung, X. Y., Sun, J., & Bai, B. (2017). Bibliometrics of social media research: A co-citation and co-word analysis. *International Journal of Hospitality Management*, *66*, 35–45. https://doi.org/10.1016/J.IJHM.2017.06.012

Liu, G. (2019). Design of Virtual Display System for Guangxi Minority Scenic Spots Based on Virtual Reality. *Proceedings - 2019 International Conference on Intelligent Transportation, Big Data and Smart City, ICITBS 2019*, 409–412. https://doi.org/10.1109/ICITBS.2019.00107

Liu, J., Wang, Y., & Zhu, N. (2021). Cycling Virtual Tour: A remote online travel system based on interactive technologies and its user experience evaluation. *Projections - Proceedings of the 26th International Conference of the Association for Computer-Aided Architectural Design Research in Asia, CAADRIA 2021*, *2*, 243–252. https://doi.org/10.52842/conf.caadria.2021.2.243

Liyushiana, Sibarani, R., Purwoko, A., & Emrizal. (2022). Cultural-Heritage Virtual Tour for Tourism Recovery Post COVID-19: A Design and Evaluation. *International Journal of Design & Nature and Ecodynamics*, *17*(3), 447–451. https://doi.org/10.18280/IJDNE.170316

Lo, W. H., & Cheng, K. L. B. (2020). Does virtual reality attract visitors? The mediating effect of presence on consumer response in virtual reality tourism advertising. *Information Technology and Tourism*, *22*(4), 537–562. https://doi.org/10.1007/S40558-020-00190-2

Lu, J., Xiao, X., Xu, Z., Wang, C., Zhang, M., & Zhou, Y. (2022a). The potential of virtual tourism in the recovery of the tourism industry during the COVID-19 pandemic. *Current Issues in Tourism*, *25*(3), 441–457. https://doi.org/10.1080/13683500.2021.1959526

Lu, J., Xiao, X., Xu, Z., Wang, C., Zhang, M., & Zhou, Y. (2022b). The potential of virtual tourism in the recovery of the tourism industry during the COVID-19 pandemic. *Current Issues in Tourism*, *25*(3), 441–457. https://doi.org/10.1080/13683500.2021.1959526

Martins, M., & Costa, R. (2022). Tracking Technologies in Tourism: A Bibliometric and Content Review. *Smart Innovation, Systems and Technologies*, *284*, 215–230. https://doi.org/10.1007/978-981-16-9701-2_18/COVER

Mavric, B., Öğretmenoğlu, M., & Akova, O. (2021). Bibliometric Analysis of Slow Tourism. *Advances in Hospitality and Tourism Research (AHTR)*, *9*(1), 157–178. https://doi.org/10.30519/AHTR.794656

Mofokeng, N. E. M., & Matima, T. K. (2018). Future tourism trends: Virtual Reality based tourism utilizing Distributed Ledger Technologies. *African Journal of Hospitality, Tourism and Leisure*, *7*(3), 1–14.

Mura, P., Tavakoli, R., & Pahlevan Sharif, S. (2017). 'Authentic but not too much': exploring perceptions of authenticity of virtual tourism. *Information Technology and Tourism*, *17*(2), 145–159. https://doi.org/10.1007/s40558-016-0059-y

Oncioiu, I., & Priescu, I. (2022). The Use of Virtual Reality in Tourism Destinations as a Tool to Develop Tourist Behavior Perspective. *Sustainability (Switzerland)*, *14*(7). https://doi.org/10.3390/SU14074191

Palácios, H., de Almeida, M. H., & Sousa, M. J. (2021). A bibliometric analysis of trust in the field of hospitality and tourism. *International Journal of Hospitality Management*, *95*. https://doi.org/10.1016/J.IJHM.2021.102944

Park, H., Kim, J., Bang, S., & Woo, W. (2018). The effect of applying film-induced tourism to virtual reality tours of cultural heritage sites. *Proceedings of the 2018 3rd Digital Heritage International Congress, Digital Heritage 2018 - Held Jointly with the 2018 24th International Conference on Virtual Systems and Multimedia, VSMM 2018*. https://doi.org/10.1109/DIGITALHERITAGE.2018.8810089

Paula, M., Sancho, L., Martín-Navarro, A., & Ramos-Rodríguez, A. R. (2020). Information Systems Management Tools: An Application of Bibliometrics to CSR in the Tourism Sector. *Sustainability 2020, Vol. 12, Page 8697*, *12*(20), 8697. https://doi.org/10.3390/SU12208697

Perry Hobson, J. S., & Williams, A. P. (1995). Virtual reality: A new horizon for the tourism industry. *Journal of Vacation Marketing*, *1*(2), 124–135. https://doi.org/10.1177/135676679500100202

Petticrew, M., & Roberts, H. (2008). Systematic Reviews in the Social Sciences: A Practical Guide. In *Systematic Reviews in the Social Sciences: A Practical Guide*. Blackwell Publishing Ltd. https://doi.org/10.1002/9780470754887

Pourmoradian, S., Salek Farrokhi, O., & Hosseini, S. Y. (2021). Museum visitors' interest on virtual tours in covid-19 situation. *Journal of Environmental Management and Tourism*, *12*(4), 877–885. https://doi.org/10.14505//JEMT.V12.4(52).02

Prideaux, B. (2005). Cyber-tourism: A new form of tourism experience. *Tourism Recreation Research*, *30*(3), 5–6. https://doi.org/10.1080/02508281.2005.11081481

Prideaux, B., & Singer, P. (2005). Space tourism - A future dream or a cyber-tourism reality? *Tourism Recreation Research*, *30*(3), 27–35. https://doi.org/10.1080/02508281.2005.11081484

Raja Kamal, C., Vijaykumar, & Retheesh, P. T. (2023). *A Study on Addiction and Isolation in Virtual Reality Tourism Experiences*. 351–357. https://doi.org/10.1007/978-3-031-08954-1_32

Roman, M., Kosiński, R., Bhatta, K., Niedziółka, A., & Krasnodębski, A. (2022). Virtual and Space Tourism as New Trends in Travelling at the Time of the COVID-19 Pandemic. *Sustainability (Switzerland)*, *14*(2). https://doi.org/10.3390/su14020628

Salimi, D., Tavasoli, K., Gilani, E., Jouyandeh, M., & Sadjadi, S. J. (2019). The impact of social media on marketing using bibliometrics analysis. *Canada. International Journal of Data and Network Science*, *3*, 165–184. https://doi.org/10.5267/j.ijdns.2019.2.006

Sánchez, A. D., de la Cruz Del Río Rama, M., & García, J. Á. (2017). Bibliometric analysis of publications on wine tourism in the databases Scopus and WoS. *European Research on Management and Business Economics*, *23*(1), 8–15. https://doi.org/10.1016/J.IEDEEN.2016.02.001

Schiopu, A. F., Hornoiu, R. I., Padurean, M. A., & Nica, A.-M. (2021). Virus tinged? Exploring the facets of virtual reality use in tourism as a result of the COVID-19 pandemic. *Telematics and Informatics*, *60*. https://doi.org/10.1016/j.tele.2021.101575

Shahbaz, M., Bashir, M. F., Bashir, M. A., & Shahzad, L. (2021). A bibliometric analysis and systematic literature review of tourism-environmental degradation nexus. *Environmental Science and Pollution Research*, *28*(41), 58241–58257. https://doi.org/10.1007/S11356-021-14798-2

Singh, S., & Bashar, A. (2021). A bibliometric review on the development in e-tourism research. *International Hospitality Review*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/IHR-03-2021-0015

Srinivasa Rao, A. S. R., & Krantz, S. G. (2020). Data Science for Virtual Tourism Using Cutting-Edge Visualizations: Information Geometry and Conformal Mapping. *Patterns*, *1*(5). https://doi.org/10.1016/J.PATTER.2020.100067

Suban, S. A. (2022). Bibliometric analysis on wellness tourism – citation and co-citation analysis. *International Hospitality Review*, *ahead-of-print*(ahead-of-print). https://doi.org/10.1108/IHR-11-2021-0072

Sussmann, S., & Vanhegan, H. (2000). Virtual reality and the tourism product substitution or complement? *Proceedings of the European Conference on Information Systems (ECIS)*, 1077–1083. https://aisel.aisnet.org/ecis2000/117/

Talwar, S., Kaur, P., Nunkoo, R., & Dhir, A. (2022). Digitalization and sustainability: virtual reality tourism in a post-pandemic world. *Journal of Sustainable Tourism*. https://doi.org/10.1080/09669582.2022.2029870

Tran, M. K., Nguyen, S. V., To, N. T., & Maleszka, M. (2021). Processing and Visualizing the 3D Models in Digital Heritage. In *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics): Vol. 12876 LNAI*. https://doi.org/10.1007/978-3-030-88081-1_46

Tsokota, T., von Solms, R., & van Greunen, D. (2019). The reticent effect of ICT on tourism: A case study of Zimbabwe. *African Journal of Hospitality, Tourism and Leisure*, *8*(3).

Tussyadiah, I. P., Wang, D., Jung, T. H., & tom Dieck, M. C. (2018). Virtual reality, presence, and attitude change: Empirical evidence from tourism. *Tourism Management*, *66*, 140–154. https://doi.org/10.1016/j.tourman.2017.12.003

Tuyen, T., & Hanh, N. T. van. (2021). Virtual tourism – a new kind of tourism: A literature review. *The 2nd International Conference on Innovations in the Social Sciences and Humanities*, 592–599.

Ulker-Demirel, E., & Ciftci, G. (2020). A systematic literature review of the theory of planned behavior in tourism, leisure and hospitality management research. *Journal of Hospitality and Tourism Management*, *43*, 209–219. https://doi.org/10.1016/J.JHTM.2020.04.003

Utkarsh, & Sigala, M. (2021). A bibliometric review of research on COVID-19 and tourism: Reflections for moving forward. *Tourism Management Perspectives*, *40*, 100912. https://doi.org/10.1016/J.TMP.2021.100912

Verma, S., Warrier, L., Bolia, B., & Mehta, S. (2022). Past, present, and future of virtual tourism-a literature review. *International Journal of Information Management Data Insights*, *2*(2), 100085. https://doi.org/10.1016/J.JJIMEI.2022.100085

Wagler, A., & Hanus, M. D. (2018). Comparing Virtual Reality Tourism to Real-Life Experience: Effects of Presence and Engagement on Attitude and Enjoyment. *Communication Research Reports*, *35*(5), 456–464. https://doi.org/10.1080/08824096.2018.1525350

Wang, F., Huang, S., Morrison, A. M., & Wu, B. (2022). The effects of virtual reality tourism involvement on place attachment and behavioral intentions: virtual reality tourism of the Yellow Crane Tower in Wuhan. *Asia Pacific Journal of Tourism Research*, *27*(3), 274–289. https://doi.org/10.1080/10941665.2022.2061363

Williams, P., & Hobson, J. P. (1995). Virtual reality and tourism: fact or fantasy? *Tourism Management*, *16*(6), 423–427. https://doi.org/10.1016/0261-5177(95)00050-X

Wiltshier, P., & Clarke, A. (2017). Virtual cultural tourism: Six pillars of VCT using co-creation, value exchange and exchange value. *Tourism and Hospitality Research*, *17*(4), 372–383. https://doi.org/10.1177/1467358415627301

Wu, H.-C., Ai, C.-H., & Cheng, C.-C. (2020). Virtual reality experiences, attachment and experiential outcomes in tourism. *Tourism Review*, *75*(3), 481–495. https://doi.org/10.1108/TR-06-2019-0205

Yung, R., & Khoo-Lattimore, C. (2019). New realities: a systematic literature review on virtual reality and augmented reality in tourism research. *Current Issues in Tourism*, *22*(17), 2056–2081. https://doi.org/10.1080/13683500.2017.1417359

Zhang, Y., Li, X., & Dai, M. (2020). Virtual Tourism Immersive Experience System. *Proceedings - 2020 International Conference on Virtual Reality and Visualization, ICVRV 2020*, 312–313. https://doi.org/10.1109/ICVRV51359.2020.00080

Zirbes, E. (2021). Shaping the Future of the Hospitality Industry through Virtual Reality Tourism. *Journal of Hospitality and Tourism Research*, *45*(5), 960–961. https://doi.org/10.1177/10963480211018551