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Digitalization of Cultural Heritage Tourism: A Bibliometric Network Analysis Study*

Kültürel Miras Turizminin Dijitalleştirilmesi: Bibliyometrik Ağ Analizi Çalışması

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Abstract

In recent years, the development and utilization of advanced technologies fostered the digitalization of cultural heritage tourism (CHT) which also triggered the attention of researchers. This study aims to inspect the studies published on the "digitalization of cultural heritage tourism" raised by advanced technologies, utilizing the bibliometric network analysis method. For this purpose, studies published between 2010 and 11 October 2024 were gathered through the Web of Science (WoS) database delivering the phrase "digitalization of cultural heritage tourism". Bibliometric analysis is a favorable method for comprehending the present situation and research trends in the relevant field. Also, the implication of software such as VOSviewer has strengthened the visualization of the data. The data was analyzed utilizing VOSviewer software and the findings are demonstrated by bibliometric network visualization techniques. The findings revealed that there were 74 published studies with 349 total citations and an average of 4.84 citations for each study. The most number of studies in this field was carried out in 2024. The most cited studies addressed the transit of digitalization within tangible/intangible cultural heritage tourism concerning tourists' attitudes, strategies, opportunities, limits, implementation, dissemination, and sustainability. The methodologic approach utilized in these studies was qualitative approach as case studies. This study significantly contributes to the field of literature in terms of displaying the global trends of a developing research field and guiding new studies to be conducted in the future in this field.

Keywords: Cultural Heritage Tourism, Digitalization, Bibliometric Network Analysis

Özet

Son yıllarda ileri teknolojilerin geliştirilmesi ve kullanılması, kültürel miras turizminin dijitalleştirilmesini teşvik etmiş ve bu durum araştırmacıların da dikkatini çekmiştir. Bu çalışmada ileri teknolojilerin ortaya çıkardığı kültürel miras turizminin dijitalleştirilmesi üzerine yayınlanmış çalışmalar bibliyometrik ağ analizi yöntemini kullanarak incelenmeyi amaçlamaktadır. Bu amaçla, kültürel miras turizmi kapsamında 2010-10 Ekim 2024 arasında yayınlanmış çalışmalar Web of Science (WoS) veri tabanında "kültürel miras turizminin dijitalleşmesi" anahtar kelimesi kullanılarak taranmıştır. Bibliyometrik analiz, ilgili alanın mevcut durumunu ve araştırma eğilimlerini anlamak için uygun bir yöntemdir.

Ayrıca VOSviewer gibi bir yazılımın kullanılması, verilerin görselleştirilmesini güçlendirmiştir. Veriler VOSviewer yazılımı kullanılarak analiz edilmiş ve bulgular bibliyometrik ağ görselleştirme teknikleriyle sunulmuştur. Bulgular, toplam 349 atıf ve her çalışma için ortalama 4,84 atıf ile 74 yayınlanmış çalışma olduğunu ortaya koymuştur. Bu alanda en fazla çalışma 2024 yılında gerçekleştirilmiştir. En çok atıf alan çalışmalar, turistlerin tutumları, stratejiler, fırsatlar, sınırlar, uygulama, yaygınlaştırılma ve sürdürülebilirlik açısından dijitalleşmenin somut/somut olmayan kültürel miras turizmi içindeki geçişini ele almıştır. Bu çalışmalarda kullanılan metodolojik yaklaşım ise vaka çalışmaları ve bibliyometrik analiz olarak nitel yaklaşımlardı. Bu çalışma, gelişmekte olan bir araştırma alanındaki küresel eğilimleri ortaya koyması ve gelecekte bu alanda yapılacak yeni çalışmalara rehberlik etmesi açısından literatüre önemli katkılar sağlamaktadır.

Anahtar Kelimeler: Kültürel Miras Turizmi, Dijitalleştirmeme, Bibiyometrik Ağ Analizi.

1. INTRODUCTION

Various structures and formations that have survived from ancient civilizations to the present day throughout world history constitute the cultural heritage of current societies. Cultural heritage (CH) is the elements in which historical, social, and cultural values are reflected in the present day and the relationship that societies establish with their past. In addition, CH is expressed as intangible assets inherited from the past to the present, transferring beliefs, values, knowledge, customs, and traditions. Therefore, CH includes various assets and values belonging to past societies that are protected and conserved for the purpose of transmitting to future generations. In other words, CH includes tangible and intangible cultural assets with universal values that have endured from past societies and cultures to the current day (Asatekin, 2004; Vargün, 2021). CH, which acts a prominent role in ensuring the economic, social, and physical development of countries and in creating the cultural identity of a society, is a whole of lifestyles transferred to generations, including traditions, values, and assets generated by a society. The transfer of CH includes efforts to convey the knowledge, art, and culture of past generations to future generations. This transfer is significant for the conservation and sustainability of CH. Tourism is a prominent tool in discovering, sharing, and transmitting CH (Kuşçuoğlu & Taş, 2017). Cultural heritage tourism (CHT) has gained significance with the usage of CH assets in tourism and their conversion into attractions for tourists (Süer, 2021).

CHT originates from individuals' travels to visit CH sites and participate in cultural activities with respect to ascertaining cultural differences and increasing their cultural level. Besides, tourism utilizes CH assets for tourism purposes and transforms these assets into tourism products. Therefore, a prominent effect of tourism is to attract visitors by exploring and promoting CH assets. Another substantial effect of tourism is to ensure the conservation of CH assets and their transmission to future generations. Since the CH of countries has substantial importance in strengthening the cultural identity of societies, it is vital for countries to protect it and transmit it to future generations (McKercher& du Cros, 2002; McNulty & Koff, 2014). In essence, developing digital technologies is an intermediary element in the storage, conservation, and transmission of CH. Since the advancements of digital technologies in recent years, innovative and effective applications have been invented in the transfer of CH. Digitization of CH is important for documents and objects that are at risk of loss and increase their sustainability. In recent years, the importance of "digitalization of CH tourism" has also increased. In this case, tourism is becoming a crucial driver in the usage of digital technologies in the preservation of CH (Sonuç & Süer, 2024). Therefore, tourism is a prominent factor in the dissemination, development, and implementation of digitalization for CH assets.

Digitalization attracts the attention of researchers with advanced technologies within the context of CHT. It is yet valuable and essential to conduct bibliometric analysis that will guide and enlighten researchers on a brand new and significant research topic. Since digitalization is still a

new era in CHT, conducting bibliometric analysis is worthy for determining the trends and researches for practitioners and academicians even though some studies were conducted in the field of CHT affiliated with digitalization (Demirel İli & Hazarhun, 2021; Bozkurt et al., 2022; Çuhadar et al., 2022). Besides, the current study contributes to and enhances the findings of previous studies that performed bibliometric analysis for revealing the affiliation between CHT and digitalization. Therefore, this study mainly enriches the brand-new era in CHT and digitalization instead of filling a gap in the literature. In this respect, this research focuses to analyze the studies emerged in the WoS database on digitalization within the context of CHT by implementing the bibliometric network analysis method. Therefore, the studies gathered through the WoS database according to the determined research phrase "digitalization of cultural heritage tourism". As a consequence, this study will contribute to future studies, researchers, and literature on the digitalization of CHT.

2. CULTURAL HERITAGE TOURISM AND DIGITALIZATION

Cultural heritage is considered as tangible (monuments, buildings and building groups, cultural and natural sites, cultural landscapes, artifacts, written documents objects, etc.) and intangible (traditions, values, beliefs, memories, narratives, symbols, rituals, festivals, textures, colors, smells, etc.) assets (Asatekin, 2004; Aksoy & Enlil, 2012) that constitute the components of CHT. In this context, CHT is defined as the travels aiming to recognize and visit all products of tangible and intangible CH, including "natural assets, architectural assets, works of art, collections, cultural assets, traditions, and languages" (Pelit et al., 2018). On the other side, all these values are faced with natural and human-induced dangers (Acar et al., 2022). Historical sites deteriorate over time and therefore the knowledge that could be obtained from historical sites diminishes. Moreover, since the restoration of these sites is an extremely expensive and difficult task, many historical sites continue to deteriorate with the effect of time and it is not eligible to preserve them (Sertalp, 2016).

Some CHs have endured the devastating effects of time from the past to the now, reflecting the lifestyle, ethnic structure, and sociocultural valuee of that day. However, there are also some sites and ancient heritage that have not persisted in entirety to the present day due to physical change and destruction. Reconstruction of CH sites is a time-wasting and costly activities. Moreover, the possibility of derogation to the ruins during restoration should be considered. In this case, it is a straining task to transfer the heritage sites to future generations, established by ancient great civilizations as few ruins have remained (Ünal, 2017; Uzun & Gözel, 2022). To ensure the transfer, protection, and sustainability of CH, the process of digitalization of CH has been triggered in the last decade. Digitalization of CH comprises the process of digitizing tangible and intangible CH using contemporary remote sensing and virtual technologies with the purpose of creating 2D and 3D digital archives for repair, restoration, conservation, and archaeological studies (Zhou et al., 2012).

Digitalization refers to the rapid integration of advanced technologies into business and social life (Madzík et al., 2023). The first steps of digitalization were initiated in the 1990s and also employed to foster the aim of protecting and disseminating CH (Gruber, 1972). Advanced technologies in digitalization such as virtual reality, augmented reality, artificial intelligence, remote sensing, and the Internet of Things, fostered the promotion and preservation of CH. Therefore, with advanced technologies, digitalization significantly became a key driver in the awareness of cultural assets and catalyzed in all the aspects of CH. Digitalization is not only an effectual tool for protecting CH, but it also supports its evolvement and proliferation with an augmented perspective. Placing digitalization as a virtual tool to provide preservation of CH, goes beyond the traditional view of the requirement for CH protection (Rosner et al., 2014). Thus, the

strong bond between digitalization and CH is expanding with revitalization of the historical sites, monuments, artifacts, archaeological remains, and other tangible/intangible cultural assets transmitting from traditional layout to digital layout.

The digitalization of CH is conducted with the aim of protecting and ensuring the sustainability of historical buildings by establishing documentation and digital archives, performing repair and restoration works, visualizing tangible and intangible CH, and promoting the value of heritage sites (Zhou et al., 2012; Acar et al., 2022). Therefore, the digitalization of CH is an important factor affecting tourism in the last decades. Digitalization not only offers new opportunities for the preservation and promotion of CH but also contributes to innovation and evolvement in the tourism industry. It also provides many advantages for the CH tourism flourishing and evolving the tourism product for further tourism experience and satisfaction of the tourists. Primarily, due to digitalization, wider audiences could reach and experience CH sites. On the other side, digitalization acts an important role in enabling a huge amount of individuals to visit heritage sites in a virtual environment without any space and time limitations (King et al., 2016; Li et al., 2009; Witcomb, 2007) and in attracting more attention from the society towards CH (Preuss, 2016). The rapid digitalization of CH sites is based on the digitization of heritage elements and their transfer to the virtual environment, ensuring sustainable documentation (Cirulis et al., 2015) and providing access to CH sites for a multitude of individuals (Melchior, 2019).

Digitalization has the potential to create memorable tourism experiences for visitors within the scope of CHT. The advancement of such technologies into CHT has the potential not only to ensure the preservation and management of CH but also to enrich the tourist experience. Digitalization efforts within the scope of CHT also create tourism attractiveness. Another aspect is the proliferation in the historical knowledge and awareness of societies. Digitalization applications for CHT are an important issue to increase interest in historical sites (Uzun & Gözel, 2022; Kandemir & Ulusoy, 2023). The digitalization of CHT positively affects tourist satisfaction and at the same time enables foreign tourists to continue their trips without needing the help of a guide and to easily access historical information (Özgüneş & Bozok, 2017; Tom Dieck & Jung, 2017; Litvak & Kuflik, 2020). Thus, the digitalization of CHT contributes to sustainability by visualizing, promoting, protecting, and transferring tangible and intangible CH assets to future generations. As a consequence, the studies in the literature on the digitalization of CHT possess innovative and pioneering approaches and are vital to scrutinize.

3. METHODOLOGY

In the last years, a few studies were conducted to comprehend the trends in digitalization affiliated with CH or CHT performing bibliometric analysis. The research query phrases of these few previous studies were "Cultural Heritage" and "Digitalization" examining 25 publications (Demirel İli & Hazarhun, 2021), "Cultural Heritage Tourism and Digital and Digitalization" inspecting 264 publications (Bozkurt et al., 2022) and "Cultural Heritage" and "Digitalization" investigating 248 publications (Çuhadar et al., 2022). Although one of these studies encompasses a similar research query, the present study targets the direct affiliation and linkage between the components. The goal in the selection of the research query is to directly and precisely approach the bond between the components. Thus, the reason for determining the research query of this study as "digitalization of cultural heritage tourism" is to reveal and inspect the publications covering the linkage.

Accordingly, this study aims to investigate the published studies on the "digitalization of cultural heritage tourism" utilizing the bibliometric network analysis method. For this purpose, studies (articles, papers, etc.) published between 2010 and 2024 were inspected via the phrase "digitalization of cultural heritage tourism" in the Web of Science (WoS), the most comprehensive

bibliographic database in the international literature. In fact, the research was performed from 1975 to 11 October 2024, and the publications were initiated in 2010 at WoS database, to avoid confusion the initiating year of the publications was mentioned in this study. WoS database is one of the widely used databases in bibliographic research and operating since 1964. Besides, WoS database currently contains 92 million reports in the core collection and 225 million reports on the platform (Web of Science Coverage Details, 2024). In addition to providing big data for research in different subject categories, researchers have the opportunity to examine the current situation and trends in their own scientific fields by following scientific developments in the literature with the data they obtain from big data analysis (Karagöz & Şeref, 2019).

Pritchard (1969), the researcher who pioneered the concept of bibliometrics, defined the concept with the term "statistical bibliography" as "the implementation of statistical and mathematical techniques to reports, articles, books, and other communication media". Bibliometrics is a quantitative study applied to research outputs revealing the items such as title, subject, citations, author, etc. regarding scientific publications in any discipline (Altunışık et al., 2023). Bibliometric analysis summarizes the direction of scientific trends from various perspectives and provides emphasis on research (Hussain et al., 2011). Bibliometric software tools provide convenience in visualizing bibliometric analyses. One of the software tools is VOSviewer which is benefited for generating maps based on network data, by visualizing and exploring the bibliometric analysis. VOSviewer is applied to create networks of researchers, scientific publications, journals, institutions, countries, keywords, or terms. This software simplifies the process while handling large maps containing thousands of elements (Van Eck & Waltman, 2019).

Table 1. Data Collecting and Processing

Data Collecting	Data Processing
Research Database	Web of Science
Research Query	"digitalization of cultural heritage tourism"
Publication Years	2010-2024, October 11
Publication Type	Article, Proceeding paper, Review article, Book chapters
Publication Languages	English, Russian, Spanish, Italian, Portuguese
Final Data	74
Data Analysis Tool	VOSviewer
Analysis Content	Publication and citation frequency by year, Top publishing countries, Co-authorship network analysis by countries, Co-authorship network analysis by organizations, Keyword network analysis, Bibliographic coupling network analysis by countries, Bibliographic coupling network analysis by organizations, Bibliographic coupling network analysis by authors, Bibliographic coupling network analysis by sources, Distribution of studies by publication languages, WoS categories, SDGs, Distribution of publishers by studies, Distribution of WoS index by studies

In this study, the published studies on the WoS database are filtered regarding the title "digitalization of cultural heritage tourism" on October 11, 2024. The filtered data resulted in 74 academic publications. "VOSviewer" software was utilized to perform bibliometric network analysis and present it with images. VOSviewer is a mapping programme established for the usage in the visual representation of bibliometric networks. The programme, which is basically established to analyze bibliometric studies, demonstrates the networks in a visiual way and creates a difference in this sense (Van Eck & Waltman, 2017). Obtaining the data via WoS composes the main limitation of the research. Thus, the research phrase "digitalization of cultural heritage tourism" was only searched in the titles of the studies. The bibliometric network analysis was

conducted on the studies and presented visually such as regarding the publication year and citation frequency with top publishing countries, co-authorship network analysis, bibliographic coupling and distribution of studies due to varied aspects.

4. FINDINGS

The findings of this study were summarized through tables, graphs, and visuals related to the data inspected in the WoS database. According to the determined research phrase, "digitalization of cultural heritage tourism", 74 studies were gathered through the WoS database. A total of 349 citations were performed to these studies. Accordingly; the average citation per study is approximately 5 and the H index is 11. In 2024, both the amount of the citations and the studies figured an increasing trend. Figure 1 represents the publication and citation frequency by year.
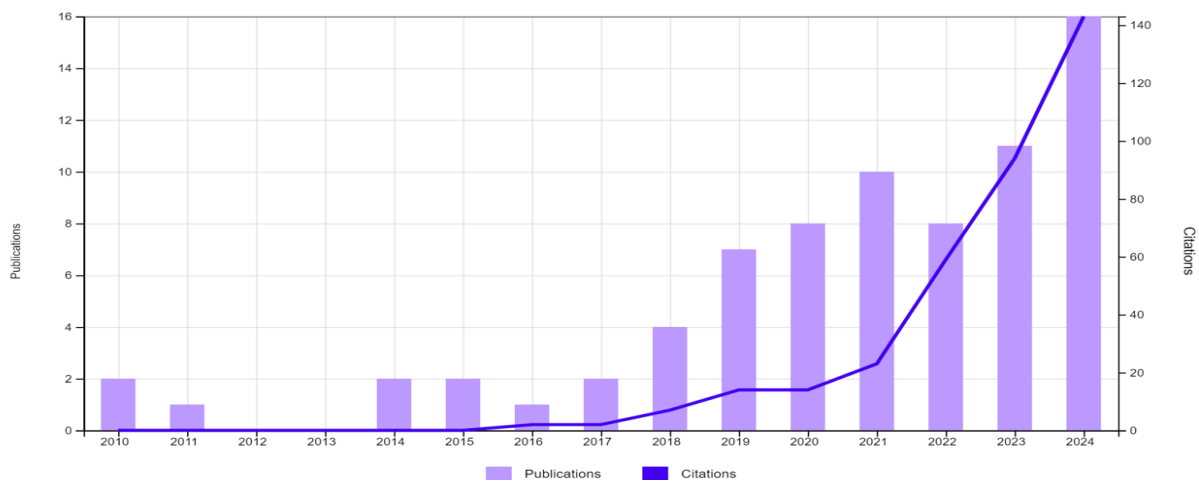
Figure 1. Publication and Citation Frequency by Year

Regarding the outcomes of Figure 1, the studies on the researched subject have been increasing in the last decades, conveying that this topic is yet brand new in the literature. It is noteworthy that these studies, which were mostly conducted after 2010, were rare in the WoS database. It was determined that the highest number of publications was conducted in 2024 with 16 publications. Moreover, no studies were published in the database in 2012 and 2013. Additionally, Table 2 compiles the number of published studies in the year-base.

Table 2. Distribution of Publications by Year

Years	Publication Numbers	Years	Publication Numbers
2024*	16	2016	1
2023	11	2015	2
2022	8	2014	2
2021	10	2013	-
2020	8	2012	-
2019	7	2011	1
2018	4	2010	2
2017	2		

As of 11 October 2024

Even though 74 publications were gathered through WoS incurring the affiliated word construction, just 47 of these studies were cited. Table 3 illustrates these publications elaborating on the citation number, author/s, year, title, aim, and methodology. The most cited publications addressed the transit of digitalization within tangible/intangible cultural heritage tourism concerning tourists' attitudes, strategies, opportunities, limits, implementation, dissemination, and

sustainability. The methodologic approach utilized in the top cited publications was mostly qualitative approach as case and scenario studies. Quantitative approach was also employed for bibliometric analysis, confirmatory factor analysis (CFA) and covariance-based structural equation modeling (CB-SEM).

Table 3. Top 10 Most Cited Publications in Detail

Citation Number	Author/s, (Year)& Title	Aim & Methodology	Theoretical & Practical Implications
43	1) Zollo, L.; Rialti, R.; Marrucci, A.; Ciappei, C. (2022), How do museums foster loyalty in tech-savvy visitors? The role of social media and digital experience.	A structural model was proposed to measure the impact of cultural heritage destination digitalization on tourists' attitudes and behaviours while visting museum. A quantitative approach with confirmatory factor analysis (CFA) and covariance-based structural equation modeling (CB-SEM) was utilized.	The findings revealed that digitalization and advanced technologies positively impacted the loyalty of tourists who visited the museum. The outcomes conveyed that digitalization is a significant strategic tool for museum authorities to improve the loyalty of tourists.
34	2) Zhang, X.; Yang, DL.; Yow, CH.; Huang, LH.; Wu, XQ.; Huang, XJ.; Guo, J.; Zhou, SJ. & Cai, YY. (2022), Metaverse for cultural heritages.	It was aimed to promote a systematic approach to the formation of the cultural heritage metaverse and provide more effectual approaches for tourism guidance, site maintenance, and conservation of heritage beings. A qualitative approach was adopted by performing a case study.	The study provided a potential impact on the digitalization of CH by proposing a general approach for constructing the metaverse of all CH. Further research as a part of this study, were suggested for the applications of the metaverse for the preservation and conversation of CH.
32	3) Eichler, J. (2021), Intangible cultural heritage, inequalities and participation: who decides on heritage?	Exploring the human dimension of intangible cultural heritage within the extent of tourism and digitalization was aspired. A qualitative approach was performed to case studies.	The study provided insights of materializing ICH by signifying the challenges in practices considering tourism-oriented developments and digitalization.
22	4) Dang, Q.; Luo, ZM.; Ouyang, CH.; Wang, L. &Xie, M. (2021), Intangible cultural heritage in China: a visual analysis of research hotspots, frontiers, and trends using CiteSpace.	It was purposed to review the studies in the field of intangible cultural heritage field and also digitalization in China. A quantitative approach was adopted for bibliometric analysis by implementing CiteSpace software.	The outcomes of the study provided a deeper understanding of ICH with its development and evolution in China. It is assumed that the practical implications of digitalization in the field of ICH were prone to conservation and sustainability.
21	5) Madzík, P.; Falát, L.; Copuš, L. & Valeri, M. (2023), Digital transformation in tourism: bibliometric literature review based on machine learning approach.	Providing a review of studies associated with digital transformation in the tourism field was addressed. A quantitative approach was conducted for bibliometric study.	The study explored a number of research opportunities focusing on the role of digitalization in tourism. The analysis results demonstrated that the pandemic raised the trend of study topics relating digitalization to the tourism industry.
20	6) De Bernardi, P.; Bertello, A. & Shams, S.M.R. (2019), Logics hindering digital transformation in cultural heritage strategic management: an exploratory case study.	Investigating the required integration level for the digitalization of museums' communication strategies and revealing the obstacles to the digital transition of cultural	The practical implications of digitalization in tourism were inspected with the developed framework on the basis of three aspects: unstructured, partial, and integrated. The outputs of

		heritage strategies were the purposes of this study. A qualitative approach was provided to develop an exploratory case study.	this study suggested that the integration of digitalization in tourism should be even fostered through countries to fill the gaps in practical implications.
19	7) Liritzis, I. & Korka, E. (2019), Archaeometry's role in cultural heritage sustainability and development.	It was aspired to inspect the contributions of archaeometry with digitalizaiton in cultural heritage and archaeology by offering policies for providing archaeometrical data for sustainable economic development at local, territorial, and national levels. A qualitative approach was provided for inpecting case studies.	The study addressed the theoretical and practical implications of digitalization in archaeometry contributes to cultural tourism. It is asserted that uncovering and documenting tangible and intangible CH supports sustainability, increases the interest and attention of visitors, and strengthens cultural tourism.
19	8) Cirulis, A.; De Paolis, L.T. & Tutberidze, M. (2015), Virtualization of digitalized cultural heritage and use case scenario modeling for sustainability promotion of national identity.	It was targeted to develop a basic design for the usage of advanced technologies with virtual and augmented reality to offer sustainability of national identities of countries within the scope of cultural heritage. Scenario analysis was applied with a qualitative approach.	The outcomes argued the enhancements regarding the widespread use of devices utilized in tourism activities based on digitalization and advanced technologies. It was stated that the promotion of mobile devices etc. at reasonable prices plays an important role in the widespread use of advanced technologies in the field of tourism.
17	9) Preuss, U. (2016), Sustainable digitalization of cultural heritagereport on initiatives and projects in Brandenburg, Germany.	It was intended to reveal the opportunities and limits of digitalization for cultural heritage and tourism in Brandenburg. Case study was implemented through a qualitative approach.	The findings suggested that digitalization contributes to the promotion, sustainability, and preservation of CH particularly for tourism. In the context of practical implications, it is recommended that institutions such as libraries and museums should participate in the transition of digitalization.
13	10) Gonçalves, A.R.; Dorsch, L.L.P. & Figueiredo, M. (2022), Digital tourism: an alternative view on cultural intangible heritage and sustainability in Tavira, Portugal.	It was sought to disclose the implementation and dissemination of digitalization in tourism with its contribution to sustainability and other aspects. A qualitative approach was applied for the case study.	The outcomes of the study were two mobile applications developed for promoting a digital cultural route. These applications aided in a narrower relationship among tourists and the local community providing the users' perspectives.

Since the number of publications by country was investigated, China ranked first with the number of published studies (n=18; 24.32%), followed by Italy (18.91%), Spain (8.10%), and Russia (5%). Including these first 4 countries, a total of 39 countries worldwide released publications and Türkiye ranked as 16th. The top publishing 15 countries and Türkiye are displayed in Table 4. As the countries with the most publications are evaluated according to the number of publications, China featured with 18 publications and Italy with 14 publications, Spain (6 publications) and Russia (5 publications) unfortunately could not achieve half as many publications as the first two countries. Along with ranking in top publishing countries, the next two countries served 4 publications followed by 5 countries that released 3 publications, and the other countries with 2 or 1 publications, indicating that the number of publications by each country diminished drastically.

Table 4. Top Publishing Countries

| Countries	Publication Numbers	% of 74	Countries	Publication Numbers	% of 74
China	18	24.32	Indonesia	3	4.05
Italy	14	18.91	Malaysia	3	4.05
Spain	6	8.10	Portugal	3	4.05
Russia	5	6.75	Finland	2	2.70
England	4	5.40	Taiwan	2	2.70
France	4	5.40	Ukrainian	2	2.70
Bulgaria	3	4.05	USA	2	2.70
Germany	3	4.05	Türkiye	1	1.35
16 of 39 records are demonstrated.					

Each colored circle in the images created by the VOSviewer software represents the frequency of the item's repetition number. The large size of the circle signifies that the frequency or number of the item in the map is high. In other words, the most repeated keyword or institution etc. is represented by the largest circle. The mentioned items are clustered into groups according to their repetition number or frequency and are represented with a single color. An item belongs to only one set and is not included in the intersection of any set of elements. The lines between elements indicate connections. Thin lines indicate a weaker connection, while thick lines indicate a stronger connection (Van Eck & Waltman, 2019).

The international co-authorship network analysis by countries is demonstrated by lines in Figure 2. The circle/text size depicts the level of international co-authorship. The country with the strongest collaboration is China with 14 studies, and 93 citations via a total network strength of 6. Italy comes second with 5 studies, and 41 citations via a total network strength of 5. This country is followed by England with 4 studies, and 2 citations via a total network strength of 3. Finland is in fourth place with 2 studies, and 5 citations via a total link strength of 3. Russia has a total network strength of 2 with 4 studies and 19 citations. Other countries with a total network strength of 2 include Germany with 3 studies and 49 citations, Georgia with 1 study and 19 citations, and Malaysia with 2 studies and 3 citations.

**Figure 2.** Co-Authorship Network Analysis By Countries

The co-authorship network analysis by organizations is demonstrated in Figure 3. The total strength of the co-authorship network with other organizations is inspected for each 97 organizations. The network analysis is demonstrated in 1 cluster with 7 items. Each item is connected with the other 6 items. Therefore, total link strength is the highest with the number 6 with one document for each organization regarding co-authorship network. For instance, the organization Herald Council President Republ Tatarstan is linked with Kazan Fed University, Petrov Acad Science & Arts, Republican Coordinating Sci &Methodol Council Pe, Sci & Expert

Council Open Univ Talents, Inst Int Relat, Int Council Preservat Monuments &Sites ICOMOS. In turn, each organization has a co-authorship network with all other organizations, again with one document.
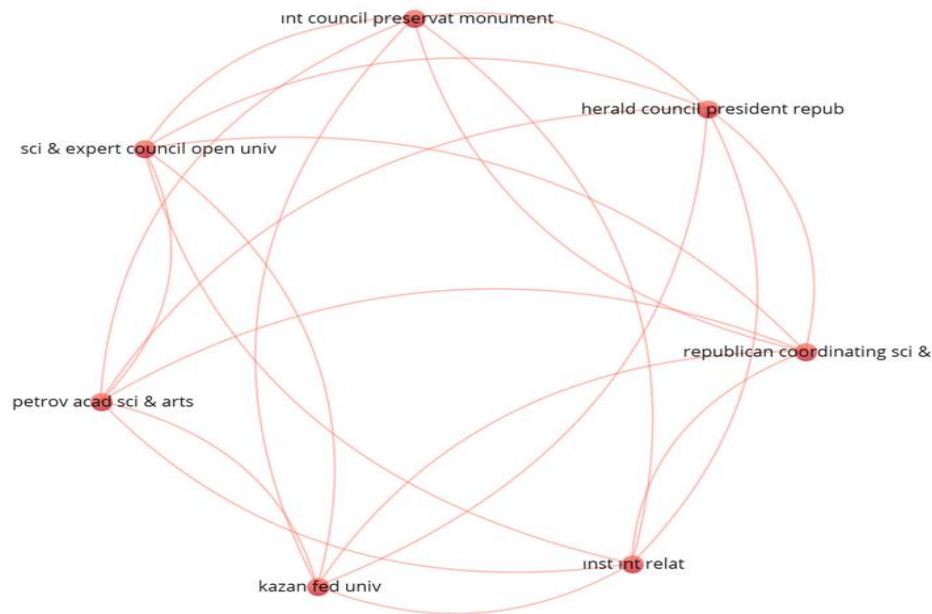

Figure 3. Co-Authorship Network Analysis by Organizations

The keyword network analysis displaying the strength of co-occurrence links between associated keywords is depicted in Figure 4. Accordingly, 28 words with links out of a total of 202 keywords are shown in the visual. Among these keywords, the keyword "cultural heritage" was repeated 14 times with the highest total link strength of 62. The keywords "digitalization" were used 7 times with a total link strength of 34, "tourism" and "cultural tourism" 6 times for each with a total link strength of 35 and 31 respectively, "COVID-19" and "sustainable development" 4 times each with a total link strength of 24 and 21 respectively. The keyword network analysis depicts 16 clusters with 166 items with varied colors. Each item's color exhibits that the item belongs to the cluster and linked with lines to other items in that cluster (Van Eck & Waltman, 2019). Therefore, 166 lines are demonstrated in keyword network analysis, presenting the 166 strongest links among items.
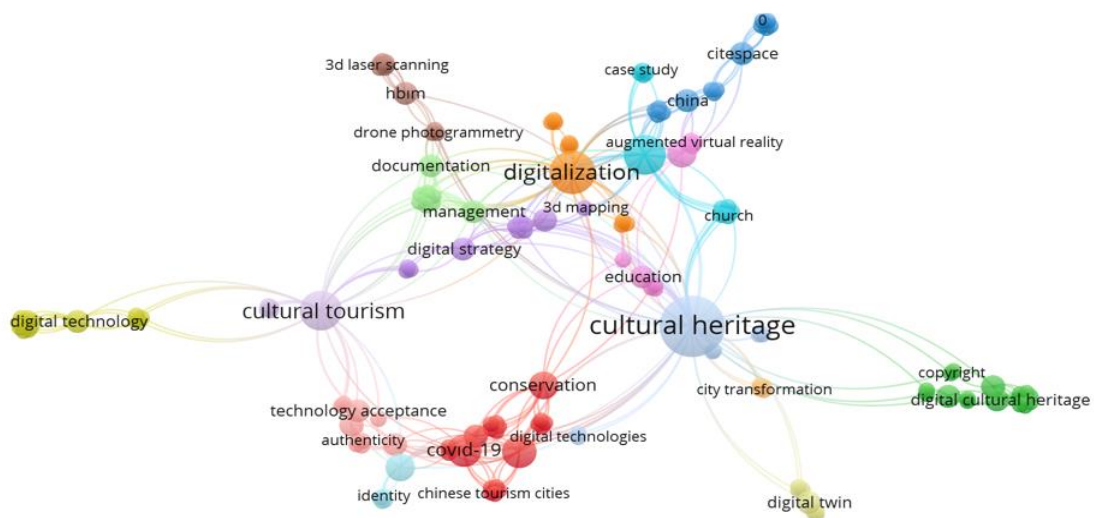

Figure 4. Keyword Network Analysis

Bibliographic coupling is a metric that conducts citation analysis to reveal a similarity association between studies, such as co-citation. Bibliographic coupling emerges when two studies cite a common third study in their bibliographies. Each circle represents a country identifying the bigger the size, the higher the quantity. Bibliographic coupling network analysis by countries embodied 25 items regarding 8 clusters. China ranked first in the bibliographic coupling analysis with the highest total link strength of 476 with 14 publications and 93 citations. It was followed by Italy with a total link strength of 206 representing 5 publications and 41 citations. Even though Spain released 5 publications with 14 citations, the total link strength was diminished by 2. Germany is third at total link strength with 150 having 3 publications and 49 citations. Though England and Russia submitted 4 publications, the former had a total link strength of 115 with 2 citations, whereas the latter performed 89 total link strength and 19 citations. Finland is the fourth country at the total link strength of 117 and 2 publications with 5 citations.
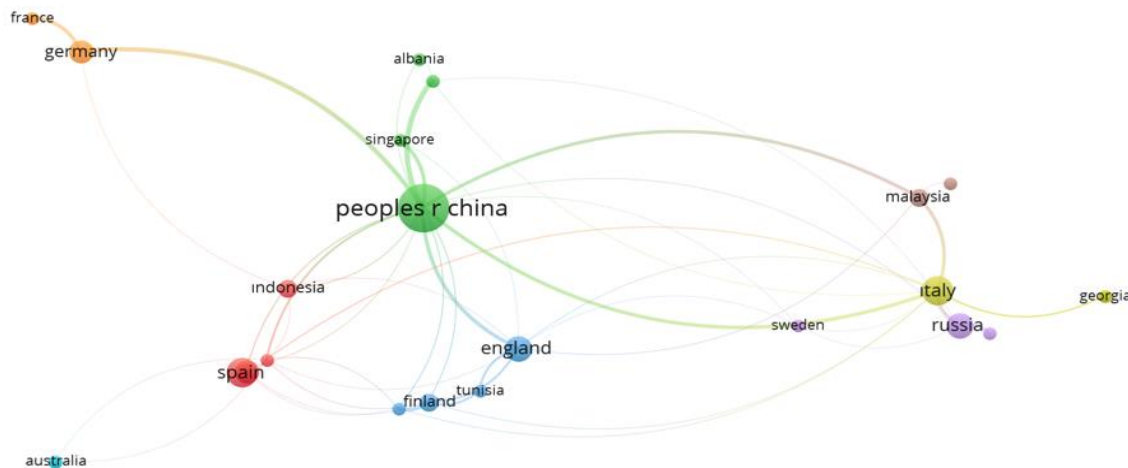
Figure 5. Bibliographic Coupling Network Analysis by Countries

Bibliographic coupling network analysis by organizations is exhibited by lines and circles in Figure 6. Each circle represents an instution defining the bigger the size, the higher the quantity. Bibliographic coupling network analysis by organizations encompassed 48 items associated to 13 clusters. The organization with the highest total link strength of 317 was Fudan University with 2 publications and 8 citations. Henan University displayed total link strength of 264 with 2 publications and 22 citations. Beijing Technology & Business University on the right side of the figure held total link strength of 114 with 1 publications and 32 citations. Guangxi University on the left side of the figure received total link strength of 91 with 1 publications and 21 citations.
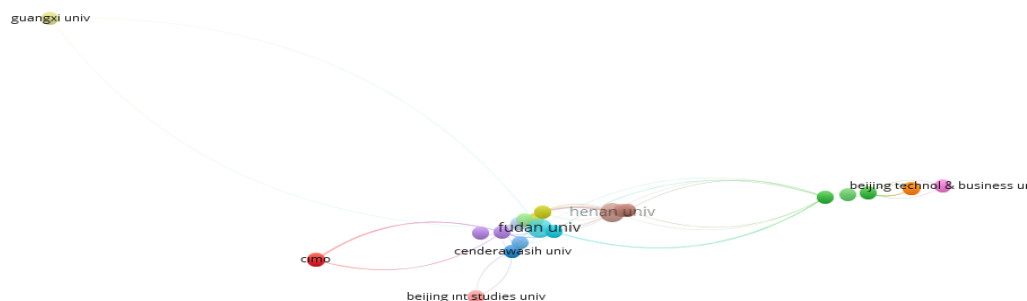
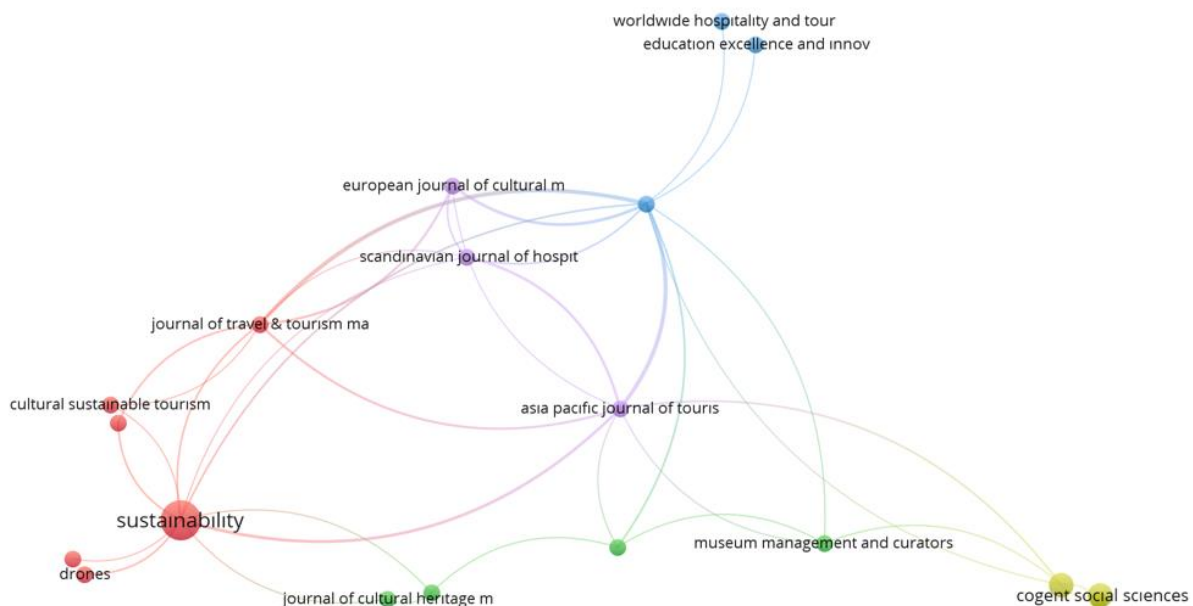**Figure 6.** Bibliographic Coupling Network Analysis by Organizations

Bibliographic coupling network analysis by authors is represented in Figure 7. For every 171 authors, the total strength of the bibliographic coupling network with other authors are computed. The authors with the highest total network strength is choosed. Accordingly, 94 items and 14

clusters are exhibited by circles and asscociated by lines. The authors Zhang, X.; Yang, D.L.; Yow, C.H.; Huang, L.H.; Wu, X.Q.; Huang, X.J.; Guo, J.; Zhou, S.J. and Cai, Y.Y. (2022) gathered a total link strength of 451 with 1 publications and 32 citations. The second total link strenght is 363 with 1 publications and 21 citatons associated with the authors Dang, Q; Luo, Z.; Ouyang, C.; Wang, L. and Xie, M (2021).

Figure 7. Bibliographic Coupling Network Analysis by Authors

Figure 8 exhibits bibliographic coupling network analysis by sources that comprised of 19 items for 5 clusters. The total strength of the bibliopgraphic coupling network with other sources were computed. The sources with the highest total network strength were choosen. The journal "Sustainability" ranked first with 71 citations with 5 publications, followed by "Electronics" (32) with one publication, "International Journal of Human Rights" (31) with one publication and "Tourism Analysis" (19) with one publication. However, "Cogent Social Science"'s delivered two publications just received 4 citations.

Figure 8. Bibliographic Coupling Network Analysis by Sources

The publishers with the most studies are presented in Table 5. Major of the studies were published in the journals Springer Nature (21.62%) with 16 publications, Taylor & Francis (13.51%) with 10 publications, MDPI (Multidisciplinary Digital Publishing Institute) (12.16%) with 9 publications, Emerald Group Publishing (5.40%) with 4 publications, IOP Publishing Ltd (5.40%) with 4 publications, Elsevier (4.05%) with 3 publications, IATED (2.70%) with 2 publications and FEADEFF (2.70%) with 2 publications.

Table 5. Distribution of Publishers by Studies

Name of the Publisher	Number	% of 74
Springer Nature	16	21.622
Taylor & Francis	10	13.514
MDPI	9	12.162
Emerald Group Publishing	4	5.405
IOP Publishing Ltd	4	5.405
Elsevier	3	4.054
IATED-Int Assoc Technology Education & Development	2	2.703
Federacion Espanola Asoc Docentes Educacion Fisica-Feadef	2	2.703

As the WoS indexes presented in Table 6 are inspected, the majority of the articles are in the ESCI (28.37%) with 21 publications, followed by SSCI (24.32%) and CPCI-s (24.32%) with 18 publications for both, CPCI-SSH (21.62%) with 16 publications, SCI-EXPANDED (14.86%) with 11 publications, A&HCI (8.10%) with 6 publications and BKCI-SSH (1.35%) with 1 publication.

Table 6. Distribution of WoS Index by Studies

Index	Number	% of 74
Emerging Sources Citation Index (ESCI)	21	28.37
Social Sciences Citation Index (SSCI)	18	24.32
Conference Proceedings Citation Index – Science (CPCI-S)	18	24.32
Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH)	16	21.62
Science Citation Index Expanded (SCI-EXPANDED)	11	14.86
Arts & Humanities Citation Index (A&HCI)	6	8.10
Book Citation Index – Social Sciences & Humanities (BKCI-SSH)	1	1.35

The distribution of studies by publication languages is designated in Table 7. Thereafter, most of the published studies on the topic under investigation are in the English language (91.89%) with 68 publications. This is followed by studies published in Russian (2.70%) and Spanish languages (2.70%) with 2 publications for both. In addition to these, there is also one publication in Italian (1.35%) and Portuguese (1.35%) languages.

Table 7. Distribution of Studies by Publication Languages

Publication Language	Number	% of 74
English	68	91.89
Russian	2	2.70
Spanish	2	2.70
Italian	1	1.35
Portuguese	1	1.35

The distribution of studies according to WoS categories is presented in Table 8. Accordingly, the most studies were conducted in the "Hospitality Leisure Sport Tourism" (20.27%) category with 15 publications. This was followed by the "Environmental Studies" (13.51%) with 10 publications, "Computer Science Interdisciplinary Applications" (12.16%) and "Green Sustainable Science Technology" (12.16%) categories with 9 publications for both, respectively.

Table 8. Distribution of Studies by WoS Categories

Category of WoS	N.	% of 74	Category of WoS	N.	% of 74
Hospitality Leisure Sport Tourism	15	20.27	Archaeology	4	5.40
Environmental Studies	10	13.51	Computer Science Artificial Intelligence	3	4.05
Computer Science Interdisciplinary Applications	9	12.16	Computer Science Information Systems	3	4.05
Green Sustainable Science Technology	9	12.16	Computer Science Software Engineering	3	4.05
Environmental Sciences	8	10.81	Economics	3	4.05
Humanities Multidisciplinary	8	10.81	History	3	4.05
Computer Science Theory Methods	7	9.45	Information Science Library Science	3	4.05
Business	6	8.10	Materials Science Multidisciplinary	3	4.05
Management	6	8.10	Remote Sensing	3	4.05
Education Educational Research	5	6.75	Architecture	2	2.70

As the research topic was also evaluated within the scope of sustainability, the distribution displayed in Table 9 was obtained. Even the sustainable development indicates 17 goals, the studies published within the research topic included 9 of these goals. The most frequently mentioned sustainable development goal was "Sustainable Cities And Communities" (24.32%) with 18 publications, followed by "Life On Land" (10.81%) with 8 publications, "Good Health And Well Being" (5.40%) and "Quality Education" (5.40%) with 4 publications for both.

Table 9. Distribution of Studies by Sustainable Development Goals

Sustainable Development Goals	Number	% of 74
11 Sustainable Cities and Communities	18	24.32
15 Life on Land	8	10.81
03 Good Health and Well Being	4	5.40
04 Quality Education	4	5.40
09 Industry Innovation and Infrastructure	3	4.05
17 Partnerships for The Goals	3	4.05
13 Climate Action	2	2.70
02 Zero Hunger	1	1.35
14 Life Below Water	1	1.35

CONCLUSION

In recent years, digitalization has rapidly integrated into the tourism industry, particularly since COVID-19 (Madzík et al., 2023). Digitalization provides many advantages for the tourism industry. Digitalization of CH is one of the many factors affecting tourism. In the same vein, tourism is an important tool in discovering, sharing, and transmitting CH. The transfer of CH includes efforts to convey the knowledge, art, and culture of past generations to future generations. This transfer is crucial for the protection and sustainability of CH. Developing digital technologies is an intermediary element in the storage, preservation, and dissemination of CH. Digitalization of CH is prominent for documents and objects that are at risk of loss and increases their sustainability. Digitalization offers new opportunities for the preservation and promotion of CH. In this respect, the significance of digitalization in CH is in reaching wider audiences. In essence, digitalization is significantly linked to CHT by enhancing the satisfaction and enriching the experience of tourists while contributing to the preservation and sustainability of CH sites. Therefore, tourist experiences were prospered by providing elements such as time and space

independence through the digitalization of CHT. Digital technologies improve the experience of tourists in CHT, which in turn leads to greater tourist satisfaction and loyalty in the tourism industry. The digitalization of CHT due to advanced technologies is a significant development in terms of both transmitting cultural values to future generations and preserving and promoting cultural values. This important development causes researchers to conduct various studies in the literature for conducting bibliometric analysis (Demirel İli & Hazarhun, 2021; Bozkurt et al., 2022; Çuhadar et al., 2022). While the usage and utilization of new technologies within the scope of CHT continues today, it is extremely important to instect the publications conducted in the literature on this subject. The previous studies performing bibliometric analysis utilized Scopus (Demirel İli & Hazarhun, 2021) with the research query of "Cultural Heritage" and "Digitalization" and WoS database with the research queries of "Cultural Heritage Tourism and Digital and Digitalization" (Bozkurt et al., 2022; "Cultural Heritage" and "Digitalization" (Çuhadar et al., 2022). As the usage and utilization of new technologies within the scope of CHT continues today, it is extremely important to instect the publications conducted in the literature on this subject. In this respect, the aim of this study is to inspect the published studies on the digitalization of CHT utilizing the bibliometric network analysis method. Therefore, studies published between 2010 and 2024 were gathered through the WoS database by searching the phrase "digitalization of cultural heritage tourism". In line with the determined phrase for the research, 74 published studies were obtained. On the other side, previous studies concuted by Demirel İli and Hazarhun (2021) extracted 25 publications between 2002 and 2021, Bozkurt et al. (2022) obtained 264 publications between 2004 and 2021, and Çuhadar et al. (2022) retrieved 248 publications between 1997 and 2022. Although this study and previous ones included similar databases and almost the same years, minor differences in the research query resulted in different publication numbers.

The analysis of bibliometric networks was implemented by utilizing VOSviewer software alike the previous studies with similar topic analysis (Demirel İli & Hazarhun, 2021; Bozkurt et al., 2022; Çuhadar et al., 2022). Primarily, bibliometric network analysis conducted to reveal the publication and citation frequency, and the distribution of publications by year. The studies obtained from the WoS database were 74 in number and had a total of 349 citations. The majority of studies on this topic were conducted in 2024 with 16 publications whereas previous studies were in 2019 with 7 publications (Demirel İli & Hazarhun, 2021) and 50 publications (Bozkurt et al., 2022); and in 2021 with 34 publications (Çuhadar et al., 2022). Then, bibliometric network analysis was performed to uncover the top publishing countries and co-authorship network analysis by countries and organizations. China was the country ranked first with 18 publications, however, Italy was ranked as the first country with 9, 68, and 67 publications respectively by Demirel İli and Hazarhun (2021), Bozkurt et al. (2022), and Çuhadar et al. (2022). According to this study, the countries that delivered the majority of publications on this topic were China, Italy, Spain, and Russia, respectively causing different findings from previous studies in co-authorship network analysis by countries and organizations. The findings of this study according to the the bibliometric network analysis for the keywords were noteworthy in that the keywords after the first four differed from the most similar previous studies: "cultural heritage" (Demirel İli & Hazarhun, 2021; Bozkurt et al., 2022; Çuhadar et al., 2022), "digitalization" (Demirel İli & Hazarhun, 2021; Çuhadar et al., 2022), "tourism" (Bozkurt et al., 2022), "cultural tourism" (Bozkurt et al., 2022); "COVID-19" and "sustainable development". Afterwards bibliographic coupling network analysis by countries, organizations, authors, and sources were uncovered that the outcomes were unique to this study providing another contribution to the literature and field. After inspecting the distribution of publishers and WoS ındex by studies; the distribution of studies by publication languages, WoS categories, and sustainable development goals are detected. Most of the studies were published by "Springer Nature" and this finding supports the results in

the study of Bozkurt et al. (2022). In addition, most of the studies were involved in the Emerging Sources Citation Index (ESCI) according to the outcomes of this study contradicts the findings of Çuhadar et al., 2022) in the Conference Proceedings Citation Index. The majority of the publications were released in the English language alike with the findings of Bozkurt et al. (2022) and Çuhadar et al. (2022). According to the findings of the study, the most mentioned WoS category was "Hospitality Leisure Sport", which is related to the study of Bozkurt et al. (2022) with the category "Accommodation, Leisure, Sports And Tourism" while contradicting the findings of İli & Hazarhun (2021) and Çuhadar et al. (2022) with categories "Computer Science" and "Information-"Library Science" respectively. Lastly, most of the studies (59%) emphasized sustainable development goals which were unique to the outcomes of this study maintaining another contribution. As a conclusion, it was determined that studies on the digitalization of CHT have increased in recent years and that few studies have been conducted yet. It is noteworthy that this study provides significant contributions to the literature in terms of displaying the global trends of a developing research topic and providing comparisons with the outcomes of similar previous studies, therefore guiding new studies to be conducted in the future in this field.

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