



A Scientometric Analysis of Virtual Tourism Technology Use in the Tourism Industry

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Abstract. The study aims to analyze the characteristics of virtual tourism technology in the tourism industry over the past ten years. The development of digital technology and the increasing number of Internet users have had a significant impact on the productivity of the world of industry, especially the tourism industry sector. The concept of virtual tourism is one of the artificial intelligence technologies that uses simulation of travel sites in the form of images and videos containing sounds and text. The virtual tourism concept is an alternative effort to provide convenience in exploring tourist destinations armed with smartphones and internet networks. The study uses scientometric analysis to analyze data from 2013 to 2022 using the Scopus database and Citespace software. The number of publications on trends in virtual technology tourism and the tourism industry taken from the Scopus search engine found 244 documents and has increased overall in the last ten years. Meanwhile, Scopus's data analysis shows that China (50) has the highest contribution to this research and the most dominant author in this research trend is Jung, TT (4). The research found that virtual tourism technology trends in the tourism industry consist of five (5) significant groups, namely technology acceptance, augmented reality, virtual reality experiences, tourism sector, and technology preparation. This research implies that it will help in the development of digital tourism in the world of the tourism industry.

Keywords: Digital Tourism · Virtual Tourism · Virtual Reality

1 Introduction

As the times change, the development of digital technology is increasingly rapid, this affects performance in the industry. As the times change, the development of all world digital [1]. The world of industry and digital technology cannot be separated because they are interconnected [2]. The industrial world needs digital technology to improve its production performance. Digital technology is understood to have the ability to analyze and solve problems in the industrial world [3]. Digital technology is a tool with a computerized system and automatic operation without the help of human labor [4]. Artificial Intelligence is one of the digital technologies underpinning the development of the industrial world. According to H. A. Simon (1995) artificial intelligence is an area of research, application, and instruction related to computer programming to do something that in the human view is intelligent.

Artificial intelligence has many benefits in everyday life such as assisting in the collection, processing, and analysis of data engaged in various fields to improve high-quality products, minimize errors, and time efficiency [6]. Along with the times, digital technology has played an important role in the tourism industry by using artificial intelligence in improving its service system [7]. This is driven by the activeness of the community which along with its development is increasingly dynamic in using the digital world [8]. In general, before the existence of digital technology, the tourism world used print media or newspapers to develop tourism [9]. The development of digital technology has changed the way of traveling with the concept of virtual tourism [10].

Virtual tourism is an alternative concept of tourism through artificial intelligence technology and internet networks that can replace tourism places virtually [11]. By using virtual tourism, tourists can see tourist attractions only using simulated tourist sites in the form of images and videos containing sound and text [12]. In addition, virtual tourism as an alternative effort in the tourism industry offers comfort in traveling, presents detailed tourism information, and offers assistance for those who have obstacles [13]. However, this new form of tourism was only acceptable to some tourists before the COVID-19 pandemic. The COVID-19 pandemic has caused various problems in the tourism industry because it substantially affects the development of tourism destinations, which has caused disruptions in the global tourism industry [14]. In fact, in the new normal period, tourism travel is also still limited, therefore stakeholders have begun to adopt the development of virtual technology as a strategy for developing tourism and reviving the global economy [15]. Not only that, there are studies that argue that the quality or features of virtual tourism still need to be studied again because they must cover all senses so that the physical tourism environment can be created entirely [16].

Various situations and conditions in the world of the tourism industry become challenges in developing tourism. However, the development of digital technology allows the creation of a sustainable tourism industry. Virtual tourism has been around for more than a decade, but most tourists are foreign to this type of technology and have begun to develop again after the post-COVID-19 pandemic [17]. Therefore, it is interesting for many researchers to know the use of virtual tourism in the current world of tourism globally. Therefore, this paper aims to analyze the trend of virtual tourism technology in the tourism industry over the past ten years using bibliometrics review and scientometric analysis based on the Scopus engine database.

2 Literature Review

Tourism is an activity associated with a relaxing or refreshing journey. According to Soekardijo (2003), tourism means a redirection of a person for a while to somewhere to enjoy peace. According to [18], tourism is a pleasure involving individuals with changing modern conditions with implications for the nation, citizenship, consumerism, cosmopolitanism, and globalization. Tourism is one of the drivers of the global economy because it has the potential to generate large incomes in a country [19]. Tourism helps in improving the construction infrastructure and boosts the scope of economic growth in a country [20].

As time goes by, the development of digital technology is increasing rapidly, impacting the tourism sector. Digital technology promises great potential for the future development of the tourism sector by focusing on the digitalization of tourism [21]. Digitalization of tourism has brought a lot of new products such as digital tourism, virtual tourism, and virtual reality. Digital tourism is a combination of physical and digital tourist attractions that are used to promote tourism potential and support the tourist experience [22]. Virtual tourism is a combination of virtual reality and the tourism industry that provides a travel experience without traveling and only using the internet [23]. Virtual tourism is the form of text, video, and audio tourist destinations where users can listen and view them using smartphones, laptops, or other technologies [12]. Virtual tourism becomes interesting because it allows one can visit tourist destinations in real time even all over the world without traveling [24].

Virtual reality is a digital technology that can create a real virtual environment and deliver innovations in the world of the tourism industry [25]. Virtual reality can visualize the real tourist environment in virtual affect the attitude of tourists in traveling and increase their intentions in visiting tourist destinations [26]. The use of virtual tourism shows that tourists who use virtual travel can follow hedonistic passions and experience travel experiences emotionally [27].

At the time of the COVID-19 pandemic, virtual tourism was on the rise, A Mura study (2017) explains that virtual travel could replace traveling around the world during the COVID-19 pandemic. Similar research [29] shows that virtual tourism can be another way to escape the isolation of COVID-19. However, there was an imbalance in the attitude of tourists toward virtual tourism during the Covid-19 pandemic [17]. Some studies show that the COVID-19 pandemic can affect the psychology and attitudes of tourists, such as stress, behavioral intentions, and sentiment. Therefore, every tourism product should be able to satisfy the tourist in its use [30].

3 Research Method

This study collected data trends related to virtual tourism technology and the tourism industry through the Scopus database from 2013 to 2022. Data collection is carried out using bibliometric studies with search strategies based on headings, abstracts, and keywords limited to open access, document types, and languages [31]. Therefore, the search queries are used as follows: (TITLE-ABS-KEY (“virtual”) AND TITLE-ABS-KEY (“tourism”) AND TITLE-ABS-KEY (technology)). Based on this search query, the study obtained 1267 documents related to virtual tourism technology and the tourism industry. Next, the document is filtered using the following search strategies: (TITLE-ABS-KEY (“virtual”) AND TITLE-ABS-KEY (“tourism”) AND TITLE-ABS-KEY (technology)) AND PUBYEAR > 2012 AND PUBYEAR < 2023 AND (LIMIT-TO (OA, “all”)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “cp”)) AND (LIMIT-TO (SRCTYPE, “j”) OR LIMIT-TO (SRCTYPE, “p”)) AND (LIMIT-TO (LANGUAGE, “English”)). Based on this strategy, it was found that there are 244 documents related to virtual tourism technology and the tourism industry. Then, the found data is displayed in documents by year, documents by country, authors’ documents,

types-based documents, sponsorship documents, documents with affiliates, sources-by-source documents, and topical documents consisting of journal articles and conference papers in English.

To analyze the data, this study uses the relevant data analysis techniques, namely Scientometric analysis. Scientometric analysis or knowledge mapping is a method of quantitative research using color theoretical graphs to find objective scientific understanding based on the data found [32]. The research also uses CiteSpace software that serves in conducting in-depth, chronological, and well-structured analyses of previous research in various fields, for example through data containing information of authors, institutions, and countries to analyze writers, agencies, and states that have made significant contributions in a particular field over decades [33].

4 Result and Discussion

The analysis of 244 scientific publications from the Scopus database resulted in a wide range of varied data. Scientific publications related to virtual tourism technology and the tourism industry from 2013 to 2022 have different perspectives. The research analyzed and classified data ranging from the year of the documents, research subjects, affiliates, authors, countries, and publication sources that most contributed to publications related to virtual tourism technology and the tourism industry. In addition, the study also provides mapping visualizations, cluster identification, and analysis which are an important part of the research findings.

4.1 Annual Publication Analysis of Virtual Tourism Technology and Tourism Industry

Research on virtual tourism technology and the tourism industry has been an outstanding research topic in the last ten years, this is due to the rapid development of digital technology. Therefore, the tourism industry is trying to adapt to digital technology developments to create sustainable tourism. Figure 1 below shows the growth trend of virtual tourism technology research publications and the tourism industry from 2013 to 2022. In 2013 and 2014, there were eight documents published each year. However, there was a decline in 2015 and 2016, there were 4 documents published. In 2017 there were 9 documents published. In 2018, there were 17 documents published. In 2019 there were 25 documents published, there was a significant increase in 2020, when there were 19 additional documents. Then, by 2020, there are 57 documents published. The year with the highest number of publications occurred in 2022, there were 2022 documents published.

The results showed that the growth trend of publications on virtual tourism technology and the tourism industry increased overall from 2013 to 2022 in the Scopus database. The findings are in line with research conducted by Gegung (2021) that the use of virtual tourism has been widely used to improve the sustainability of destinations and to explore the authenticity of the virtual tourist experience, as a substitute for the real-life experience after COVID-19. Based on the findings, 2020 is experiencing a significant increase in publication trends, this is in line with [17] the COVID-19 pandemic in early 2020,

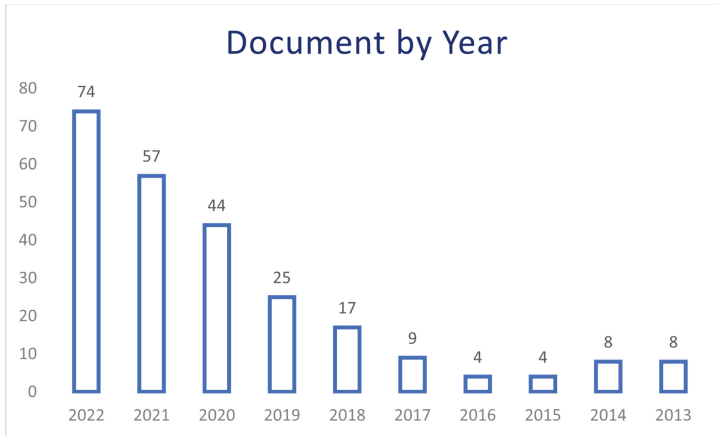


Fig. 1. Annual Publication Analysis of Virtual Tourism Technology and Tourism Industry based year document

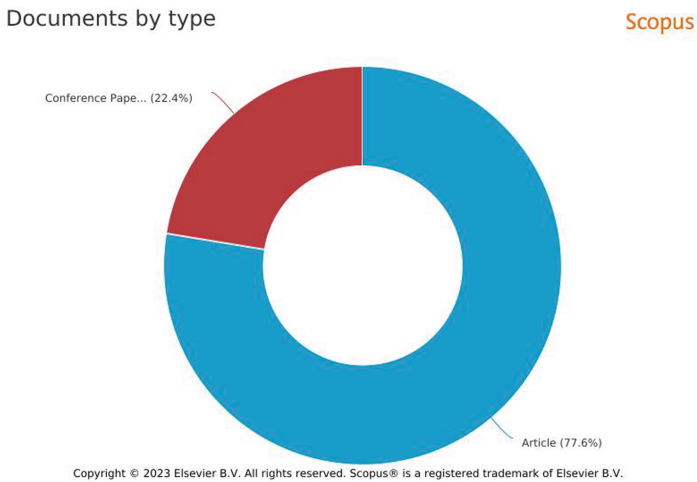


Fig. 2. Annual Publications Analysis of Virtual Tourism Technology and Tourism Industry based on document types.

urging the tourism industry to look for alternative solutions to understanding the effects of virtual tourism implementation, given the existence of activity restriction policies.

Figure 2 shows the analysis type of data based on the type of document, so in the publication, this study is dominated by type of article with a percentage of 77.6%, compared with conference paper type documents of 22.4% .

4.2 Analysis of Subject Area

Research on virtual tourism technology and the tourism industry has coverage of research topics. Based on the Scopus database, the most discussed trends were in the field of social sciences at 18.4% with 102 documents. Other research topics covered in this study include Computer Science (18%), Engineering (11%), Environmental Science (9.9%), Business, Management, and Accounting (9.2%), Energy (5.2%), Physics and Astronomy (5%), Earth and Planetary Sciences (4%), Materials Science (3.4%), Mathematics (3.4%) and others (12.4%) (Fig. 3).

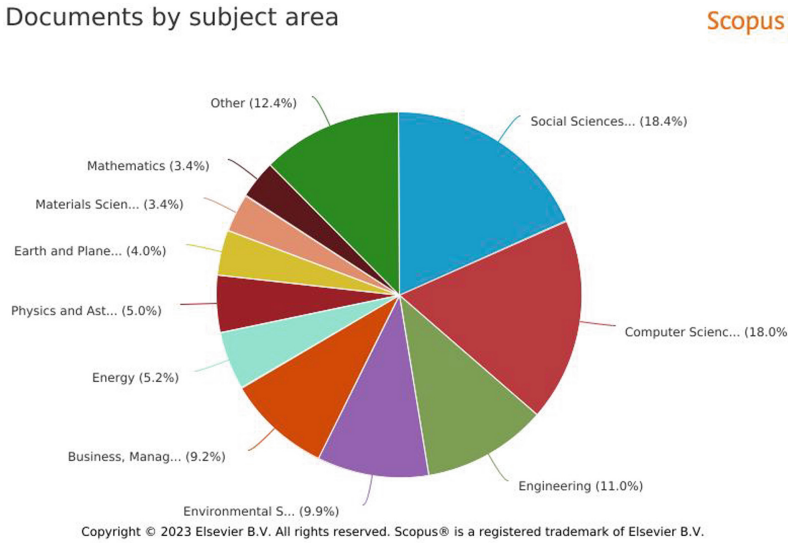


Fig. 3. Annual Publication Analysis of Virtual Tourism Technology and Tourism Industry based on the subject area of the document.

The results of the analysis showed that virtual tourism technology has a great influence on social science because the development of technology in tourism can influence social behavior such as the consumer behavior of tourists. In addition, virtual technology tourism is also discussed quite highly in the field of computer science and engineering, can be seen the comparison of social science and computer science only differed by 0.4% and engineering is in the third position (11%). Virtual tourism technology is discussed in science technology because in the tourism sector technology can be used load Mobile Augmented Reality Virtual Reality (VR), artificial intelligence (AI), and the Internet of Things. (IoT). This technology has the potential to boost positive changes in the tourism industry, as it can provide facilities that are easily accessible by consumers in the middle of the new normal era [35].

4.3 Analysis of Most Contributing Affiliates in Virtual Tourism and Tourism Industry Technology Publications

Figure 4 shows the affiliates that contributed the most to virtual tourism and tourism industry technology publication trends from 2013 to 2022. Manchester Metropolitan University ranks highest with the number of publications of 8 papers. Followed by the University of Surrey and the School of Business and Law with 5 papers. Then, Kyung Hee University, Universitat de Valencia, Hong Kong Polytechnic University, and Universitat Politècnica de Valencia with 4 documents. Next, the Ministry of Education of China, King Abdul Aziz University, and Hainan University with a total publication of 3 documents.

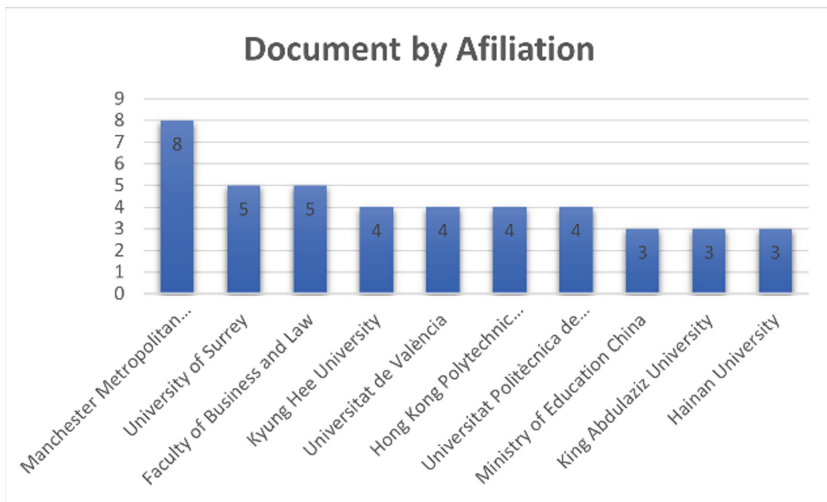


Fig. 4. Analysis of Most Contributing Affiliates in Virtual Tourism and Tourism Industry Technology Publications

4.4 Analysis of Most Contributing Author in Virtual Tourism and Tourism Industry Technology Publications

Based on the Scopus database of 244 analyzed documents, here is an analysis related to the authors who have had the highest contribution to the publication trends of virtual tourism technology and the tourism industry from 2013 to 2022. Based on the number of documents published, Jung, T. occupied the highest rank with the total number of publications of 4 documents. Followed by Deng had 3 documents, Fourkiotou had 3 papers, Jung T.H. had 3, Manglis had 3, Papadopoulou had 3, and Tom Dieck had 3. Then, Ammirato had two documents, Buhalis had two, and Chen had two (Fig. 5).

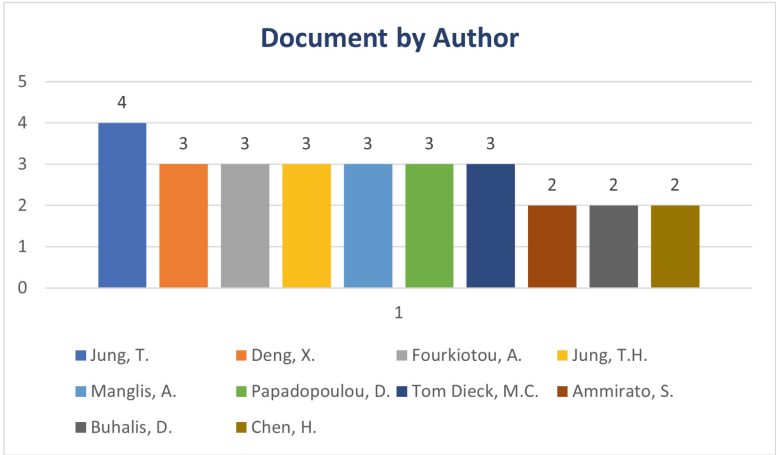


Fig. 5. Analysis of Most Contributing Author in Virtual Tourism and Tourism Industry Technology Publications

4.5 Analysis of the Most Contributing Countries in Virtual Tourism and Tourism Industry Technologies Publications

10 countries are contributing to this global research on virtual tourism technology publication trends and the tourism industry from 2013 to 2022. Publication statistics indexed by the Scopus Engine are provided in Fig. 6 below. Based on the analysis, China was the country that contributed the most to the publication trend of virtual tourism technology and the tourism industry from 2013 to 2022, contributing 50 documents. England ranks second with a total of 27 documents. Followed by Italy and Spain with 24 documents. South Korea donated 15 documents, Greece 11 documents, Indonesia 11 papers, the United States 11 documents, India 9 documents, and Portugal 9 documents.

The study finds the fact that China has become a pioneer in virtual tourism technology trends in the tourism industry as an effort to improve the tourist industry since the outbreak of COVID-19. China is taking quick steps and alternatives to limit the spread of the pandemic and policy to travel by leveraging the development of 5G digital technology, Virtual Tourism, and Artificial Intelligence [36]. One of the cities in China that has implemented Virtual Tourism is Tiongkok, for example, the Palace Museum, which is in the Forbidden City, has now launched the Virtual Reality Theatre Technology Palace Museum that can make it easier for visitors to see the conditions of the past using virtual tourism [37].

4.6 Analysis of Publication Sources

5 sources have the highest contribution to the publication trends of virtual tourism technology and the tourism industry from 2013 to 2022. Figure 7 below shows the publication source with detailed data information.

Figure 7 shows that Sustainability Switzerland ranks highest with a total of 25 papers published. The second place was occupied by the Journal of Physics Conference Series.

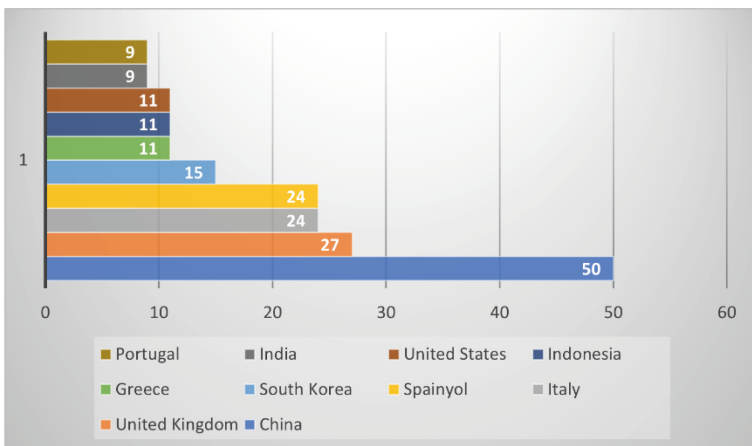
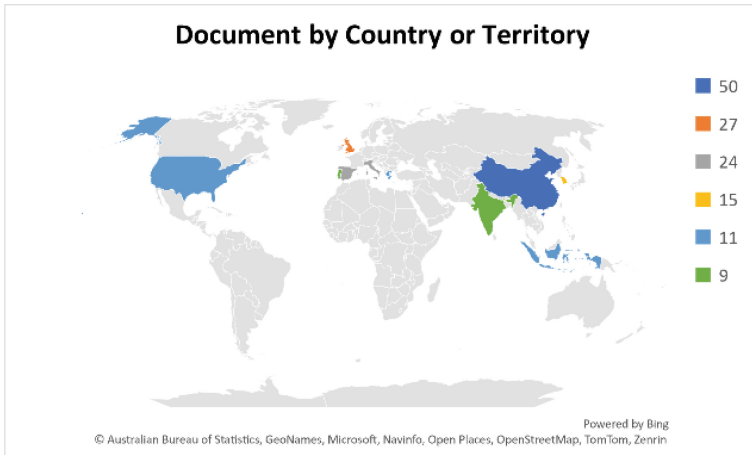


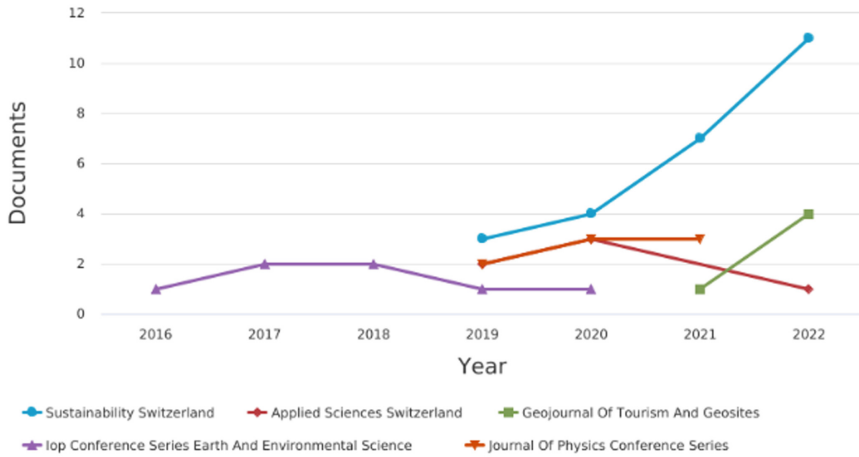
Fig. 6. Analysis of the Most Contributing Countries in Virtual Tourism and Tourism Industry Technologies Publications

Third place was held by the IOP Conference Series Earth and Environmental Science. Then, Applied Sciences Switzerland with 6 documents and Geojournal of Tourism and Geosites with 5 documents. Based on the Fig. 7 above publication each source experienced an increase in 2020. From this perspective, it can be concluded that in 2020 when the COVID-19 pandemic occurred it posed a variety of problems in the economic, educational, social, and cultural sectors, especially the tourism sector. Since the COVID-19 pandemic, travel activity has declined drastically. Therefore, virtual tourism technology has become one of the alternatives to improve the tourism industry since the spread of COVID-19.

Documents per year by source

Scopus

Compare the document counts for up to 10 sources. Compare sources and view CiteScore, SJR, and SNIP data



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Fig. 7. Analysis of publication sources

4.7 Mapping Visualization, Cluster Identification, and Analysis

Figure 8 below shows the result of an illustration of the clusters generated by the CiteSpace software. The largest number of clusters is 0 and the smallest number is 5.

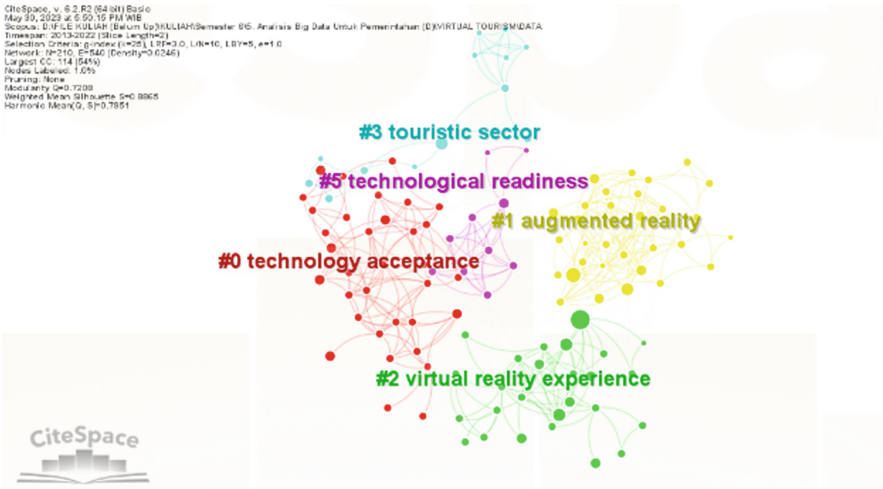


Fig. 8. Mapping Visualization, Cluster Identification, and Analysis Technology and Tourism Industry

CiteSpace software has a grouping function, in this function, the information analyzed is extracted using keywords designed as an alternative to knowing the constantly changing domains [38]. In addition, calculate the grouping findings using the log-likelihood ratio (LLR) [39]. In the publication trend of virtual tourism technology and tourism industry research from 2013 to 2022 with 244 documents used, CiteSpace provided the results of cluster analysis and found the 5 largest clusters. Five of the largest clusters were found, labeled #0, #1, #2, #3, and #5 (Table 1).

Table 1. Presents detailed information for each cluster.

Id Cluster	Size	Silhouette	Year	Label (LLR)
0	34	0,905	2019	Technology acceptance
1	31	0,881	2017	Augmented reality
2	26	0,828	2018	Virtual reality experience
3	13	0,928	2018	Touristic sector
5	10	0,936	2019	Technological readiness

The largest cluster consists of 34 members, **technology acceptance** with a silhouette value of 0.905. This cluster discusses the acceptance of technology in providing facilities to the tourism industry. Li et al. (2022). Revealed that there are new scales of assessment of the use of virtual tourism to tourists, such as scale of usability, convenience of use, risk of COVID-19 conditions, and attitudes toward technology acceptance. Furthermore, based on the scale of the assessment, it turns out that the use of virtual tourism technology has a significant impact on the acceptance of tourist technology, as they have considered the usage of virtualized tourism as a factor of convenience in traveling in the time of the COVID-19 pandemic [17]. However, on the other hand, there are still some things that disturb the convenience of tourists in using virtual tourism technology, the constraints of a complex operating system, unclear guidance, and expensive costs [40].

The second cluster consists of 31 members, that is, **argumented reality** with a silhouette value of 0.881. Based on the real arguments of tourists, they assume that virtual tourism technology is an effective technology and allows one to gain in-depth information about tourist destinations, such as museums [41]. This is because, virtual tourism can enhance the travel experience, encourage tourists to visit tourist destinations directly, and the desire to promote tourism destinations caused by pride [42]. However, unlike the Bharata study (2023) that found that the satisfaction experienced by tourists in using virtual tourism did not necessarily drive tourists' intentions to visit the sights.

In the third cluster, the **virtual reality experience** consists of 26 members with a silhouette value of 0.828. Based on the experience of using virtual travel, it turns out that virtual tourism technology can have a positive impact in improving the attitude and number of consumers when compared to previous travel experiences [44]. Same with research [45] that shows that the use of virtual tourism can affect consumer purchasing intentions and can boost tourism, especially in the culinary field. In addition, virtual tourism also presents features that are more interesting than other technologies [46].

Virtual tourism has different and higher levels of sensory information and some sites are very accurate with the world of tourism [44].

Next, on the fourth cluster is the **touristic sector**, consisting of 16 members with a silhouette value of 0.928. The tourism sector can help a country to boost economic growth [47]. One attempt to boost economic growth by enhancing 5G mobile networks designed to facilitate the use of technology as it can support the acceleration of social, economic, cultural, and tourism transformation digitally [48] [49]. The presence of this Internet network creates quality, innovative, and adaptive tourism concepts [50]. In the tourism sector, 5G networks are exploited to encourage long-distance tourism to enhance the real travel experience and bridge the gap between the physical and virtual worlds for tourism [48].

The last of the fifth clusters is **technological preparation**, consisting of 10 members with a silhouette value of 0.936. The COVID-19 pandemic has had a significant impact on life, its impact on flight cancellations, empty hotels and restaurants leading to bankruptcy, and tourist destinations starting to be crowded [51]. Virtual technology is expected to be able to revive the tourism industry from the impact of the COVID-19 pandemic [34]. Therefore, it is proposed the existence of a virtual tourism technology model that can enhance the virtual travel experience, the acceptance of technology in the community, encourage the intention of tourists to travel, and the use of virtual technology tourism [52]. Realizing this requires mature technology preparation so that it can simulate a virtual tourist spot [53].

5 Conclusion

The conclusions of the study show that the year 2022 has the highest number of publications in the publication trends of virtual tourism technology and the tourism industry indexed in the Scopus database from 2013 to 2022. China is the top contributing country of the ten countries with the highest rate of publication in this trend, with a total of 50 documents. Sustainability Switzerland is the most publishing source of virtual tourism technology and tourism industry trends, with a total of 25 publications. Later, Jung, T. was the most productive author in the publication trend of virtual tourism technology and the tourism industry, with a total of 4 papers. Furthermore, the affiliation with the most publications on this trend was achieved by Manchester Metropolitan University, with a total of 8 papers.

In addition, Scientometric analysis with CiteSpace software produced 5 major clusters in the publication trends of virtual tourism technology and the tourism industry from 2013 to 2022. These clusters include technology adoption, augmented reality, virtual reality experiences, the tourism sector, and technology readiness. Although the study outlines trends in the publication of virtual tourism technology and the tourism industry globally from 2013 to 2022, the study still has limitations in some ways as data is obtained only from the Scopus search engine with restrictions on all open access, types of article documents and conference papers, and English as the only language used. Therefore, recommendations for further research need to use data sources from the Web of Science as other global research database sources.

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