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Scientometric analysis of smart tourism using CiteSpace

Abstract. This scientific article is devoted to the scientometric analysis of one of the new and relevant areas in economics - smart tourism, which has become widespread in the last 10-12 years. The research was conducted based on the using of materials from the Web of Knowledge database (Web of Science Core Collection: Science Citation Index Expanded, Social Science Citation Index, Arts and Humanities Citation Index Conference Proceedings Citation Index - Science, Conference Proceedings Citation Index - Social Science and Humanities Book Citation Index - Science, Book Citation Index - Social Science and Humanities, Emerging Sources Citation Index) for 2008-2022, which was later uploaded to CiteSpace 5.8.R3 to implement the tasks set in the research article: analysis of co-citations, including by authors; cluster analysis by keywords.
It should be noted that the authors presented a capacious description of the WoS database array itself: from the perspective of the country component, institutes / universities / educational institutions and funding organizations, key sections, citation, types of documents, research area, Web of Science indexes / categories, etc. Also given a brief description of the authors whose work in the field of smart tourism is the most cited today. In general, it should be noted that the overall result of the search query «Smart Tourism» amounted to 724 documents, which were further used in the «Plain Text» format for scientometric analysis, which made it possible to determine the current and prospective areas of research in the field of smartification of tourism services, as well as build networks that visualize them visually.
The author's methodology for conducting scientometric analysis was also developed, starting from the moment the data array was received, and ending with the final visualization, which is universal, adaptive and complex, and can be used by any researcher when conducting a scientometric analysis of this kind in any of the branches of science, including in tourism.
Keywords: Smart Tourism; Tourism Digitalization; Scientometric Analysis; Bibliographic Analysis; CiteSpace

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Наукометрический анализ смарт туризма с использованием CiteSpace

Аннотация. Данная научная статья посвящена наукометрическому анализу одного из новых и актуальных направлений в экономической науке – смарт туризму, получившему свое распространение в последние 10-12 лет. Исследование проводилось на основе использования материалов базы данных Web of Knowledge (Web of Science Core Collection: Science Citation Index Expanded, Social Science Citation Index, Arts and Humanities Citation Index Conference Proceedings Citation Index - Science, Conference Proceedings Citation Index - Social Science and Humanities Book Citation Index - Science, Book Citation Index - Social Science and Humanities, Emerging Sources Citation Index) за 2008-2022 годы, который в дальнейшем выгружался в CiteSpace 5.8.R3 для реализации задач, поставленных в работе: проведение анализа ко-цитирований, в том числе по автору; кластерного анализа по ключевым словам.

Следует заметить, что авторами была представлена емкая характеристика непосредственно самого массива базы WoS: с позиции страновой компоненты, институтов / вузов / образовательных учреждений и финансирующих организаций, ключевых разделов, цитируемости, типов документов, области исследования, указателя Web of Science и др. Также дана краткая характеристика авторов, чьи работы в области смарт туризма на сегодняшний день являются наиболее цитируемыми.

В целом, необходимо отметить, что общий результат выдачи по поисковому запросу «Smart Tourism» составил 724 документа, которые далее в формате «Plain Text» были использованы для наукометрического анализа, позволившего определить текущие и перспективные направления исследования в сфере смартификации туристских услуг, а также построить сети, наглядно их визуализирующие.

Также была разработана авторская методика проведения наукометрического анализа, начиная с момента получения массива данных, и, заканчивая финальной визуализацией, которая является универсальной, адаптивной и комплексной, и может быть использована любым исследователем при проведении наукометрического анализа подобного рода в любой из отраслей науки, в том числе и в туризме.

Ключевые слова: смарт туризм; цифровизация туризма; наукометрические анализ; библиографический анализ; CiteSpace.

1. Introduction

Under the conditions of modern economic development, issues related to the study of the digital component become particularly relevant. In recent years, there has been an increase in the number of publications dealing with the analysis of the role of information technology in the emergence and development of smart tourism, which is inextricably linked to the creation of smart destinations.

The widespread introduction and use of various digital solutions in the main and complementary sectors of the tourism industry makes it possible, on the one hand, to create customized products based on the wishes and needs of customers and, on the other hand, ensures the broad involvement of service consumers in the process of learning about and getting to know a variety of objects at destinations, making tourism accessible to a broad mass of people.

Being a relatively new and multi-faceted economic phenomenon, smart tourism can be considered as a tool for generating sustainable tourism interest, including through the use of various digital solutions (audio guides, applications, corporate websites, virtual and augmented reality, etc.), and as an effective means of managing destination branding, the formation of a successful marketing strategy. At the same time, the authors of scientific articles still disagree on the relationship between the intelligent component of tourism and the scientific fields of knowledge: some scientists consider intelligent tourism as part of the information and communication component (IT-sphere), others as a direction of modern marketing and management based on the use of new technologies, still others as a resulting value from the experience that the customer has through the use of digital tools in the consumption of tourist services.

For a better understanding of current scientific trends and existing practical solutions in this field, it is advisable to perform a scientometric analysis of the publications presented in the Clarivate Analytics (WoS) database, which is *the aim of this scientific article*. The main objectives of the study are: selection of a dataset for analysis; basic characteristics of the resulting sample of works; study of common citations by authors, including the study of the research centers and institutes they represent, and by the articles themselves using CiteSpace.

2. Data Collection and Methods

Data were collected using materials from the Web of Science Core Collection scientometric database (Clarivate Analytics), which includes the Science Citation Index Expanded (Sci-Expanded; coverage - 1975 - present), the Social Science Citation Index (SSCI; coverage - 1975 - present), the Arts and Humanities Citation Index (AHCI; Coverage - 1975 - present), the Conference

Proceedings Citation Index - Science (CPCI-S; coverage - 1990 - present), the Conference Proceedings Citation Index - Social Science and Humanities (CPCI-SSH; coverage - 1990 - present), the Book Citation Index - Science (BCI-S; coverage - 2005 - present), the Book Citation Index - Social Science and Humanities (BKCI - SSH; coverage - 2005 - present), the Emerging Sources Citation Index (ESCI; coverage - 2017 - present). The formula for the exploratory search was: TS = Topic («Topic»): «Smart Tourism». The time period was not limited, so the query was processed from 1975. However, since the term entered the scientific cycle relatively recently, the first articles on the analyzed topic in the database date back to 2008, so the results of the study present further coverage within the period «2008-2022».

As a result, 724 publications were received for subsequent scientometric analysis based on the capabilities of the WoS database (Results Analysis, Create Citation Report) and using a special program for conducting a comprehensive and holistic study of this type - CiteSpace (version: CiteSpace 5.8.R3 (64-bit)). The parameters set in the above software product to achieve optimal results are as follows: Time slices - January 2008 - January 2022; the number of years in a time slice (years per slice) - 1; term source in the search (term source) - all sections; node type - changed depending on the task and type of analysis performed (co-citation analysis (cluster analysis), by author (co-author analysis), by keyword (co-word analysis)); selection criteria: scientific productivity index value (g-index) = 25, top N (levels of most cited or most frequently occurring items in each time slice) = 50.

Figure 1 shows the author's research methodology, which is complex and adaptable and includes 8 phases.

The first is the definition of the purpose and objectives of the study conducted by the authors; *the second* is the phase of preparation of the information field, whose structure and procedures for the selection of data have been described in detail above. *The third* phase is the phase of basic analysis of the obtained results, based on the use of the tools WoS - Results Analysis and Create Citation Report, as well as on the basic elements of descriptive statistics; *the fourth* is the phase of preparing a set of information for work in CiteSpace by uploading it in «plain text» format in the data collection mode - «Full Record and Cited References»; in the *fifth phase*, the basic parameters of the analysis project are set, in particular LRF (at the «unlimited» level), LIN (5), Filter Refs By Intrinsic Citations (2.0), LBY (unlimited) and percentage of nodes by Lebel (20%).

The sixth phase consists of preparatory activities related to the establishment of analysis criteria in CiteSpace, which include: the time period (in our case it is determined from the date of the first publication in the framework of the considered scientific problem to the present), the number of years in the time slice - an indicator that allows to concisely reflect the results of the analysis, especially in the case of a large number of publications and their depth in the framework of time intervals, the determination of the source of the search term (the best choice is all sections, the selection criteria (g-index and Top N) and the key elements, the variations of which depend on the type of analysis - co-author analysis (by authors of publications), co-citation and cluster analysis (by co-citations and on their basis with the assignment of homogeneous groups by keywords - cluster analysis), and co-word analysis (analysis of co-citations by keywords) - *stage 7*; in the final *eighth stage*, the data are visualized and the final interpretation of the results of the performed scientometric analysis is made.

3. Brief Literature Review

Smart tourism has gained particular popularity in the last 8-10 years, when special attention was paid to the aspects of smartification of economic sectors, destinations and individual areas. The analysis conducted by the authors of the scientific article has shown that the main part of the publications related to the research topic under study can be conditionally divided into several groups. Thus, *the first group* concerns aspects revealing the essence of using the CiteSpace software product for analysis in different branches of science: directly in the context of bibliometric analysis (Chen, 2016; Kim & Zhu, 2018) [1-2], chemistry and physics (Ma et al., 2020; Wang et al., 2022) [3-4], innovation theory (Xi et al., 2017) [5].

The second is a special pool of publications dedicated to the use of CiteSpace for the analysis of Smart Tourism, in particular to reflect a sociometric view of this economic category for the period 2008-2020 from the perspective of smart technologies and ecosystems, the creation and implementation of a unique tourism experience and in the context of the sharing economy (Borges-Tiago et al., 2022; Mamrayeva & Tashenova, 2017) [6-7]; bibliometric visualization of current and future
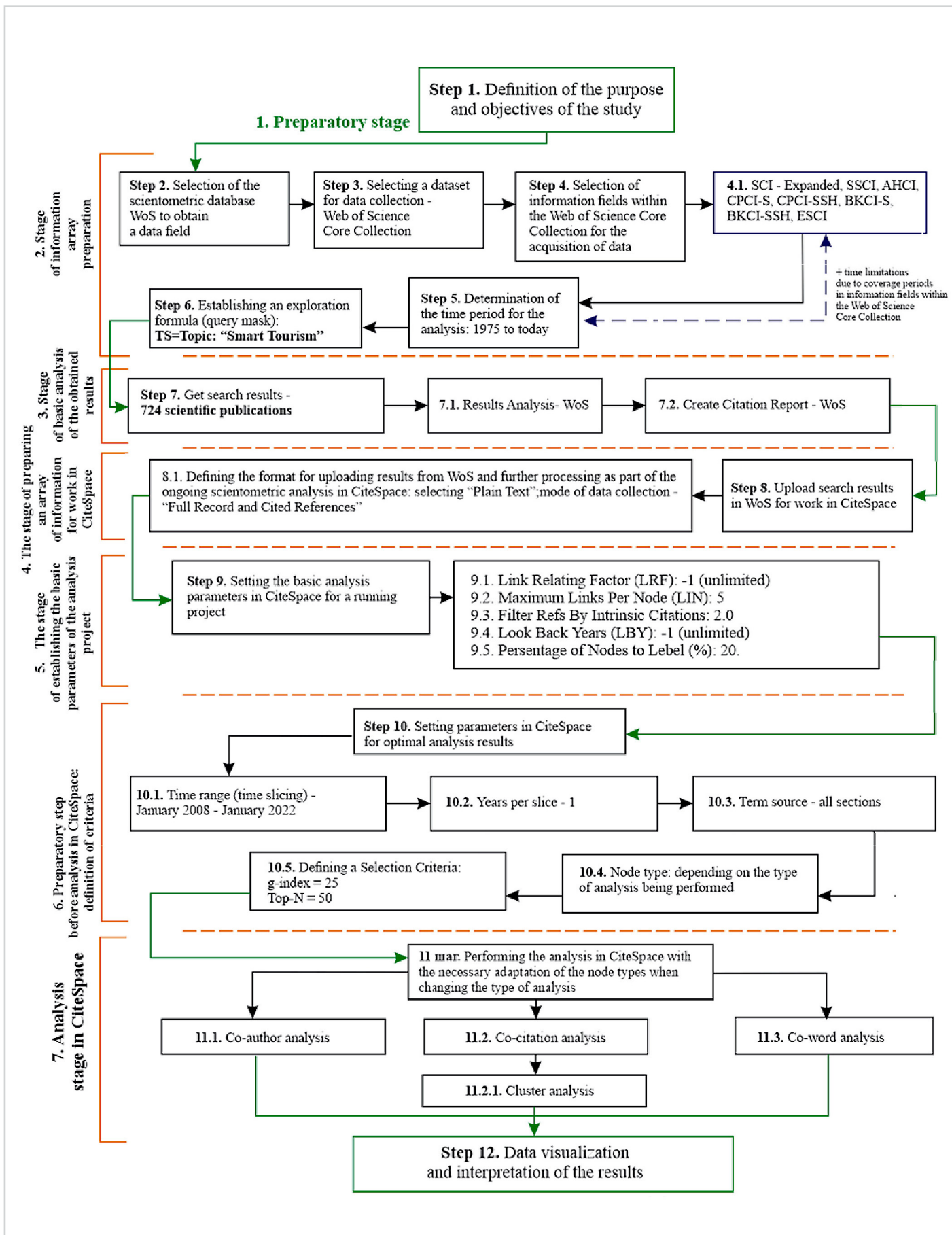
Figure 1:
Scientometric analysis methodology
Source: Developed by the authors

directions of tourism industry smartification and tourism demand forecasting (Chen et al., 2021; Johnson & Samakovilis, 2019; Liu et al., 2019; Zhang et al., 2020) [8-11]. A number of scholars are taking advantage of the program's capabilities to analyze social tourism as one of the most promising areas under the conditions of modern economic development (McCabe & Qiao, 2020) [12].

It should also be noted that a fairly large cohort of scientific papers (***the third group***) reflects the provisions regarding the management of sustainable systems (Babkin et al., 2017) [13], which may include tourist destinations (Azis et al., 2020; Ye et al., 2021; Zhang et al., 2018) [14-16]; conceptual approaches to study the nature and specific characteristics of smart tourism (Femenia-Serra & Neuhofer, 2018; Gretzel, 2018; Gretzel & de Mendonca, 2019; Gretzel et al., 2015) [17-20]; consideration of information services as smart components (Li et al., 2017; Gajdosik & Marcis, 2019; Geropanta et al., 2019; Hua, 2018; Lee et al., 2020; Tyan et al., 2020) [21-26]; methodological tools for assessing the tourism and recreational potential of the region, including from the perspective of the digital component / assessing the digital potential of complex integrated systems (clusters) (Mamraeva & Tashenova, 2020; Tashenova et al., 2020) [27-28].

Some scientific articles (***the fourth group***) deal with the analysis of international experiences in the implementation of smart technologies on the territory of a number of countries and regions of the world, for example, Spain (Ballina, 2020; de Esteban Curiel et al., 2017; Gonzalez-Reverte, 2019) [29-31], Slovakia (Gajdosik, 2017) [32], Slovenia (Johnson et al., 2021) [33], Portugal (da Costa Liberato et al., 2018) [34], United Arab Emirates (Khan et al., 2017) [35], Montenegro (Podzharaya & Sochenkova, 2020) [36], Romania (Sabou & Maiorescu, 2020) [37], Turkey (Salur et al., 2019) [38], South Korea (Um & Chung, 2021) [39], China (Wang et al., 2013) [40], and in Chalkidiki (Avdimiotis & Tilikidou, 2017) [41].

4. Results and Discussions

4.1. General characteristics of search results in the Web of Knowledge database (Clarivate Analytics)

The main pool of publications, according to the search query - «Smart tourism», falls on the PRC - 189 units. (26.1%), followed by South Korea - 95 articles (13.1%), Italy closes the top three with 92 (12.7%) scientific papers. It should be noted that countries such as Spain, the USA, Greece and England also have quite high publication activity within the scope of the scientific topics considered (Figure 2).

Regarding the type of papers, it can be noted that 417 units (58%) are articles published in scientific journals («Sustainability», «Asia Pacific Journal of Tourism Research», «Current Issues In Tourism», «Journal of Destination Marketing Management», «Tourism Review», «Advances In Social Science Education And Humanities Research», «Journal of Hospitality And Tourism Technology», «Technological Forecasting And Social Change», «Tourism Management», «International Journal of Tourism Cities», «Electronic Markets» and others), 244 (34%) - publications in conference proceedings
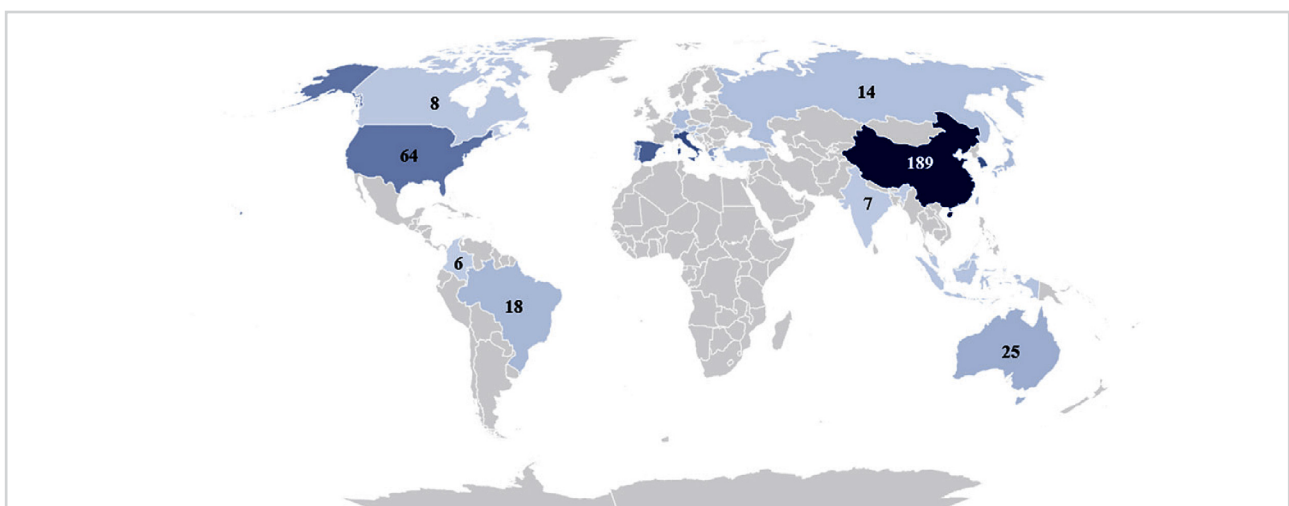

Figure 2:
Distribution of search results for the search query «Smart tourism»
Source: Developed by the authors

(«Springer Proceedings In Business And Economics»), the rest - sections of books («Smart Tourism As A Driver For Culture And Sustainability», «Analytics In Smart Tourism Design Concepts And Methods», «Tourism On The Verge», «Lecture Notes In Computer Science») and editorial content.

The distribution of published papers related to the categories of the TOP - 10 Web of Science is shown in Table 1.

Table 1:
Top 10 Web of Science categories for the query «Smart tourism»

Web of Science categories	Number of publications	%
Hospitality Leisure Sport Tourism	253	34.95
Green Sustainable Science Technology	119	16.44
Computer Science Information Systems	115	15.88
Environmental Studies	83	11.46
Computer Science Theory Methods	81	11.19
Environmental Sciences	76	10.50
Management	76	10.50
Engineering Electrical Electronic	74	10.22
Computer Science Artificial Intelligence	55	7.60
Business	51	7.04
Cultural Studies	44	6.08

Source: Compiled by the authors based on the search query «Smart Tourism» in the Web of Science (Clarivate Analytics)

According to Table 1, 253 publications belong to the field of «Hospitality Leisure Sport Tourism», which is explained by the nature of the scientific direction considered; 119 - to the field of «Green Sustainable Science Technology», which is, of course, the most important component of sustainable development of tourist destinations, based on the use of new information technologies in all stages of creation, supply and consumption of tourist services, including their smartification; 115 - to the field of «Computer Science Information Systems», which includes works explaining the specifics of the software products created to ensure the efficient operation of intelligent systems in tourism.

A somewhat different situation in the distribution of scientific publications can be observed in connection with the research areas: thus, 277 papers are concentrated within the direction «Social Sciences Other Topics» (including issues and aspects of tourism economics, development and popularization of destinations); 200 - «Computer Science»; 128 accounted for «Science Technology Other Topics»; 119 - «Business Administration», and the top five conclude 98 papers within the field of study «Engineering». These results once again confirm the multidisciplinarity of smart tourism, its close relationship with social sciences, economics and information technology.

Regarding the distribution of publications within the Web of Science indexes (Table 2), the largest share is accounted for by the Social Science Citation Index (SSCI) - 293 units, the Science Citation Index Expanded (SCI-EXPANDED) - 185 units, and the Conference Proceedings Citation Index - Science (CPCI-S) - 145 papers.

Table 2:
Distribution of publications in the Web of Science index for the search query «Smart tourism»

Web of Science index	Number of entries / articles	% of 724
Social Science Citation Index (SSCI)	293	40.47
Science Citation Index Expanded (SCI-EXPANDED)	180	24.86
Conference Proceedings Citation Index – Science (CPCI-S)	145	20.03
Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH)	109	15.06
Emerging Sources Citation Index (ESCI)	84	11.60
Book Citation Index – Social Sciences & Humanities (BKCI-SSH)	35	4.83
Arts & Humanities Citation Index (A&HCI)	4	0.55
Book Citation Index – Science (BKCI-S)	1	0.14

Source: Compiled by the authors based on the search query «Smart Tourism» in the Web of Science (Clarivate Analytics)

It is also important to consider the funding sources and universities conducting research in smart tourism (Table 3).

The leading organisations funding research in the field of «Smart Tourism» are the following: National Research Foundation of Korea, Ministry of Education of The Republic of Korea and National Natural Science Foundation of China NSFC, which correlate to some extent with the universities that have published the most papers in the scientific topics under consideration - Kyung Hee University, Hong Kong Polytechnic University.

Table 3:
TOP -6 educational institutions that have published the most papers on the research query «Smart tourism» and organizations that fund smart tourism research

University, funding organization	Number of records	%
1. TOP-6 universities with the largest number of publications for the research query «Smart Tourism» *		
Kyung Hee University	75	10.36
Hong Kong Polytechnic University	24	3.32
Universitat De Alacant	22	3.04
Sapienza - University of Rome	18	2.49
State University System of Florida	14	1.93
University of Florence	14	1.93
2. TOP-5 Organizations funding research within the search query «Smart Tourism» **		
National Research Foundation of Korea	45	6.22
Ministry of Education of The Republic of Korea	40	5.53
National Natural Science Foundation of China Nsfc	27	3.73
European Commission	16	2.21
Japan Society For The Promotion of Science	10	1.38

Notes:
* - 6 records are displayed because State University System of Florida and University of Florence have the same statistics.
** - 6 entries are shown because the European Commission and Japan Society for The Promotion of Science have the same score.

Source: Compiled by the authors based on the search query «Smart Tourism» in the Web of Science (Clarivate Analytics)

It is also possible to single out researchers whose work is quite extensive and deals with the aspects of smartification of tourism (Table 4).

In general, it can be stated that the works of the presented scientists deal with the conceptual aspects of the development of smart tourism, the consideration of the experience of its application in different countries, the sustainable development of the territory on the example of the use of various smart technologies (e.g. audio guides) for the popularization of tourist destinations and the formation of a sustainable tourist interest.

The total number of citations of all papers submitted in the query is 8063 (for 724 papers); there are about 11 citations on average for one article; the Hirsch index is 42, which indicates a high demand and importance of the research results in the field of «smart tourism», both from the point of view of business and from the point of view of other related scientific disciplines (geography, digitalization, engineering, etc.).

Table 4:
TOP -5 scientists with the largest number of publications in the field of «Smart tourism»

Name of the scientist	Number of publications	h–Index (WoS)	University	Most cited article(s) by subject / number of citations
Chung, Namho	33	4	Kyung Hee University	Lee P, Hunter WC, Chung N. Smart Tourism City: Developments and Transformations. Sustainability. 2020; 12(10):3958 / 25 citations.
Koo, Chulmo	31	28	Kyung Hee University	Gretzel, U., Sigala, M., Xiang, Z. et al. Smart tourism: foundations and developments. Electron Markets 25, 179 - 188 (2015) / 488 citations.
Gretzel, Ulrike	16	31	University of Southern California	1. Gretzel, U., Sigala, M., Xiang, Z. et al. Smart tourism: foundations and developments. Electron Markets 25, 179 - 188 (2015) / 488 citations. 2. Gretzel, U., Werthner, H., Koo, Ch., Lamsfus, C. Conceptual foundations for understanding smart tourism ecosystems. Computers in Human Behavior, Volume 50 (2015), 558-563 / 240 citations.
Lee, Hyunae	14	7	Kyung Hee University	Lee H, Hlee S. The Intra- and Inter-Regional Economic Effects of Smart Tourism City Seoul: Analysis Using an Input-Output Model. Sustainability, 2021; 13(7):403 / 41 citations.
Del Bimbo, Alberto	13	35	University of Florence	Seidenari L., Baecchi C., Uricchio T., Ferracani A., Bertini M., Del Bimbo A. (2018) Object Recognition and Tracking for Smart Audio Guides. In: Serra G., Tasso C. (eds) Digital Libraries and Multimedia Archives. IRCDL 2018. Communications in Computer and Information Science, vol 806. Springer, Cham / 2 citations.

Source: Compiled by the authors based on data from the search query «Smart Tourism» in the Web of Science (Clarivate Analytics) and Publons data

4.2. Results of scientometric analysis in CiteSpace

The above general characteristics of the results of the output of the Web of Knowledge database allowed a first description of the spectrum of publications in the field of smart tourism. CiteSpace, in turn, is a software product capable of performing an in-depth scientometric analysis of co-citations based on a database obtained from WoS / Scopus. In our case, as mentioned above, the WoS data will serve as such a source of information.

Following the methodology presented in Figure 1, we will first build a network of co-citations by authors (Figure 3).

The key nodes of the figure show the names of the researchers and the years of the most cited publications: Wang D. (2013), Amaranggana A. (2015), Li Y.P. (2017), Boes K. (2016), and others. It should also be noted that there is a correlation between the size of the surname and the number of citations. Using the obtained data, we will perform a cluster analysis of the co-citations of articles (Figure 4).

The data in the figure show that all publications can be conditionally classified into 9 clusters based on the analysis of co-citations: zero - «destination resilience», the first - «visualized review»,
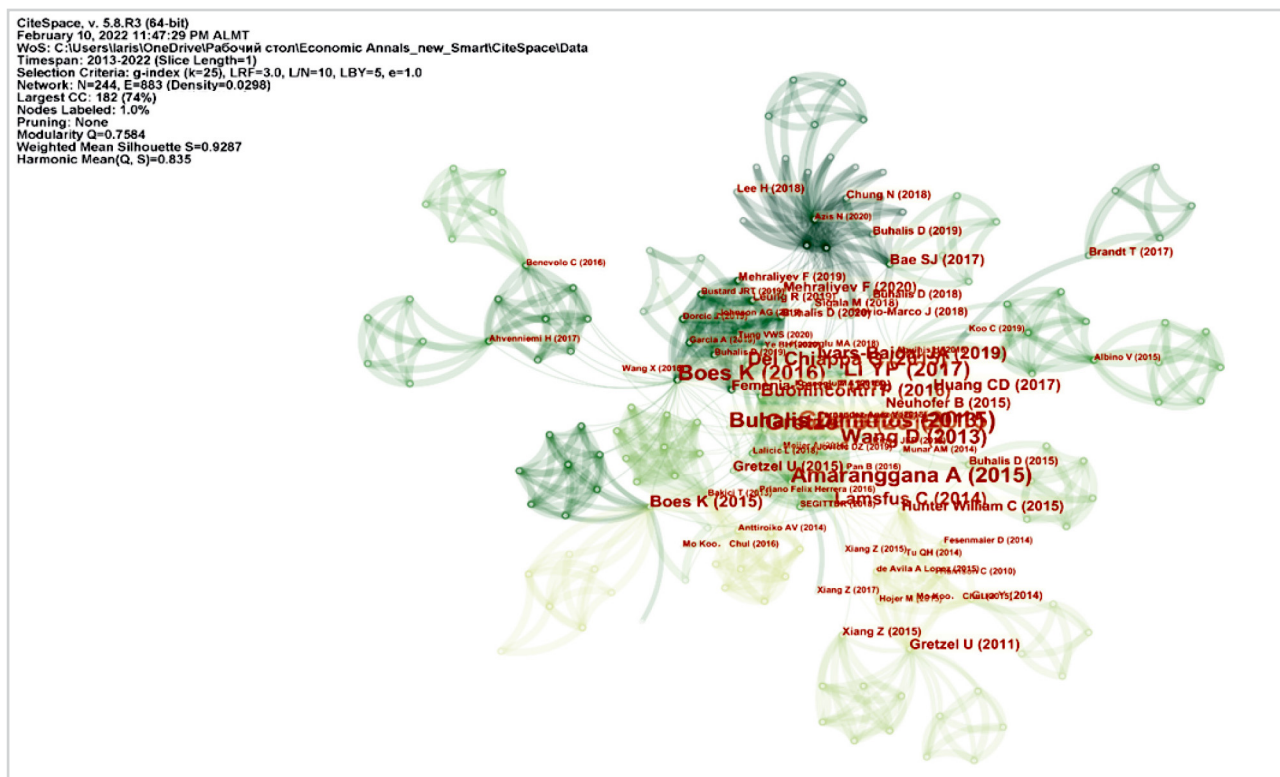

Figure 3:
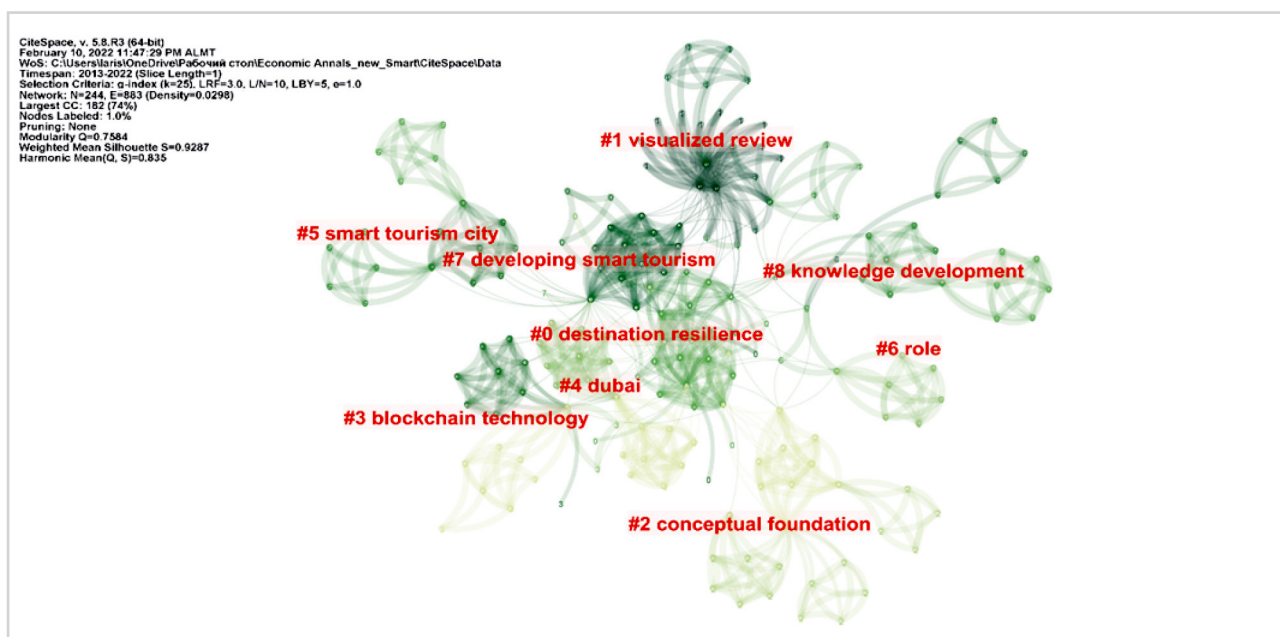**Co-author analysis**
Source: Developed by the authors

Figure 4:
Co-citations cluster analysis
Source: Developed by the authors

the second - «conceptual foundation», the third - «blockchain technology», the fourth - «Dubai», the fifth - «smart tourism city», the sixth - «role», the seventh - «developing smart tourism», the eighth - «knowledge development». The presence of a «zero» cluster does not imply any quantitative component characterizing the cluster itself; the thing is that the program itself starts the numbering of the found clusters at zero. In general, the resulting hierarchical units represented by clusters show once again the multidisciplinarity and multidimensionality of the economic phenomenon under consideration.

It should also be noted that in the context of the presented clustering, a rather high modularity index Q (Modularity Q) of 0.7584 characterizes the quality of clustering and the ability to divide the network (data field) into separate cluster units. Usually it ranges from 0 to 1, and the closer it is to 1, the higher the quality of clustering, as in our case. It is also important to note the high value of the weighted average silhouette indicator of 0.9287, which indicates high consistency of the data presented in the clusters, which is, of course, another verifiable value related to the study conducted by the authors.

Table 5 also shows the characteristics of the three strongest clusters in terms of the size of an indicator like «silhouette».

Table 5:
General characteristics of the 3 largest data clusters identified in the co-citations cluster analysis

Cluster number	Number of publications within the cluster	Silhouette size	Keyword within LSI (Latent Semantic Analysis)	Keyword within LLR (Likelihood Ratio Test: Logarithmic)	Keyword within MI (Likelihood Ratio Test: Based on Information Collection)	Average time period (year) occurring most often
0	30	0.869	smart tourism research	destination resilience (9.7; 0.005)	systematic review (1.18)	2016
1	29	0.919	smart tourism research	visualized review (3.53; 0.1)	smart tourism destination governance (0.08)	2018
2	25	0.967	smart tourism	conceptual foundation (14.97; 0.001)	tourism distribution channel (0.16)	2013

Source: Developed by the authors based on the results of the analysis in CiteSpace

The largest cluster (No. 0) consists of 30 publications and has a silhouette value of 0.869. From the perspective of LLR, LSI, and MI, it is characterized by keywords such as «smart tourism research», «targeted sustainability», and «systematic review». The main source for the cluster is Gretzel, Ulrike «From Smart Destinations to Smart Tourist Regions» (2018).

The second largest cluster (No. 1) consists of 29 articles and has a silhouette value of 0.919. It is characterized by keywords such as «smart tourism research» (LSI), «visualized overview» (LLR), and «smart tourism management» (MI). The most cited publication within this cluster is Borges-Tiago, Teresa (2022) «Smart tourism: a scientometric review (2008-2020)» (European Journal of Tourism Research).

The third largest cluster (No. 2) includes 25 scientific articles; the silhouette value is set at 0.967. The keywords and phrases associated with this cluster based on various semantic analysis algorithms are as follows: «intelligent tourism» (LSI), «conceptual framework» (LLR), and «tourism distribution channel» (MI). The main source for the cluster is Gretzel, Ulrike (2015) «Conceptual foundations for understanding smart tourism ecosystems» (Computers In Human Behaviour).

Figure 5 shows the result of a cluster analysis by keywords, distinguishing 7 clusters according to the results obtained: zero - «development smart tourism», the first - «smart tourism research», the second - «smart tourist cities», the third - «destination resilience», the fourth - «understanding smart tourism ecosystem», the fifth - «smart tourism design system», the sixth - «bibliometric analysis».

A brief description of all resulting clusters can be found in Table 6.

Figure 6 shows a timeline visualization of research results by year (2008-2020: the period when publications for the search query «Smart Tourism» are available in the WoS database) based on three analyzes performed: co-citations by author, co-citations by article, and a cluster analysis based on the latter, on which the relationship between citations and their intensity in different years of research on aspects of smartification by scientists is very visible.

It is important to note that the highest activity of mutual citations is observed in 2016-2019, which clearly reflects the figure constructed by the authors. At the same time, it is important to reiterate that «smart tourism» is a relatively new and not yet fully understood phenomenon, closely related to the emergence of new information technologies, whose progressive development will undoubtedly contribute to the emergence of new and «smart» digital solutions for tourism.

Regarding the limitations of the study conducted by the authors, it should be noted, firstly, that the data collection was carried out only in the Web of Science Core Collection, which was selected because it contains the largest collection of scientific publications, allowing a fairly effective and comprehensive tracking of citations.
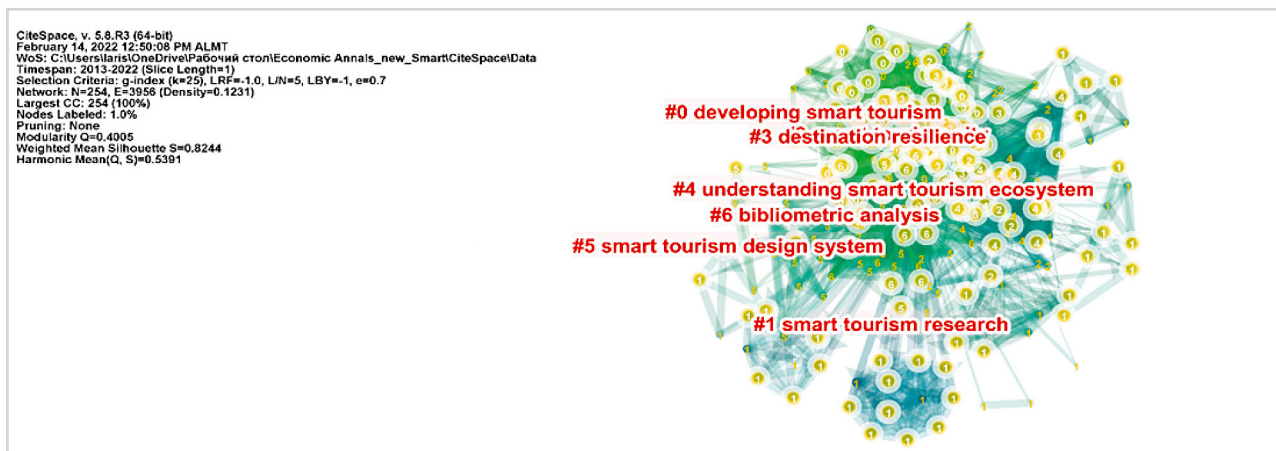

Figure 5:
Co-word cluster analysis
Source: Developed by the authors

Table 6:
General characteristics of the clusters obtained in the co-word cluster analysis

Cluster number	Number of publications within the cluster	Silhouette size	Average time period (year) occurring most often	Keyword within LSI (Latent Semantic Analysis)	Keyword within LLR (Likelihood Ratio Test: Logarithmic)	Keyword within MI (Likelihood Ratio Test: Based on Information Collection)
0	51	0.855	2014	developing smart tourism; scientometric review; smart tourism; rural smart tourism; smart tourism experience | smart tourism destination and others	developing smart tourism (21.16, 1.0E-4); scientometric review (15.76, 1.0E-4); smart tourism destination (6.99, 0.01) and others	rural smart tourism (0.19); smart tourism service supply chain (0.18); management mode (0.18) and others
1	51	0.839	2012	smart tourism; development strategy; value promotion; smart phone; industrial upgrading | mobile smart tourism; marketing system design and others	smart tourism research (20.58, 1.0E-4); development strategy (18.33, 1.0E-4); value promotion (18.33, 1.0E-4); smart tourism (17.74, 1.0E-4) and others	data mining (1.92); smart tourism system (1.92); cloud computing (1.92); rural smart tourism (1.92) and others
2	37	0.726	2016	smart tourism; smart tourism destination; blockchain technology; smart tourism destination governance; smart tourism research / smart city and others	smart tourism city (20.02, 1.0E-4); smart city (15.94, 1.0E-4); destination marketing website (11.9, 0.001); smart tourism cities (11.9, 0.001) and others	management mode (0.43); smart tourism project (0.43); Sichuan province (0.43); rural smart tourism (0.42) and others
3	36	0.812	2015	smart tourism destination; destination resilience; smart tourism region; smart destination; smart tourism experience | smart tourism research; smart tourism destination and others	destination resilience (13.21, 0.001); smart tourism region (8.89, 0.005); smart destination (8.89, 0.005); smart tourism destination (6.47, 0.05); smart tourism (6.23, 0.05) and others	rural smart tourism (0.2); smart tourism service supply chain (0.2); management mode (0.2); data mining (0.2); smart tourism system (0.2) and others
4	29	0.875	2012	smart tourism; understanding smart tourism ecosystem; conceptual foundation; systematic mapping; smart tourism destination | smart tourism research and others	understanding smart tourism ecosystem (11.72, 0.001); conceptual foundation (11.72, 0.001); systematic mapping (7.66, 0.01); blockchain technology (5.05, 0.05) and others	rural smart tourism (0.19); smart tourism service supply chain (0.19); management mode (0.19); data mining (0.19); smart tourism system (0.19) and others
5	28	0.834	2017	smart tourism; smart tourism design system; digital omotenashi; travel planning; smart tourism technologies | kano model; quality attribute and others	smart tourism design system (26.38, 1.0E-4); digital omotenashi (26.38, 1.0E-4); smart tourism technologies (21.86, 1.0E-4) and others	smart tourism service supply chain (0.34); rural smart tourism (0.33); management mode (0.33) and others
6	22	0.828	2017	smart tourism research; knowledge development; bibliometric analysis; artificial intelligence tool; smart tourism development and others	smart tourism research (25.74, 1.0E-4); bibliometric analysis (14.11, 0.001); knowledge development (14.11, 0.001); smart tourism (11.78, 0.001); artificial intelligence tool (7.78, 0.01) and others	smart tourism (0.13); rural smart tourism (0.13); smart tourism service supply chain (0.13); management mode (0.13); data mining (0.13) and others

Source: Developed by the authors based on the results of the analysis in CiteSpace
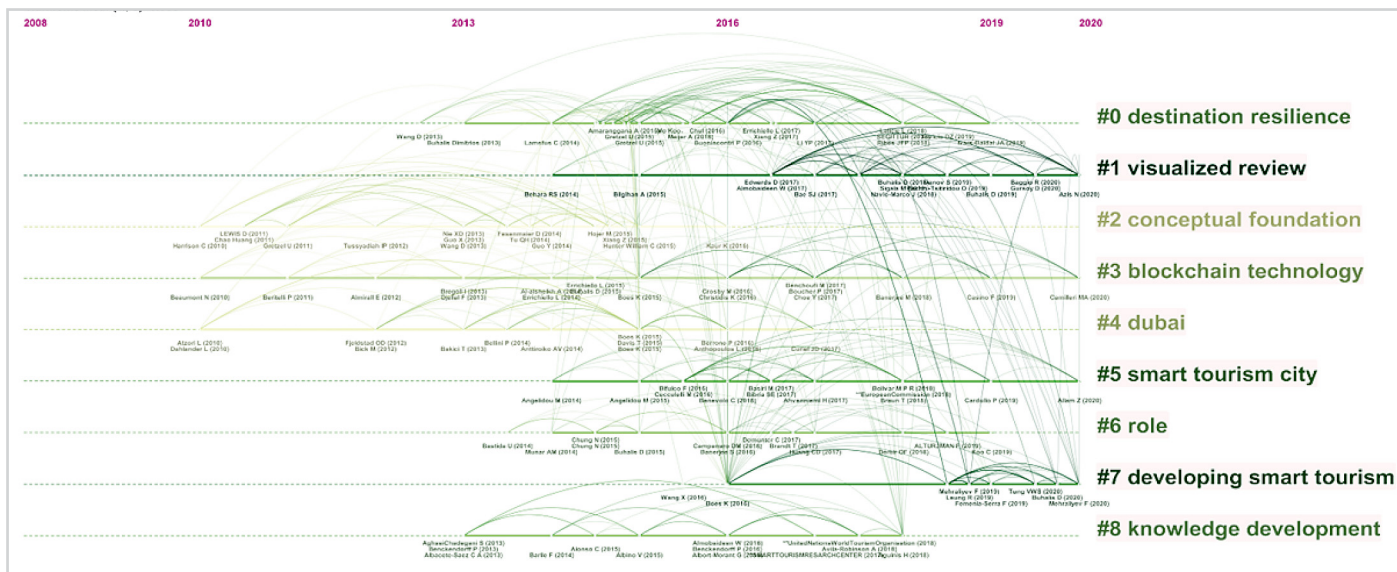
Figure 6:
**Timeline: Visualization of research results by year (2008-2020) based on 3 analyzes performed:
co-citations by article, co-citations by author, and cluster analysis**
Source: Developed by the authors

Secondly, the term «smart tourism» was specified in the search, which perhaps limited the search possibilities to some extent, and the system was not able to identify some of the relevant results related to the studied topic, for example, for such keywords as «digitization of tourism», «smart destinations», «smart technologies in the service sector» and others, but according to the authors of this scientific article, the results obtained through the search mask «smart tourism» already give a clear picture of the type of publications, citations, promising scientific directions in the issues of smartification of the tourism industry.

5. Conclusion

The research has shown that the study of smart tourism is relevant and timely. It should be noted that the first publication indexed in the scientific database Web of Knowledge on the subject of smartization of tourism services appeared only in 2008, so the economic phenomenon studied by the authors is a new and still little researched scientific field; at the same time, there is a clearly traceable relationship between scientific and practical research, interdisciplinarity and diversity, leading to the development of components and specific proposals for the tourism industry, for example, the creation of portable audio guides integrated into the system of smart cities, based on the use of Big Data, cyber-physical systems, virtual reality and other various digital products.

In general, the scientometric analysis allowed to obtain a picture of real and promising scientific and practical areas in the field of smart tourism, one of which is the formation of high quality content for the creation of smart audio guides and their placement on different platforms (izi.Travel, Qwixi, etc.) for the purpose of popularizing destinations and forming a sustainable tourist interest.

Further research of the authors will be related to the study of the features of the use of smart technologies in the structure of tourist and excursion services in the world's leading tourist centers, as well as the creation of urban tourist routes in Central Kazakhstan and their uploading to the platform izi.Travel.

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