urban science

MDPI

Review

A Bibliometric and Content Analysis of Sustainability and Smart Tourism

Clara Madeira [1,2,3,*], Paula Rodrigues [1,2] and Monica Gomez-Suarez [3]

[1] Faculty of Economics and Management, Universidade Lusíada–Norte, R. de Moçambique 21, 4100-346 Porto, Portugal
[2] COMEGI (Research Centre in Organizations, Markets and Industrial Management), R. da Junqueira 188-198, 1349-001 Lisboa, Portugal
[3] Department of Finance and Marketing Research, Universidad Autónoma de Madrid, Cantoblanco, 28049 Madrid, Spain
* Correspondence: clara-madeira@hotmail.com

Abstract: Sustainability and smart tourism are current hot topics in academic research. While these two concepts are complementary, their relationship has not been clearly outlined in the scientific literature. This bibliometric analysis aims to address this gap by examining the literature on sustainability and smart tourism. Specifically, this review has five objectives: (i) to document the size and growth of the literature on this topic, (ii) to identify the key authors, journals, and documents, (iii) to categorize the countries with the highest productivity rates, (iv) to highlight emerging topics and their relationship to the conceptual structure of each domain, and (v) to analyse the methodology approach. A total of 104 scientific documents were searched and analysed from the Web of Science Core Collection for the period 1900–2022 using R-Program and VOSviewer. The results indicate that there is an emerging knowledge base with main clusters identified in smart tourism, sustainable tourism, innovation, and smart cities. China, Spain, the Republic of Korea, Italy, Iran, and Portugal have demonstrated the highest rate of scientific production. This review provides valuable insights for both academics and practitioners seeking to expand their knowledge of sustainability and smart tourism research. It also offers new perspectives on the future development of these areas within the social sciences' academic literature.

Keywords: sustainability; smart tourism; smart cities; innovation; bibliometric review

Citation: Madeira, C.; Rodrigues, P.; Gomez-Suarez, M. A Bibliometric and Content Analysis of Sustainability and Smart Tourism. *Urban Sci.* **2023**, *7*, 33. https://doi.org/10.3390/urbansci7020033

Academic Editor: Deborah Edwards

Received: 28 February 2023
Revised: 12 March 2023
Accepted: 13 March 2023
Published: 23 March 2023

1. Introduction

Research in the areas of sustainability and smart tourism has been a subject of interest in recent years [1,2]. Several explanations might be found for this increase of interest, including collaborations among scholars within the academic community resulting in academic contributions that can help to understand these fields [3]. Several published articles have presented bibliometric studies on both topics separately. Nevertheless, although a number of studies, such as [4–7], have shown the importance of smart technologies for sustainable tourism, to the best of the authors' knowledge, there are no bibliometric reviews relating to both fields together. Moreover, there is an absence of relational studies using social network analysis in the tourism domain [8]. For this reason, the purpose of this research is to fill this void, by examining how the research about sustainability and smart tourism has globally evolved.

Concerning the topic of sustainability, knowledge management [9], human resource management [10], tourism development [11], entrepreneurship [12], corporate governance and board attributes [13], socially responsible funds [14], and leadership [15] are distinct sub-disciplines analysed with this methodology.

Regarding smart tourism, bibliometric studies on this topic [16,17] have also been of interest for both academics and business practitioners, due to its capacity to provide

useful information, timely data, and interconnectivity between tourism stakeholders [18]. As Celdrán-Bernabeu et al. [3] suggest, the interest in smart tourism as a research topic is growing within the academic community, and the collaborations established between researchers help to understand this field. For instance, Johnson and Samakovlis [16] examined the production of smart tourism knowledge and found that the most dominant authors within the authorship sub-clusters were Law, Leung [19], Lorenzo Cantoni, Ulrike Gretzel, Hannes Werthner, Chulmo Koo, and Namho Chung.

With respect to the emerging themes, the abovementioned authors analysed the keywords included in the papers and showed associations to terms, namely smart city, smart tourism, social media, and information technology.

This study aims to analyse the scientific production on sustainability and smart tourism. First, it covers the geographical and yearly distribution. Second, the main authors, articles, and top keywords are identified. Moreover, the clusters regarding the conceptual structure are shown. Then, a content analysis is performed to describe the theoretical or empirical nature of the most cited publications, featuring the major lines for future research within these fields and revealing the knowledge pillars of the respective concepts.

One of the main purposes of this study is to provide orientation and guidance to academics and practitioners who are developing their investigation within this field. Thus, this research increases their knowledge about the key scientific journals, authors, and articles shaping this topic. Moreover, these findings could also help scholars who are at an initial phase of their careers by listing the most prominent countries and institutions where they might develop their studies [20].

Hence, four research questions guided this systematic and bibliometric review of research on sustainability and smart tourism:

RQ1: How has scientific production on sustainability and smart tourism evolved geographically and yearly?

RQ2: Which authors, journals, and documents on sustainability and smart tourism have achieved the greatest scholarly impact?

RQ3: What is the conceptual structure of the knowledge base on sustainability and smart tourism?

RQ4: What are the gaps and directions for future research?

Regarding methodology, this study uses data derived from the database Web of Science (WoS) Core Collection, recognized as an important database used by tourism academics [21,22] and in interdisciplinary, international social science publications. The analysis and visualization process resorts to VOSviewer and R-Studio (Bibliometrics version 3.6.3). Through the application of a social network analysis (SNA), it was possible to identify collaborative networks specifically in sustainability and smart tourism, providing a deeper understanding of knowledge developing in the tourism domain [23]. Using several bibliometric indicators, this paper examines the main academic contributions in researching the relationship between sustainability and smart tourism.

This paper is organized as follows. In the next section, the theoretical framework is presented. Then, the methodology and the data collection process are introduced, followed by the presentation of the bibliometric review results that describe the state of the art of the studied topics. Additionally, through a social network analysis, two maps concerning the keywords and citation connections, respectively, are developed. The keyword analysis allowed us to identify four clusters. Finally, a content analysis and the main future research lines we identified based on the most cited articles of each conceptual cluster were elaborated.

2. Theoretical Framework

2.1. Smart Tourism

Smart is a current buzz term that cuts across many sectors and activities and is present on a daily basis. Gretzel, Werthner [24] (p. 559) described "Smart" as "a prefix to technological terms to indicate special capabilities, intelligence and/or connectivity, as in smart phone or smart card". It has also been associated with resource optimization

through advanced technologies [25] or the interconnection and synchronization of different technologies [26]. The term "smart cities" has been widely used to describe different types of urban areas. As Harrison et al. [27] indicate, smart cities are urban areas that make use of operational data (e.g., traffic congestion data, power consumption statistics, etc.) and are capable of analysing this information and optimizing the city services in constant interaction with its inhabitants. These services have been made available to tourists, and one of the goals of smart cities is to be a smart tourism destination [28,29].

The constant development of information and communication technologies (ICTs) has challenged tourism practices and brought smartness into destinations. Several articles have been devoted to the analysis of smart tourism destinations [30–32]. Thus, Jovicic [33] (p. 278) defines a smart tourism destination as "a knowledge-based destination, where ICTs are used to provide a technological platform on which information and knowledge relating to tourism could be instantly exchanged". Following this trend, the European Union has promoted the "European Capital of Smart Tourism" initiative to reward and share the most exemplary European cities that implement tools, measures, and projects to develop smart tourism. The European Union [34] defines a smart tourism destination as "a destination that facilitates access to tourism and hospitality products, services, spaces, and experiences through ICT-based tools". Additionally, these practices must be centred around four key categories: sustainability, accessibility, digitalization, and cultural heritage and creativity.

2.2. Sustainability

Considering the different domains of sustainability that have been studied, one of the challenges is the lack of consistent definitions in the literature [35]. Based on a systems perspective, Ben-Eli [35] (p. 1340) offers the following definition of sustainability: "a dynamic equilibrium in the process of interaction between a population and the carrying capacity of its environment such that the population develops to express its full potential without producing irreversible adverse effects on the carrying capacity of the environment upon which it depends". According to the author, this definition portrays the idea of sustainability as a catalyst for creating a cohesive and functional balance between people, society, the economy, and the Earth's regenerative ecosystems, ensuring their ability to support life in the long term.

Many global organizations such as the OECD, the European Union, and the United Nations have been increasingly addressing this issue and warning multiple entities, governments, and populations on the consequences of their actions. International events such as the United Nations Conference on Sustainable Development organized in 2012 that addressed themes such as green and blue economies [36], the United Nations General Assembly in 2015 that provided a concrete goals agenda, and the Agenda 2030, in which the Sustainable Development Goals were defined [37] are examples of tangible steps that are being taken to promote sustainable practices.

In the scope of smart tourism, according to the European Union [34], sustainability goes beyond the societal equilibrium described by Ben-Eli [35] and includes various actions that should be taken in order to better manage the city resources, such as reducing seasonality and engaging locals and tourists in tourism activities. Climate change, the diversification and protection of local economies, the efficient management of natural resources based on more eco-friendly energies, and the city development are some of the concerns that should be considered by policymakers in the development of smart tourism practices.

2.3. Integrating Sustainability and Smart Approaches in Tourism

It is recognized that sustainability and smart approaches are closely related in the context of tourism [1,34], reinforced by the various definitions of smart tourism or smart cities encountered in academic papers that outline resource optimization [25,27], efficiency [35], competitiveness, and inclusiveness [18]. In fact, the smart tourism paradigm emphasizes the importance of efficient, responsible, and sustainable management of tourism resources as a crucial strategic goal for tourism destinations [6]. Inversely, the integration of big data

and artificial intelligence into tourism services is also a key instrument to achieve sustainability [2]. Despite the conceptual connection between smart tourism and sustainability, there are several challenges that hinder their implementation, such as financial resources, incompatibility between market competitiveness and long-term growth, and even human behaviour (tourists, employers, and locals). These challenges, along with the complexity of both fields and the novelty of smart tourism, create a barrier to further empirical analysis into the relationship between sustainability and smart tourism. Therefore, more research is needed to explore the intersection of these topics in the scientific literature. According to Shen et al. [6], the merger of sustainable and smart strategies can be accomplished, for example, by encouraging suitable practices and involving tourists as co-managers, co-designers, and co-creators of tourism experiences. In addition, implementing eco-friendly practices, such as reducing plastic waste, conserving water and energy, and promoting local culture and products, can contribute to sustainability while also enhancing the tourist experience. Moreover, using technology to facilitate sustainable tourism, such as mobile apps that provide information on eco-friendly accommodations and activities, can also promote smart tourism.

3. Methods

3.1. Bibliometric and Content Analysis Methods

To understand the scientific production and the evolution over the last few years of sustainability and smart tourism, we performed a bibliometric analysis using bibliometrics and SNA. This approach has become popular to draw trends and deepen the understanding of emerging concepts [22,38]. Accordingly, its application seems to fit the objective of our research.

Bibliometrics applies mathematical and statistical methods to aggregated bibliographic data produced by other scientists within the field who express their opinions through citation, collaboration, and writing [39,40]. These methods represent a systematic, unambiguous, and replicable review process, while reflecting both quantitative and qualitative analysis [40–42].

Bibliometric tools withstand the measurement of publications and citations. While the former reflects productivity in quantifiable terms, the latter presents influence and quality of scientific production. These measures are analysed per author, per geographical area, and per time period. Moreover, the relevance of topics mentioned across the literature and the main methodological approaches of articles are determined through statistical analysis of keywords.

Subsequently, SNA is used to map bibliographic data, complementing bibliometrics. SNA facilitates the examination of various relationship structures and provides a straightforward interpretation of the corresponding interactions. Through mapping processes, it can measure relationships between nodes and understand how knowledge flows [42,43]. In addition, it identifies clusters that reflect strong groups within the networks [44]. Focusing these aspects, the main objective within SNA falls on the construction and analysis of networks.

In this study, we created a keyword co-occurrence network, which allows us to understand how the most relevant themes and core scientific knowledge around sustainability and smart tourism relate [45,46] and to identify the knowledge structure of the subject area [16]. The content analysis allows us to summarize the patterns in the literature by recognizing the "hot spots" and "blind spots" as well as complementing the previous selected methods [47,48]. Thus, the empirical investigation in this study endeavours to (i) understand the size and growth of scientific output in these topics, (ii) identify the most influential authors as well as the most productive countries, (iii) recognize core themes, (iv) uncover the main methodological approaches, and (v) recap the main future research guidelines.

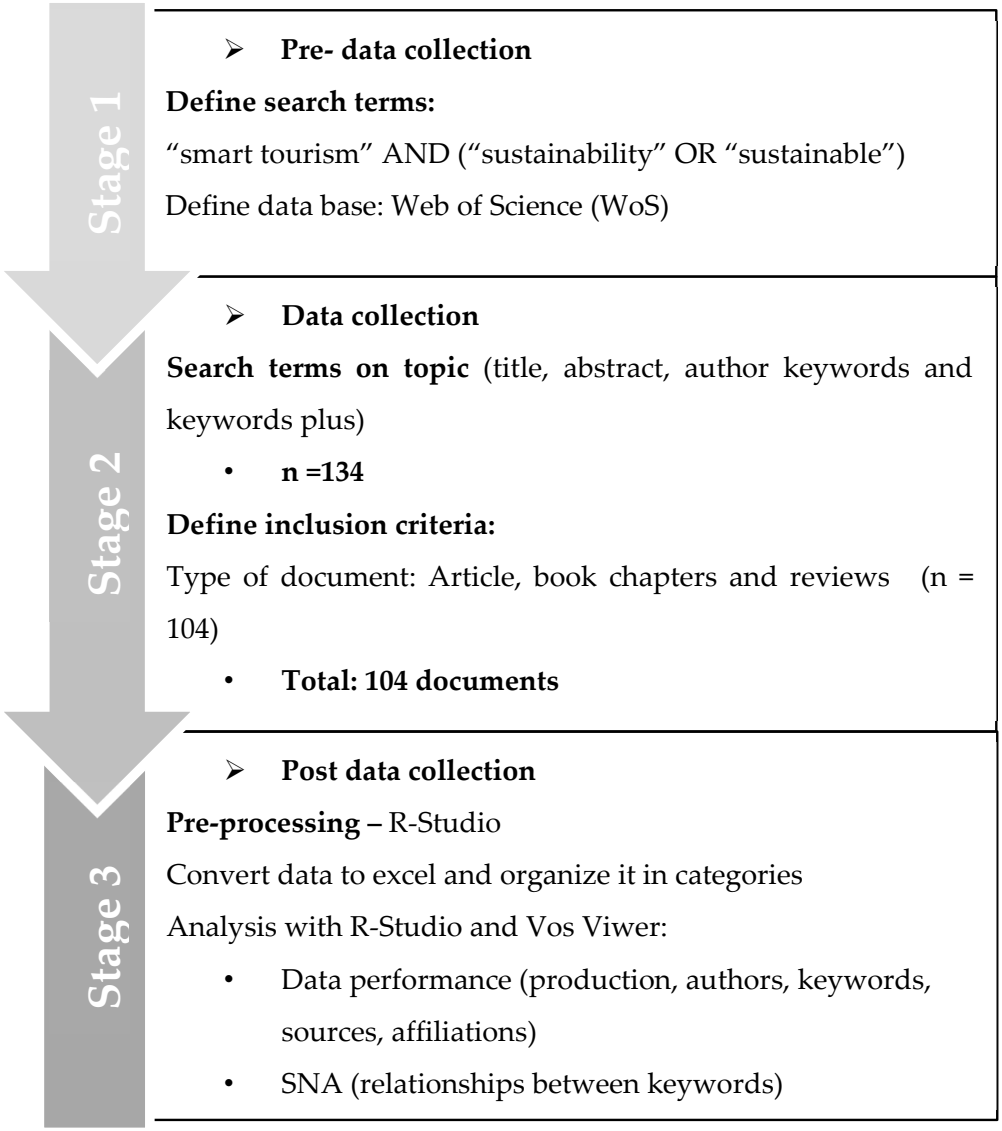
To develop the bibliometric analysis, we used the Bibliometrix package (which offers resources to analyse and map bibliometric information) that works under the R-Program

software (version 3.2.3). For SNA, we used VOSviewer (version 1.6.15) [49]. This method can reveal how scientific research in smart tourism and sustainability has contributed to theoretical discussions, methodological advancements, and practical implications in this field.

3.2. Data Collection

To sustain our bibliographic analysis, data from Web of Science [50] was collected. The search encompasses title, abstract, author keywords, and keywords plus and focuses this combination: "smart tourism" AND ("sustainability" OR "sustainable"). Additionally, only articles, book chapters, and reviews were considered.

All information published on WoS until the day of search, 19 December 2022, was considered. Hence, the database results in 104 articles from 2015–2022. The process to collect data is depicted in Figure 1.



Source: Own elaboration.

Figure 1. Data acquisition and pre-processing for bibliometric analysis.

Note that, complementarily to the information from WoS, some qualitative categories, such as methodological approach, core themes, and future research lines, were assigned to each of the 104 articles after an attentive reading. All the data were then pre-processed for a better and more precise analysis.

The main indicators from the information retrieved from WoS show that the final database consisted of 104 documents from 52 different sources published between 2015 and 2022. Collaboration is predominant, with more than 90% of the documents having multiple authors. On average, each article is attributed to approximately 3 authors and has around 17 citations.

In the upcoming sections, a bibliometric review and content analysis will be conducted.

4. Results

4.1. Bibliometric Analysis

Figure 2 depicts the growth of scientific research on sustainability and smart tourism in cumulative terms from 2015 to 2022. It has been growing exponentially, especially from 2018 to 2020, but slightly decreased from 2020 to 2022. In fact, smart tourism has become a buzz term not only in academics but also in the media and the business world. In 2019, the European Union promoted a new initiative to find the "European Capital of Smart Tourism", recognizing exemplary European cities on practices of smart tourism.

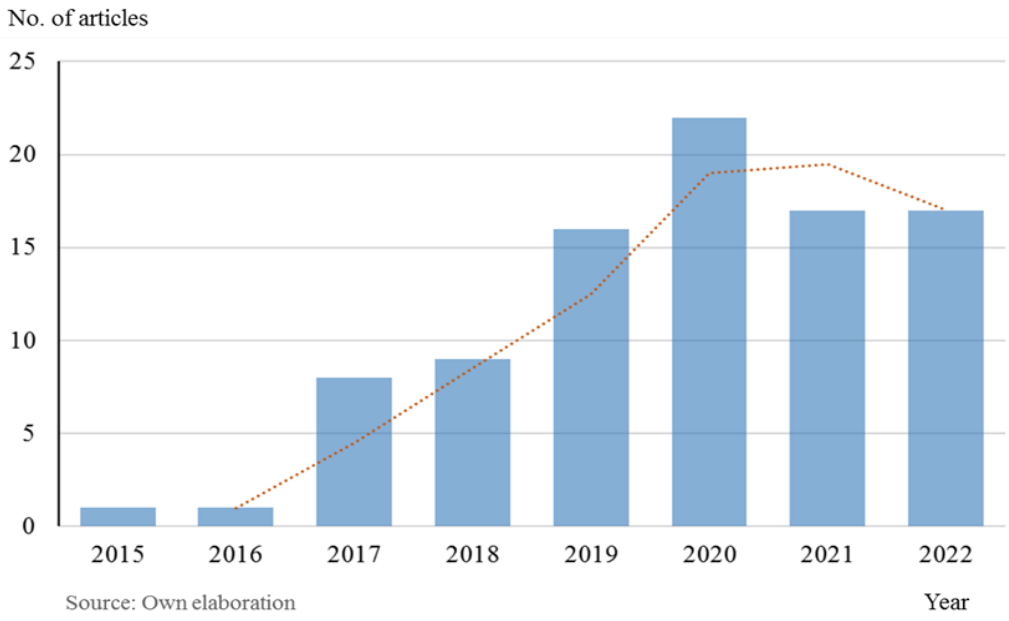
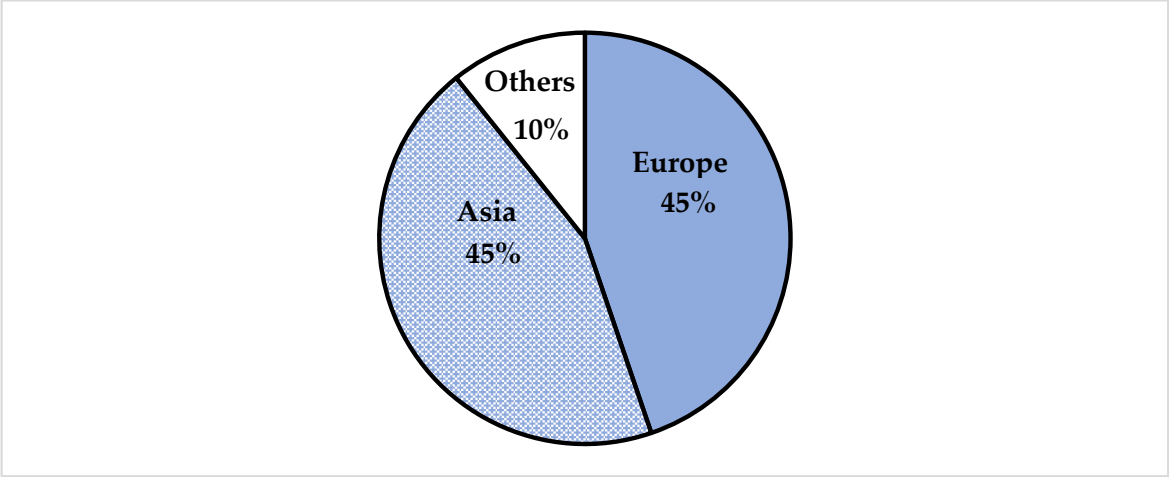


Figure 2. Annual scientific production, 2015–2022.

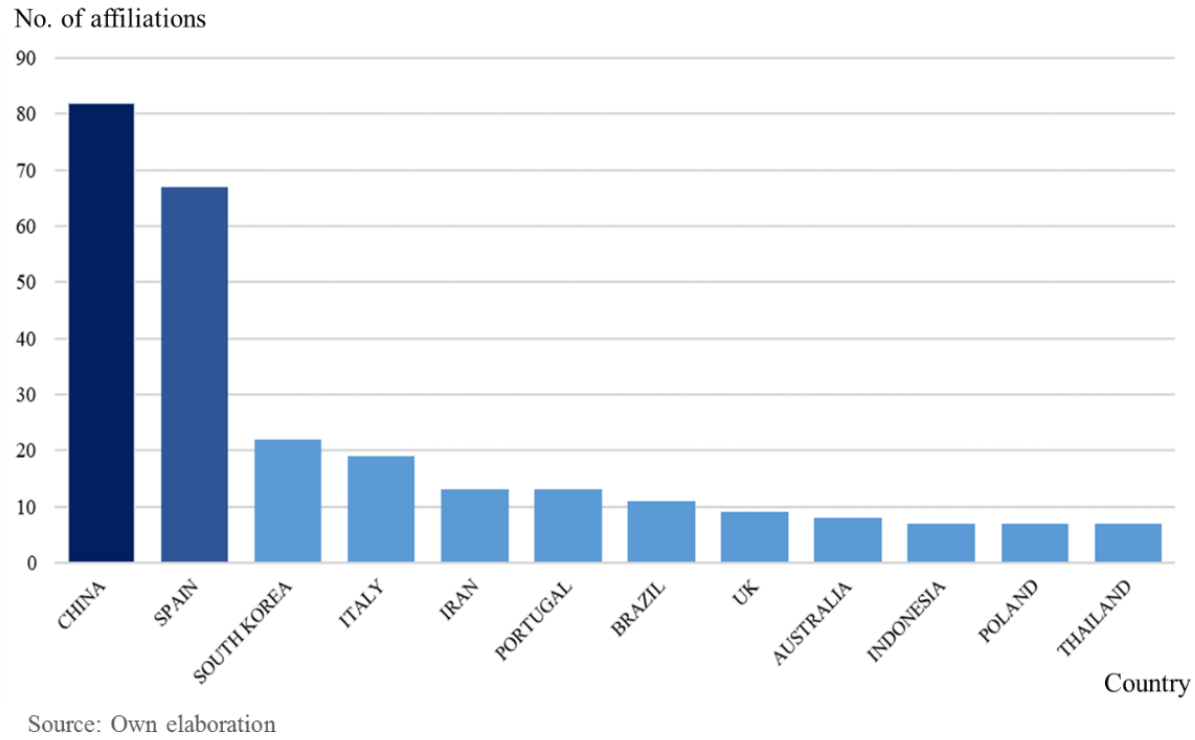
This might have raised awareness for the academy to explore the theme of smart tourism. Nonetheless, in 2020, the research might have shifted to other topics in the face of the consequences of the COVID-19 pandemic on tourism (which decreased significantly). Based on the data presented, it is perceived that the combination of sustainability and smart tourism is a relatively recent phenomenon on a global scale. This may be due to the fact that smart tourism is a new and developing field of research, with a focus on conceptual works that have yet to explore specific aspects of smart tourism, including sustainability. In order to find gaps in the literature related to sustainability and smart tourism, additional bibliometric statistics have been developed.

To gain insight into the geographic dissemination of the academic research, the overall distribution per continent is depicted on Figure 3 and the top 12 countries in Figure 4, based on the affiliation of all authors.



Source: Own elaboration.

Figure 3. Scientific production per continent (%), 2015–2022.



Source: Own elaboration

Figure 4. Scientific production per country, 2015–2022.

Crossing information from both figures, we note that the scientific literature is predominantly from Europe, where the Mediterranean region, including Spain, Italy, and Portugal, contributes the most, and Eastern Asia, strengthen by the production of China, mainly, and the Republic of Korea. Oceania, Africa, and the Americas are incorporated in "Others" (Figure 3), as they have individually a less significant proportion of article production. In this analysis, two clusters are identified: a group of Asian countries characterized by technologically integrated cities that relate to the smart concept and Southern Europe, which is highly dependent on tourism and not necessarily reputable for technological interconnectivity in its cities.

To show these differences, Table 1 presents aggregated indexes from (1) tourism, with the relative contribution of travel and tourism to employment and to GDP, data from 2019 retrieved from the World Travel and Tourism Council (WTTC) [51] Economic

Impact Reports; (2) technological development, with the 2022 Innovation Index from the World Intellectual Property Organization (WIPO) [52] and 2020 expenditures of research and development (R&D) in total gross domestic product (GDP) from the OECD [53] gross domestic spending on R&D; and (3) sustainability, through the 2020 Sustainable Development Goals Index (SDG), which tracks country performance on the 17 SDGs, as agreed by the international community in 2015 with equal weight to all 17 goals [54]. These measures show that Eastern Asian countries have a better performance in technology, while Southern Europe has a significant social-economic dependence on tourism, reflected in employment and GDP.

Table 1. Indicators of tourism, innovation, and sustainability.

	Tourism		Innovation and Technology		Sustainability
Country	**2019 T&T % of Total Employment**	**2019 T&T % of Total GDP**	**2022 Innovation Index**	**2020 R&D Expenditures % of Total GDP**	**2020 SDG Index**
China	10.3	11.3	55.3	2.1	73.9
Korea	4.8	4.2	57.8	4.5	78.3
Spain	14.6	14.3	44.6	1.2	78.1
Italy	14.9	13.0	46.1	1.4	77.0
Portugal	18.7	16.5	42.1	1.4	77.6

Source: Own elaboration.

In fact, regions such as Seoul in Korea; Beijing, Shenzhen, and Hong Kong in China; or Tokyo and Yokohama in Japan are internationally recognized for their smart cities, through the high investment in the IoT (Internet of things) towards the construction of infrastructure, housing, networks of transportation and services, and many others [53]. In Korea and Japan, governments have been investing in smart and eco-city projects from the early 2000s, while China has been adopting the latest smart technology for urban management [55]. On the other side, Southern Europe does not stand out in terms of high-tech urban structures in comparison with Northern European countries, such as Switzerland, the United Kingdom, and Sweden. Nonetheless, governments have been applying efforts in the development of smart systems in the scope of tourism [53].

Table 2 presents the top five articles based on the cumulative number of citations since their publication (higher than 50 citations). These articles have been published by authors from the two clusters identified in the previous section: Sun et al. [56], Pan et al. [57], and Shafiee et al. [58] from the Asian cluster, and Pencarelli [59] and Encalada et al. [60] from the European cluster. The document from Sun et al. [56] has an impressive mark of almost 500 citations. It conceptualizes "smart and connected communities" as a natural evolution of "smart cities" and presents a case study—TreSight—in Trento, Italy, that integrates the IoT and big data analytics for smart tourism and sustainable cultural heritage. It has become a guide and reference not only for scientific investigators but also for managers of city services.

Table 2. Most cited articles about smart tourism and sustainability, 2015–2022.

First Author, Year	Affiliation of First Author	Title	No. of Citations	Average No. of Citations/Year
Sun Y (2016) [56]	China	Internet of things and big data analytics for smart and connected communities	479	68.43
Pan SY (2018) [57]	Taiwan	Advances and challenges in sustainable tourism toward a green economy	149	29.80

Table 2. *Cont.*

First Author, Year	Affiliation of First Author	Title	No. of Citations	Average No. of Citations/Year
Pencarelli T (2020) [59]	Italy	The digital revolution in the travel and tourism industry	67	22.33
Shafiee S (2019) [58]	Iran	Developing a model for sustainable smart tourism destinations: a systematic review	62	15.50
Encalada L (2017) [60]	Portugal	Identifying tourist places of interest based on digital imprints: towards a sustainable smart city	55	9.17

Source: Own elaboration.

With respect to the scientific production per journal (Table 3), it is possible to observe that *Sustainability* attains a dominant position with its 38 published articles (37% of the total) and almost half a thousand citations. *IEEE Access* published one article that is currently the most cited of the database: "Internet of things and big data analytics for smart and connected communities" by Sun et al. [56]. The remaining 50 journals have a significantly lower output, averaging one paper per journal. Even though the number of articles is low, journals such as *Science of the Total Environment* (149), *Tourism Management Perspectives* (69), and *Journal of Destination Marketing & Management* (62) demonstrate a high rate of citations. One possible explanation for these results is the interdisciplinary nature of the topics covered across different academic fields (see Table 3). In terms of impact factor outlined in the 2021 Journal Citation Reports [61], *Science of Total Environment* is attached to the highest value (10.76) followed by *Tourism Management Perspectives* (7.61) and *Journal of Destination Marketing & Management* (7.16). Environmental sciences and business, management, and accounting are cross topics among the most relevant journals.

Table 3. Ranking of the five most productive and influential journals (sorted by citations), 2015–2022.

Journal	Publications	Citations	Impact Factor	Main Theme
Sustainability	28	492	3.89	Energy; environmental science; social sciences
IEEE Access	1	479	3.48	Computer sciences; engineering; material science
Science of the Total Environment	1	149	10.76	Environmental science
Tourism Management Perspectives	2	69	7.61	Business; management; accounting
Journal of Destination Marketing & Management	3	62	7.16	Business; management; accounting

Source: Own elaboration.

Next, the most frequent keywords (≥6 times) used by the authors of the collected scientific documents are listed in Table 4. This ranking is also observed through a word cloud (see Figure 5) that depicts the top 35 keywords, in which the size of each word reflects its frequency. Due to the high frequency of the term "smart tourism" (20%) among the 35 most used keywords, its relative size was reduced to make room for other keywords and to ensure a clear and comprehensive conceptual analysis of the word cloud. As expected, keywords such as "smart tourism" and "sustainability" dominate, which supports our selection of keywords in WoS. Nonetheless, it is interesting to note that the term "smart tourism" is much more frequent than "sustainability", reinforced by terms associated with smartness ("smart cities", "smart tourism destinations", "smart destinations", and "smart"). Additionally, it is possible to understand that keywords related to R&D and information and communications technology (ICT), such as "innovation", "technology", "smart", and "tourism intelligence", have a significant weight across the approached topics. Words related to management and politics, such as "governance", "co-creation", and "destination management", are relevant and reflect the political aspect involved in the construction of a smarter and more sustainable kind of tourism.

Table 4. Top keywords, 2015–2022.

Authors' Keywords	Number of Occurrences
Smart tourism	43
Smart tourism destination(s)	17
Sustainability	15
Tourism	15
Smart city(ies)	13
Sustainable tourism	11
Innovation	9
Smart destination(s)	9
Smart	7
Governance	6
Technology	6

Source: Own elaboration.

Figure 5. Word cloud.

4.2. Social Network Analysis: Co-Occurrence Network of Keywords

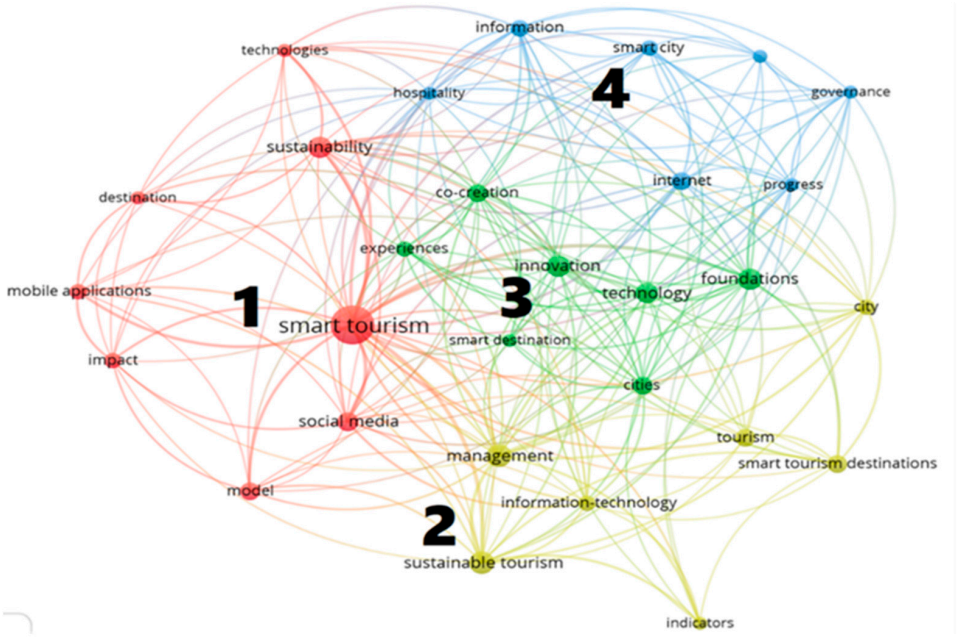
To analyse the main subjects of our database, we developed a keyword network with VOSviewer based on co-occurrences. This enables us to uncover links between concepts and to create a conceptual map. The attribute of occurrences indicates the number of documents in which a keyword occurs. Then, the map returns clusters that are shorter and somewhat isolated networks where nodes have a high number of interactions, more specifically, networks with densely connected groups of nodes with sparser connections between them. Descriptions of terminologies related to networks based in VOSviewer language [49,62] are presented in Table 5.

Table 5. Terminology of networks based in VOSviewer language.

Concepts	Description
Item or Node	The objects of interest. Items may for example be publications, researchers, or terms.
Link	A connection or a relation between two items.
Network	Set of nodes connected by their links.
Cluster/Community	Set of connected nodes included in a network. One node belongs to only one cluster.
Link strength (Link strength and total link strength are terms used in VOSviewer program)	Attribute of each link, expressed by a positive numerical value. In the case of co-authorship links, the higher the value, the higher the number of publications the two researchers have co-authored.
Weight Attribute: Total Link Strength	The cumulative strength of the links of an item with other items.

Source: Own elaboration.

Based on an initial set of 591 keywords (author keywords and keywords plus), the following criteria were applied to achieve the keyword co-occurrence network: (1) the full counting method, where each of the links has strength of one; (2) a minimum number of co-occurrences of six, meaning that each keyword belonged to at least six documents; and (3) association as the normalization method of the network layout [49]. The resulting network (Figure 6) was composed of 29 keywords and organized into four clusters identified by the VOSviewer algorithm, each named according to its main node: (1) smart tourism, (2) sustainable tourism, (3) innovation, and (4) smart cities (see Figure 6 and Table 6). Interestingly, certain themes such as technology and smart tourism destination were found to belong to different clusters (Table 6), specifically, smart tourism, sustainable tourism, and innovation clusters. This finding is consistent with previous analyses (e.g., Table 4), which identified smart tourism as the most frequently occurring term in our database.



Source: Own elaboration (using VOSviewer)

1-Smart Tourism	2-Sustainable Tourism
3-Innovation	4-Smart Cities

Figure 6. Visualization of keyword co-occurrence network based on total link strength.

Table 6. Clusters identified in the keyword network.

Cluster No.	Colour	Name of Cluster	Number of Keywords
1	Red	Smart Tourism	8
2	Yellow	Sustainable Tourism	7
3	Green	Innovation	7
4	Blue	Smart Cities	7

Source: Own elaboration.

Table 6 presents a comprehensive summary of the conceptual network by identifying the four distinct clusters, each represented by a unique colour in the accompanying map in Figure 6, and the corresponding number of keywords. Each cluster in the network is characterized by a set of nodes and links, which are colour-coded to facilitate its visual identification. Smart tourism is highlighted in red, sustainable tourism in yellow, innovation in green, and smart cities in blue, respectively.

Considering the clusters identified through SNA (Figure 6 and Table 6), the next section will be devoted to the content analysis that will complement the information extracted above.

4.3. Content Analysis

This procedure is a highly flexible research method, enriching our analysis based on quantitative and statistical tools [48,63]. It is also considered a systematic and rigorous approach to analyse documents obtained for the bibliometric review [64], enabling the summary of trends and gaps in the most influential literature. Therefore, the most cited articles (a total of 20 articles with more than 20 citations) are identified. Then, a careful read of the title, its keywords, abstract, and article content were performed. This procedure allowed us to allocate each article to a thematic cluster. Table 7 provides information about the cluster identification, articles, methodology, and future lines of research.

Table 7. Analysis of the 20 most cited articles.

Cluster	Article	Methodology	Future Lines of Research
	Yoo et al. [7]	Empirical Quantitative	a. To carry out a follow-up study on actual users after a certain period, using the same model. b. Further studies should be carried out in other countries to determine whether the results vary based on network technology level, smartphone penetration rate, and cultural characteristics.
	Del Vecchio and Passiante [65]	Conceptual	*
	Ivars-Baidal et al. [66]	Conceptual and Empirical	a. This study proposes an indicator system for smart tourism destinations that could be applied in other contexts and help to develop more accurate tourism policies. b. Future studies must adjust the proposed indicators by enhancing psycho-econometric properties of some dimensions.
	Gretzel and Scarpino-Johns [67]	Conceptual	a. In practice, resilience management and smart tourism development are still disconnected, and merging the two would enable destinations to take advantage of their potential synergies. b. More critical studies are needed to reveal smart tourism management and governance vulnerabilities, implications, and traps. c. More technology-focused studies can also support the integration of smart tourism principles into its frameworks.

Table 7. *Cont.*

Cluster	Article	Methodology	Future Lines of Research
Sustainable Tourism	Mandic and Pranicevic [68]	Conceptual	a. The Interreg Italy–Croatia developed a data-based networking "Living Lab" that could guide researchers and practitioners on approaching a smart business ecosystem with creativity and innovation. b. There is a need to explore in depth the role of the ICT implemented in leading tourism destinations on new visitors' behaviours, decision making, and experiences. c. Since the role of smart governance in smart destinations has not been fully recognized by researchers, future studies should pay more attention to this dimension.
	Shafiee et al. [58]	Empirical Qualitative	a. To consider causal relationships and components from the model developed. b. Additionally, public governance of smart destinations' development could be better analysed, clarifying duties and political strategies.
	Pan et al. [57]	Conceptual	To evaluate policies, sector investments, and feedback mechanisms aimed at regulating corporate and tourist behaviours.
	Ribes and Baidal [69]	Conceptual	a. To validate the causal relationships inherent in the mechanisms found in the model. b. To analyse in depth the practical avenue of sustainability and smartness in order to mitigate the mere theoretical use of concepts such as smart destination that entail a great potential for the development of smart sustainability.
	Alfaro Navarro et al. [70]	Conceptual	This paper introduces an index to assess sustainable tourism at the European NUTS 2 level. Following the presented model, future works could: a. Extend environmental dimensions in the indicators by including subjective measures of aspects that have not been previously addressed. b. Conduct this study at micro levels, such as at NUTS 3 or cities.
	Pencarelli [59]	Conceptual	a. Integrating knowledge from various relevant fields is essential for research on smart tourism destinations, including information systems, travel behaviour, marketing, urban planning, destination management and governance, and the emerging fields of data sciences. b. To empirically examine and assess the potential practical impact of the digital revolution on tourists in the future. c. To evaluate the effect of the sharing economy on the value ecosystem within the tourism industry.
	Romão and Neuts [71]	Empirical Quantitative	a. To accurately identify distinct regional patterns of evolution and potential changes over time. b. To evaluate CO_2 emissions at a regional level and analyse spatial impacts of tourism on local ecosystems.
Innovation	Polese et al. [72]	Empirical Qualitative	a. Identify some key drivers that foster successful value co-creation and sustainability to enhance current insights on value co-creation and expose the various types of real user activities and collaborations. b. Integration of varied service theories is needed to establish a comprehensive meta-theory for service and value co-creation. c. Identifying the primary factors that drive value co-creation and innovation can promote an effective management for encouraging stakeholders' involvement and determining sustainable relationships, considering its complexity. d. The analysis focused solely on the perspectives of bed and breakfast (B&B) owners, thereby limiting the analysis to provider viewpoints. Future studies could investigate the opinions and behaviours of other smart tourism actors, such as travellers, to facilitate comparisons between managers' and users' perceptions, acceptance, and technology use.
	Battino and Lampreu [73]	Empirical Qualitative and Quantitative	*
	Kim and Kim [74]	Empirical Qualitative	a. Analyse which type of Internet connection, fixed or mobile, travellers tend to choose depending on the nature of their trip, the decision-making process, environments, and costs. b. To evaluate current methodologies that rely on survey-based data collection by studying consumer behaviour through analyses of mobile app reviews. c. Focus on analysing other technologies due to the potential for the platform provider to exert control over mobile technology, thereby influencing tourism planning governance and the competitiveness of tourism destinations.

Table 7. *Cont.*

Cluster	Article	Methodology	Future Lines of Research
Smart Cities	Tavitiyaman et al. [75]	Empirical Quantitative	a. Future works could collect data from the same destination (Hong Kong) during other periods, or from different destinations, and compare the results. In addition, the following could be considered: b. Other tourism stakeholders, such as governments, tourism policymakers, and tourism providers. c. Other criteria to visit future smart tourism destinations.
	Ma et al. [2]	Conceptual	a. An online tourism agency with big data marketing technology is an indispensable bridge between tourists and a tourism spot. b. Consumer shopping behaviour and experience must be considered in business decisions. c. The altruistic preference between a tourism spot and an online tourism agency can promote environmental efficiency while bringing a better experience to tourists, which leads to a more sustainable development of tourism.
	Sun et al. [56]	Conceptual	*
	Encalada et al. [60]	Empirical Quantitative	a. Simply integrating technology within a tourism destination is not sufficient to make it "smart". To create an effective quality management evaluation system for tourist attractions, ICTs must be complemented with insights from experts such as government officials and researchers. b. Technology dependency is another concern to consider, highlighting the need to examine the outcomes of a digital split based on smart device access and affordable tourism infrastructure, and develop mechanisms to diminish the issue. c. Smart tourism could contemplate, among other strategies, the value in use, i.e., the value created by using data or technology instead of owning it, in order to mitigate digital footprints.
	Lee et al. [76]	Conceptual	a. Future studies could extend the components of the smart tourism city model.
	Sigalat-Signes et al. [77]	Conceptual	a. Further research could analyse quantitatively how smart a destination is, based on the perception of tourists and residents. b. To develop and extend information about smart tourism besides the private providers' view.

* The study does not present future lines of research. Source: own elaboration.

The next sections will show how each cluster identified with SNA will be complemented by the content analyses, including the sources identified and a brief description of the studies.

4.3.1. Cluster Smart Tourism

The first cluster in smart tourism covers studies about smart technology and its contribution to tourism [7,68]. Del Vecchio et al. [78] and Ivars-Baidal et al. [66] elaborate their research based on destinations' case studies, namely in Italy and Spain, respectively. Del Vecchio and Passiante [65] examined Apulia, Italy, and uncovered the impact of tourism on smart regional growth. Smart specialization "is a place-based strategy that invites the European regions to identify and follow a development path that is based on their specific vocations leverages the appropriate key enabling technologies, and focuses particularly on entrepreneurial development" [65] (p. 163).

Tourism represents a key industry for Apulia and should be approached strategically towards local growth and smart specialization. The researchers stress that the close relationship between a smart specialization strategy and tourism development will rely on the destination's capacity to capitalize on both the opportunities from ICT, fomenting its symbioses.

Additionally, Ivars-Baidal et al. [66] developed an indicator system in collaboration with INVAT.TUR, a public organization, to assess different smart tourism destinations of the Region of Valencia, Spain, regarding its policies. The authors provide a very useful tool that can be applied for tourism managers and governors that may adapt the suggested indicators in their own destinations. The work enhances the need to develop a strategic planning that should be inclusive of all stakeholders. Universal accessibility of destinations must be prioritized in future political actions. Moreover, sensorization may be improved

to promote business connectivity. Finally, they find a gap concerning the impact of online marketing designed by the smart development on the tourist's experience.

The work of Gretzel and Scarpino-Johns [67] intersects the concepts of destination resilience and smart destination, which is an identified gap, so far, in the current studies. Moreover, it provided a model that may guide managers and policymakers in developing a more resilient and smart kind of tourism. This is sustained on five pillars: (1) sensing, (2) opening, (3) sharing, (4) governing, and (5) innovating. These are elements of smart tourism destination that should work synergistically, upgrading destination resilience.

Through an extensive literature review, Mandic and Pranicevic [68] assess the effect of ICTs on tourism destination appeal and draw implications for smart tourism development. These encompass six main aspects: attractions, public and private amenities, accessibility, human resources, image and character, and price. The authors conclude ICT impacts tourism management and travellers' experiences, providing a smart transition. Namely, there is impact on general tourism dynamics by promoting a process of co-creation, on travellers' decision making, on travel security, and on data privacy and access. Websites contribute significantly to boost exposure, influencing the image of tourism destinations, and to aggregate knowledge to tourists' decision making. Nonetheless, there are some negative factors associated with ICT on tourism, such as anxiety, addiction, and mindlessness. The authors assert that current and future destination management organizations should rely more on ICT and develop co-creation strategies.

Yoo et al. [7] added to the discussion by investigating the factors influencing the adoption of smart tourism applications that integrate game features. According to their study, these applications provide tourists with "emotional pleasure (through gaming elements) and cognitive information" [7] (p. 14). Furthermore, the authors emphasized gamification applied in the context of tourism to enhance the visitor's experience. They anticipate that the gaming attributes in gamified smart tourism applications differ from those found in conventional games.

4.3.2. Cluster Sustainable Tourism

The second cluster is centred on the modelling and conceptualization of sustainable tourism and provides theoretical and practical strategies to adapt and assess sustainable tourism.

Shafiee et al. [58] introduce a model for sustainable smart tourism destinations, which relies on meeting various criteria, including a significant Internet penetration rate, the adoption of ICT, the availability of smart infrastructure, the establishment of social networks, and the capacity to adjust to global shifts to ensure its successful execution.

Ribes and Baidal [69] examine the concepts of smartness and sustainability in tourism destinations from both theoretical and managerial viewpoints to develop an innovative model of smart sustainability. The authors find a strong correlation between these concepts, highlighting common elements such as long-term vision and planning, innovation, public–private cooperation, and stakeholders' involvement. In addition, they propose a synergistic model centred on smart sustainability, sustained on a public decision-making process that applies technology to support five pillars: planning and efficient resource management; monitoring, transparency, and participation; public–private cooperation, knowledge, and innovation; and communication, awareness raising, and the enhancement of the visitor experience. However, the model should not be interpreted linearly.

Likewise, through a cross-disciplinary perspective, Pan et al. [57] investigate tourism sustainability. The authors initially analyse the challenges and constraints of sustainability, such as energy and pollution, while also exploring fundamental concepts such as green infrastructure, agriculture, and smart technologies. They conclude that sustainable tourism management asks for an integrated and multidisciplinary approach, such as coordinating public policies and tourism strategies; incorporating local, national, and international governance; and promoting pioneering and green practices through environmental education.

Finally, the paper of Alfaro Navarro et al. [70] identified a gap concerning the analysis of sustainable tourism at a local level, hence, proposing an index to measure sustainable

tourism at the European NUTS 2 level. Social and economic dimensions are the greatest players in the level of sustainability, but the environmental dimension has been growing substantially. Thus, regions that want to apply sustainable practices should focus first on environmental and then on social aspects. Germany stands out in social and environmental indicators, while Spain shows a good overall performance in each dimension. Alfaro Navarro et al. [70] challenge other investigators and practitioners to adapt the index at more micro levels, such as cities, and warn about the current lack of information to do so.

4.3.3. Cluster Innovation

The third cluster focuses on innovation and how it relates with smart and sustainable tourism. Pencarelli's research [59] explores the impact of technology in the tourism sector. One of the study's focal points examines the effects of the digital revolution on tourism, while another compares tourism 4.0 and smart tourism. The former refers exclusively to new ICTs, whereas the latter denotes the effective employment of these ICTs in a sustainable and long-term perspective toward the quality of life of tourists and locals. New ICTs have not only impacted business strategies but also visitors' participation in co-creation processes. Consequently, the authors argue that an optimal smart tourism approach should be based on sustainability, circular economy, quality of life, and social value. Additionally, they emphasize the need for co-creation strategies in both the physical and digital domains to enrich the tourist experience.

Ma et al. [2] focus on a transition from the traditional business model to a more sustainable approach. They discuss a low-carbon smart tourism strategy empowered by big data through an ideal system of supply chain of low-carbon tourism online-to-offline (O2O). This is based on a tourism spot that provides a low-carbon service while an online tourism agency provides big-data information. The performance is analysed in the decision modes centralized, decentralized, and altruistic. The last mode proves to be the best in achieving sustainability and supply chain coordination at the same time. The overall tourism experience can be consequently improved.

Polese et al. [72] and Kim and Kim [74] developed two qualitative studies. The first proposes an integrated model that combines service ecosystems and smart service systems to overcome some limitations inherent to these models when analysed independently. Polese et al. [72] delve into the key element steps for maximizing value co-creation and sustainability within the tourism industry and transitioning from innovation to social innovation. The authors emphasize the significance of ICT as an enabler of sustainable interactions between guests and hosts. The second draws attention to determining the contribution of mobile technology in attaining smart and sustainable tourism from the technological and consumer viewpoints. Kim and Kim [74] note the difficulty of evaluating the sequential relationship from mobile technology to mobility to sustainability, considering aspects such as the type of tourist, demographics, and geography. Nonetheless, the authors suggest that mobile technology advancements can offer tourists helpful information, contributing to efficient decision making and overall wellbeing.

On the other hand, Romão and Neuts [71] and Tavitiyaman [75] develop quantitative studies. Romão and Neuts' [71] research emphasizes the critical role of smart specialization in regional innovation strategies [79] and sustainable development. The authors analyse the use of territorial resources (natural and cultural) and other capital features in various European regions in the promotion of tourism specialization and performance through smart processes. The results indicate a gap in development among various countries in Europe, with tourism specialization failing to mitigate this issue. In light of the positive findings concerning the selected regions' CO_2 emissions, the authors recommend that technological and industrial development should prioritize energy-saving measures based on renewable sources. Tavitiyaman et al.'s [75] investigation aims to understand perceptions of tourists on tourism smart app attributes and how the use of those apps affects the perceived image of a destination and the tourists' future behavioural intention. Moreover, they analyse how information search moderates some of the identified relationships. The results pinpoint

that the attributes smart information systems, smart sightseeing, e-commerce systems, and smart forecasting positively impact tourists' perceived destination image, which, in turn, increases their behavioural intention. Information search negatively moderates the relationship between smart app attributes and perceived destination image but positively moderates the relationship between perceived destination image and behavioural intention. Some practical implications are the development of smart tourism applications should be anchored on tourists' preferences and on the respective destination, and they should be regularly updated, reinforcing the destination image. Other stakeholders from public and private sectors should participate more in the development of smart tourist destinations.

4.3.4. Cluster Smart Cities

Lastly, the cluster of smart cities falls on the topics of smart communities [56,60], smart tourism cities [76], and on the transition from smart city to smart destination [56,77]. Lee et al. [76] explore, through a conceptual approach, the concepts and the components of smart cities (service, infrastructure, and land) and smart tourism (transportation, accommodation, gastronomy, attraction, and ancillary service), comparing both. Consequently, the authors converge the concepts, originating a new view on smart tourism cities. To improve the smart tourism experience, it is crucial that smart city elements should be integrated throughout the whole travelling process, before, during, and after. In addition, there is a need to aggregate all stakeholders' perspectives and interests (tourists, locals, and governments). Policies must follow both a rational and emotional approach, connecting efficiency in ICT to people's management. Some problems are discussed, namely regarding over-tourism and sustainability at environmental, social, and economic levels.

Encalada et al. [60] (p. 14) considered these challenges, including over-tourism, but also overpopulation in urban centres and suggest that for cities "becoming smart implies reinforcing a city's uniqueness rather than allowing it to become impersonal and homogenized". To fill a gap in the literature on the factors that shape the spatial distribution of visitors, the authors conducted a study that collected and analysed data from the social network *Panoramio* concerning tourist patterns in Lisbon in the period 2008–2014. Their research revealed patterns among tourists, including the most visited sights and their locations within the urban context, and explored how this related to various variables related to the city's tourism industry.

Besides Encalada et al. [60], two other works examine specific regions to sustain the concepts of smart city and its transition to smart destination. Sigalat-Signes et al. [77] analyses Gandia, Spain, aiming to understand how intermediate destinations such as this can evolve and transition to a smart tourism destination. This city appears to be transitioning to becoming a smart tourism destination but still lies in an initial phase of the smart model, based on six dimensions: population, environment, mobility, economy, quality of life, and governance. The authors suggest the human dimension is a main issue to guide cities in the direction of a smart management of tourism, including dialogue, participation, and a critical vision among the interest groups. It is recommended that, while tourism businesses should be flexible to technological advances, it also should be careful about its ICT governance since there is lack of knowledge about it.

In turn, Sun et al. [56] examine smart and connected communities (SCCs) that evolved from the concept of smart tourism. Through a case study, the authors present a project, Tresight, which provides a context-aware recommendation system that condenses opportunities and challenges of the IoT and big data analytics for the development of smart tourism and sustainable cultural heritage in Trento, Italy. It is based on FI-WARE technology, resorting to mobile crowdsensing and cyber-physical cloud computing, two of the most important IoT technologies identified in promoting SCCs. Moreover, Sun et al. [56] find that SCCs synergistically address liability, preservation, revitalization, and sustainability of a community, encompassing the goals of living in the present, planning for the future, and remembering the past of a community.

5. Future Research Directions

In this section, the lines of research of the 20 most cited articles that were used in the content analysis are summarized. These are the future lines of research that may be used for further research on the topics of smart and sustainable tourism, innovation, and smart cities. The future research areas are presented by cluster.

5.1. Research Agenda for Smart Tourism

Considering the studies covered in this cluster, the investigation of smart technology and its contribution to sustainable tourism offer several future lines of research. With respect to the investigation carried out by Yoo et al. [7] that examined some variables impacting the adoption of gamified smart tourism applications, the authors suggest for future research a follow-up study and the development of further investigation in other regions to verify whether the findings obtained vary depending on the level of network technology, the rate of smartphone penetration, and cultural traits. Ivars-Baidal et al.'s [66] research proposes an indicator system for smart tourism destinations that could be applied in other contexts (other regions, other types of destinations, etc.) and could help to develop more accurate tourism policies.

Based on the first trial to develop and apply the system, further studies should adjust the proposed indicators by enhancing psycho-econometric properties of some dimensions. Then, some comparative results could be drawn, leading to very interesting results. The work of Mandic and Pranicevic [68] presents the Interreg Italy–Croatia BLUTOURSYSTEM project developed by both researchers and practitioners to promote a big-data-based network "Living Lab". This project may guide future investigations and management plans on approaching a smart business ecosystem with creativity and innovation. The authors address two main gaps, concerning the necessity to examine in depth the role of the ICT implemented in leading tourism destinations on new visitors' behaviours, decision making, and experiences; and the understanding of smart governance on smart tourism. Finally, Gretzel and Scarpino-Johns [67] found some vulnerabilities concerning the development of resilient and smart tourism, for which they also developed a model. They state that both concepts (resilience and smart tourism) should be approached together. Additionally, more critical studies could be drawn to highlight smart tourism management and governance weaknesses and strengths. This could involve more technological-oriented studies to address any existing gaps and clarify what it is and how to achieve smart tourism [68].

5.2. Research Agenda for Sustainable Tourism

In relation to the second cluster, the authors provide some useful insights to perpetuate its advances so far. Shafiee et al. [58] and Ribes and Baidal [69], for example, suggest the further study of the causal relationships and components of the developed models of sustainable smart tourism destinations and smart sustainability, respectively. According to Ribes and Baidal [69], the practical application of the theoretical models and concepts such as smart destination should be fostered. This could be carried out through the deeper examination of the political, corporate, and investment attitude towards the smart development of destinations, as stated by both Pan et al. [57] and Shafiee et al. [58], and a greater integration between the economic, social, environmental, and technological strategies and substructures [58]. Alfaro Navarro et al. [70] provide an index to measure sustainable tourism at the European NUTS 2 level. Future researchers could apply this model, namely by incorporating subjective indicators of factors that were previously overlooked, particularly those related to the environment, extending the list of indicators. They could also analyse at micro levels, such as NUTS 3 or cities, even though the authors indicate a lack of information to do so. Thus, public organizations could also manage efforts to collect more useful and reliable information for smaller regional levels.

5.3. Research Agenda for Innovation

The research guidelines covered by the authors of this cluster highlight several aspects. First, the work developed by Pencarelli [59] suggests that smart tourism destinations might benefit from the integration of knowledge from other areas, such as information systems, travel behaviour, marketing, urban planning, etc. The authors also recommend to further investigate the impact of the digital revolution on tourists' behaviour, as well as the influence of the sharing economy on the value ecosystem. Polese et al. [72] suggest that to better understand and foster value co-creation it is vital to identify diverse types of real activities and cooperative efforts carried out by users. The authors also suggest that it is necessary to develop a general meta-theory for service and value co-creation, and this might be achieved through the integration of different service theories. Since the authors' research was conducted on B&B owners, merely considering the providers' viewpoint, additional empirical studies ought to be undertaken on tourists and other smart tourism systems in order to compare perspectives and assess the adoption of technology. Ma et al.'s [2] research reflects on the transition from the traditional approach to a more sustainable tourism model. They conclude that tourist behaviour and experience must be considered in the tourism market decisions. Moreover, an online tourism agency with big data marketing technology is an essential link between tourists and a tourism spot. In fact, tourism spots promote environmental efficiency and better tourist experiences and should be adapted if destinations want to achieve sustainability in the long term. In the investigation carried out by Kim and Kim [74], we verified that a possible avenue for future research relies on analysing what type of Internet is preferred by users (fixed vs. mobile), considering factors such as the nature of travel, the decision-making process, the environment, and the cost to the traveller. Another interesting potential study would be to examine other technologies in light of the potential that the platform player dominates the mobile technology. The output will be of interest to determine the governance of tourism planning and the competency of tourism destinations. The study by Romão and Neuts [71] points out the need for more precise identification of various regional evolution patterns and their expected time shifts, evaluating CO2 emissions at a regional level and analysing ecological footprints of tourism on the local biosphere. Lastly, the work of Tavitiyaman et al. [75] was based on tourists' perceptions on Hong Kong during an unstable political period of social unrest. Thus, the authors understand that future investigation could be replicated in a different political context and then compared with previous results. Moreover, the opinions of different stakeholders besides tourists could be explored, e.g., governments, tourism policymakers, and providers of tourism services. Other criteria to visit smart tourism destinations could be contemplated in future research.

5.4. Research Agenda for Smart Cities

In the last cluster, the smart cities, some future guidelines are pinpointed. Concerning the relevance of big data in the development of smart city services, Encalada et al. [60] suggest that future studies should integrate ICTs and complement with know-how by, for example, policymakers and investigators towards the promotion of a quality management evaluation mechanism regarding the tourist experience. Moreover, it is also recommended to analyse the consequences of a digital split based on smart device access and affordable smart tourism infrastructure in order to develop mechanisms that minimize this problem. Another area that deserves to be investigated in future relates to smart tourists and their massive digital footprints. It is important to develop studies that examine the value created by using data and technology instead of owning it. Lastly, Sigalat-Signes et al. [77] pinpoint that future research on the transition of a smart city into a smart destination could analyse quantitatively how smart a destination is, based on the perception of tourists and residents, and to extend information about smart tourism besides the private providers' view. Following the same idea, Lee et al. [76] suggest to other researchers to extend the components of the smart tourism city model.

6. Conclusions

This paper aims to provide a state of the art of the relationship between smart tourism and sustainability. Even though sustainability is a key area of smart tourism, the present study enabled us to conclude that the conceptualization of smart tourism is at an initial phase, following the approach of the better-known concept of the smart city, not developing yet with clarity sub-topics, such as sustainability, and how these relate and contribute to a smart course of action. Scientific research on these areas corroborates the underlined gap and propose a deep understanding of smart tourism either through an unambiguous theoretical approach or through the empirical analysis of diverse destinations and tourism contexts. Moreover, in the face of the social, economic, and environmental challenges of today and future generations, a sustainable perspective proves to be essential not only in tourism but in any business strategy. The results derived from this study have allowed us to answer all the research questions posed in the introduction.

Relating to RQ1, the descriptive analysis supported the answer to this question. The geographical distribution found that authors from European countries (Spain, Italy, and Portugal) and Asia (China and the Republic of Korea) have published the most documents on sustainable and smart tourism (90.0%) within the period of 2015–2022. This distribution is not surprising considering the relevance of tourism in the Mediterranean countries and the importance of technology in some Asian communities (e.g., Hong Kong and Seoul).

Regarding RQ2, the analysis of the articles with the most engagement (based on the number of citations) also validates this geographic clustering, which belongs to Sun et al. [56] and Pan et al. [57] from the Asian cluster, and Pencarelli [59] and Encalada et al. [60] from the European cluster. Considering the most prominent journals on sustainable and smart tourism, our findings demonstrate that *Sustainability* has the largest number of published articles. Despite the lower production of the remaining journals, it is important to notice the high rate of citations from *IEEE Access*, resulting from the most cited document of the database: "Internet of things and big data analytics for smart and connected communities" by Sun et al. [56].

Using a mapping process, the keyword co-occurrence network helped to find the current conceptual structure of research on the topic (RQ3). Furthermore, the content analysis of the most cited articles addressed the key research findings, methodological approaches, and proposed a future research agenda. Four relevant clusters were identified: (1) smart tourism, (2) sustainable tourism, (3) innovation, and (4) smart cities. Observing the relationship between the four clusters, a main conclusion is reached: sustainability and smart tourism are research topics that are highly interconnected with each other and with technology, innovation, and smart cities. Several articles highlighted the importance of technology and innovation on consumer experience as well as their contribution towards sustainability and smart tourism. However, there are other topics that should be explored such as the development of a more sustainable kind of tourism that focuses on an integrated and multi-disciplinary approach including several stakeholders (e.g., governments, citizens, and tourists) [57,66,76] and promoting green and innovative practices [2,57,70,71]. Another important contribution of this study is the recognition of research guidelines that might be useful for scholars that aim to develop these topics in the future (RQ4). Given the state of the topic's development, the clusters identified could be subject to a synthesis of substantive findings. Although the primary methodologies used in sustainability and smart tourism were highlighted in this research, verifying a balance between conceptual and empirical (quantitative and qualitative) studies, this should be examined more thoroughly.

The findings of this study have important implications for future research in the field of smart tourism and sustainability. Firstly, there is a need for further exploration of the interconnection between smart tourism, sustainability, innovation, and smart cities. This could involve examining how these concepts can be integrated into a co-creation approach involving multiple stakeholders, as well as exploring the development and implementation of green and innovative practices in tourism contexts. Secondly, there should be a more thorough examination of the balance between conceptual and empirical studies in sustainability

and smart tourism. Finally, there is a need for a synthesis of substantive findings in the field, in order to provide a clearer understanding of the relationship between smart tourism and sustainability, a gap that this review tries to narrow. In summary, future research in this field should aim to develop a more comprehensive and multi-disciplinary approach to sustainability and smart tourism, while verifying the balance between conceptual and empirical studies and integrating substantive findings.

Nonetheless, this bibliometric study is not free of limitations. First, the social network analysis does not explore the content of the papers but classifies them according to categories to provide a general approximation of the scientific production in a given field of study. Thus, it is not always easy to classify articles into one category since it involves a certain degree of subjectivity. For this reason, the researchers pool their opinions before the final classification is made.

Second, even though we have tried to ensure that the searched keywords broadly represent the studied fields, there might be, on one side, important papers on the area that do not incorporate those exact keywords and, thus, are excluded from the database. On the other side, there might be non-relevant works in the final database since this systematic method does not measure the relative strength of the searched terms within the actual paper.

Third, citations may not reflect quality and might be, in fact, overestimated because of the underlying goals of citing each paper that are very particular to each author, the auto-citations, the frequency of citations by authors tends to increase for highly ranked journals, and a trend for earlier articles to have higher citation rates than more recent ones (due to being available for longer periods). To address this limitation, future studies could consider incorporating the Emerging Sources Citation Index or employing basic metric measurements to quantify pure bibliographic data.

Finally, only publications present in the WoS Core Collection were considered. However, we also performed an analysis using the Scopus database, and significant differences concerning the number of documents were not found. Future research should include documents from other databases.

Despite these limitations, the investigation provides a valid picture of the state of the art of smart tourism and sustainability, whose several categories can be scientifically extended or explored in more specific areas or time periods.

Author Contributions: Conceptualization: C.M., P.R. and M.G.-S.; data curation: C.M.; formal analysis: C.M.; investigation: C.M; methodology: C.M.; project administration: P.R. and M.G.-S.; software: C.M.; supervision: P.R. and M.G.-S.; visualization: C.M.; writing—original draft: C.M.; writing—review and editing: M.G.-S. and P.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data supporting reported results are not available due to privacy restrictions.

Acknowledgments: This research is supported by national funds through FCT–Foundation for Science and Technology, I.P., Portugal under the project UIDB/04005/2020. The study was also conducted under the framework of the UAM research group TECHNOCONS "Consumer behavior and technology".

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References

1. Li, Y.; Hu, C.; Huang, C.; Duan, L. The concept of smart tourism in the context of tourism information services. *Tour. Manag.* **2017**, *58*, 293–300. [CrossRef]
2. Ma, D.; Hu, J.; Yao, F. Big data empowering low-carbon smart tourism study on low-carbon tourism O2O supply chain considering consumer behaviors and corporate altruistic preferences. *Comput. Ind. Eng.* **2021**, *153*, 107061. [CrossRef]

3. Celdrán-Bernabeu, M.A.; Mazón, J.-N.; Ivars-Baidal, J.A.; Vera-Rebollo, J.F. Smart Tourism. Un estudio de mapeo sistemático. *Cuad. Turismo* **2018**, *41*, 107–138. [CrossRef]
4. González-Reverté, F.; Díaz-Luque, P.; Gomis-López, J.M.; Morales-Pérez, S. Tourists' risk perception and the use of mobile devices in beach tourism destinations. *Sustainability* **2018**, *10*, 413. [CrossRef]
5. Pradhan, M.K.; Oh, J.; Lee, H. Understanding travelers' behavior for sustainable smart tourism: A technology readiness perspective. *Sustainability* **2018**, *10*, 4259. [CrossRef]
6. Shen, S.; Sotiriadis, M.; Zhou, Q. Could smart tourists be sustainable and responsible as well? The contribution of social networking sites to improving their sustainable and responsible behavior. *Sustainability* **2020**, *12*, 1470. [CrossRef]
7. Yoo, C.; Kwon, S.; Na, H.; Chang, B. Factors affecting the adoption of gamified smart tourism applications: An integrative approach. *Sustainability* **2017**, *9*, 2162. [CrossRef]
8. Koseoglu, M.A.; Rahimi, R.; Okumus, F.; Liu, J. Bibliometric studies in tourism. *Ann. Tour. Res.* **2016**, *61*, 180–198. [CrossRef]
9. Sanguankaew, P.; Ractham, V. Bibliometric Review of Research on Knowledge Management and Sustainability, 1994–2018. *Sustainability* **2019**, *11*, 4388. [CrossRef]
10. Kainzbauer, A.; Rungruang, P. Science Mapping the Knowledge Base on Sustainable Human Resource Management, 1982–2019. *Sustainability* **2019**, *11*, 3938. [CrossRef]
11. Yoopetch, C.; Nimsai, S. Science Mapping the Knowledge Base on Sustainable Tourism Development, 1990–2018. *Sustainability* **2019**, *11*, 3631. [CrossRef]
12. Thananusak, T. Science Mapping of the Knowledge Base on Sustainable Entrepreneurship, 1996–2019. *Sustainability* **2019**, *11*, 3565. [CrossRef]
13. Zheng, C.; Kouwenberg, R. A Bibliometric Review of Global Research on Corporate Governance and Board Attributes. *Sustainability* **2019**, *11*, 3428. [CrossRef]
14. Fabregat-Aibar, L.; Barberà-Mariné, M.G.; Terceño, A.; Pié Dols, L. A Bibliometric and Visualization Analysis of Socially Responsible Funds. *Sustainability* **2019**, *11*, 2526. [CrossRef]
15. Hallinger, P.; Suriyankietkaew, S. Science Mapping of the Knowledge Base on Sustainable Leadership, 1990–2018. *Sustainability* **2018**, *10*, 4846. [CrossRef]
16. Johnson, A.-G.; Samakovlis, I. A bibliometric analysis of knowledge development in smart tourism research. *J. Hosp. Tour. Technol.* **2019**, *10*, 600–623. [CrossRef]
17. Zhang, Q.; Wang, Q.; Hao, J.-X.; Yu, Y. Mapping smart tourism research in China: A semantic and social network analysis using CiteSpace. In Proceedings of the 2016 13th International Conference on Service Systems and Service Management (ICSSSM), Kunming, China, 24–26 June 2016; IEEE: Manhattan, NY, USA, 2016.
18. Boes, K.; Buhalis, D.; Inversini, A. Conceptualising Smart Tourism Destination Dimensions. In *Information and Communication Technologies in Tourism 2015*; Tussyadiah AIe, I., Ed.; Springer International Publishing: Berlin/Heidelberg, Germany, 2015; pp. 391–403.
19. Law, R.; Leung, R.; Buhalis, D. Information technology applications in hospitality and tourism: A review of publications from 2005 to 2007. *J. Travel Tour. Mark.* **2009**, *26*, 599–623. [CrossRef]
20. Law, R.; Leung, R.; Buhalis, D. An Analysis of Academic Leadership in Hospitality and Tourism. *J. Hosp. Tour. Res.* **2010**, *34*, 455–477. [CrossRef]
21. De la Hoz-Correa, A.; Muñoz-Leiva, F.; Bakucz, M. Past themes and future trends in medical tourism research: A co-word analysis. *Tour. Manag.* **2018**, *65*, 200–211. [CrossRef]
22. Garrigos-Simon, F.J.; Narangajavana-Kaosiri, Y.; Lengua-Lengua, I. Tourism and sustainability: A bibliometric and visualization analysis. *Sustainability* **2018**, *10*, 1976. [CrossRef]
23. Köseoglu, M.A.; Okumus, F.; Putra, E.D.; Yildiz, M.; Dogan, I.C. Authorship trends, collaboration patterns, and co-authorship networks in lodging studies (1990–2016). *J. Hosp. Mark. Manag.* **2018**, *27*, 561–582. [CrossRef]
24. Gretzel, U.; Werthner, H.; Koo, C.; Lamsfus, C. Conceptual foundations for understanding smart tourism ecosystems. *Comput. Hum. Behav.* **2015**, *50*, 558–563. [CrossRef]
25. Gretzel, U.; Koo, C.; Sigala, M.; Xiang, Z. Special issue on smart tourism: Convergence of information technologies, experiences, and theories. *Electron. Mark.* **2015**, *25*, 175–177. [CrossRef]
26. Höjer, M.; Wangel, J. Smart sustainable cities: Definition and challenges. In *ICT Innovations for Sustainability*; Springer: Berlin/Heidelberg, Germany, 2015; pp. 333–349.
27. Harrison, C.; Eckman, B.; Hamilton, R.; Hartswick, P.; Kalagnanam, J.; Paraszczak, J.; Williams, P. Foundations for smarter cities. *IBM J. Res. Dev.* **2010**, *54*, 1–16. [CrossRef]
28. Tu, Q.; Liu, A. Framework of smart tourism research and related progress in China. In Proceedings of the International Conference on Management and Engineering (CME 2014), Shanghai, China, 24–25 May 2014.
29. Guo, Y.; Liu, H.; Chai, Y. The embedding convergence of smart cities and tourism internet of things in China: An advance perspective. *Adv. Hosp. Tour. Res.* **2014**, *2*, 54–69.
30. Baggio, R.; Del Chiappa, G. Real and virtual relationships in tourism digital ecosystems. *Inf. Technol. Tour.* **2014**, *14*, 3–19. [CrossRef]
31. Del Chiappa, G.; Baggio, R. Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure. *J. Dest. Mark. Manag.* **2015**, *4*, 145–150. [CrossRef]

32. Racherla, P.; Hu, C.; Hyun, M.Y. Exploring the role of innovative technologies in building a knowledge-based destination. *Curr. Issues Tour.* **2008**, *11*, 407–428. [CrossRef]
33. Jovicic, D.Z. From the traditional understanding of tourism destination to the smart tourism destination. *Curr. Issues Tour.* **2019**, *22*, 276–282. [CrossRef]
34. European Union. Smart Tourism Capital. 2019. Available online: https://smarttourismcapital.eu/downloads/guide-for-applicants.pdf (accessed on 12 September 2022).
35. Ben-Eli, M.U. Sustainability: Definition and five core principles, a systems perspective. *Sustain. Sci.* **2018**, *13*, 1337–1343. [CrossRef]
36. Atkisson, A.; Arnbom, T.; Tesar, C.; Christensen, A. Getting It Right in a New Ocean: Bringing Sustainable Blue Economy Principles to the Arctic. World Wide Fund for Nature. 2018. Available online: http://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf_report_arctic_blue_economy_181018.pdf (accessed on 12 September 2022).
37. United Nations. What Are the Sustainable Development Goals? 2022. Available online: https://www.undp.org/sustainable-development-goals (accessed on 12 September 2022).
38. Milán-García, J.; Uribe-Toril, J.; Ruiz-Real, J.L.; de Pablo Valenciano, J. Sustainable Local Development: An Overview of the State of Knowledge. *Resources.* **2019**, *8*, 31. [CrossRef]
39. Pritchard, A. Statistical Bibliography or Bibliometrics? *J. Doc.* **1969**, *25*, 348–349.
40. Zupic, I.; Čater, T. Bibliometric methods in management and organization. *Organ. Res. Methods* **2015**, *18*, 429–472. [CrossRef]
41. Glänzel, W. *Bibliometrics as a Research Field: A Course on Theory and Application of Bibliometric Indicators*, 3rd ed.; Magyar Tudományos Akadémia, Kutatásszervezési Intézet: Budapest, Hungary, 2003.
42. Serrat, O. *Social Network Analysis*; Springer: Singapore, 2009. Available online: https://link.springer.com/chapter/10.1007/978-981-10-0983-9_9 (accessed on 30 November 2022).
43. Tabassum, S.; Pereira, F.; Fernandes, S.; Gama, J. Social network analysis: An overview. *Wiley Interdiscip. Rev. Data Min. Knowl. Discov.* **2018**, *8*, 1256. [CrossRef]
44. Kamińska, A. The application of methods of social network analysis in bibliometrics and webometrics. Measures and tools. 2018. *Nowa Biblioteka. Usługi Technol. Inf. Media* **2018**, *29*, 29–46.
45. Kovacs, A.; Van Looy, B.; Cassiman, B. Exploring the scope of open innovation: A bibliometric review of a decade of research. *Scientometrics* **2015**, *104*, 951–983. [CrossRef]
46. Su, H.-N.; Lee, P.-C. Mapping knowledge structure by keyword co-occurrence: A first look at journal papers in Technology Foresight. *Scientometrics* **2010**, *85*, 65–79. [CrossRef]
47. Sassmannshausen, S.P.; Volkmann, C. The scientometrics of social entrepreneurship and its establishment as an academic field. *J. Small Bus.* **2018**, *56*, 251–273. [CrossRef]
48. Gaur, A.; Kumar, M. A systematic approach to conducting review studies: An assessment of content analysis in 25 years of IB research. *J. World Bus.* **2018**, *53*, 280–289. [CrossRef]
49. van Eck, N.J.; Waltman, L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* **2010**, *84*, 523–538. [CrossRef] [PubMed]
50. Ferreira, J.J.M.; Fernandes, C.I.; Ratten, V. A co-citation bibliometric analysis of strategic management research. *Scientometrics* **2016**, *109*, 1–32. [CrossRef]
51. World Travel and Tourism Council. Economic Impact Reports. 2021. Available online: https://wttc.org/research/economic-impact (accessed on 5 December 2022).
52. World Intellectual Property Organization (WIPO). Global Innovation Index 2022. In *What Is the Future of Innovation Driven Growth?* WIPO: Geneva, Switzerland, 2022. Available online: https://www.wipo.int/edocs/pubdocs/en/wipo-pub-2000-2022-en-main-report-global-innovation-index-2022-15th-edition.pdf (accessed on 5 December 2022).
53. OECD. *Main Science and Technology Indicators*; OECD Publishing: Paris, France, 2022; Volume 2022. [CrossRef]
54. Sachs, J.; Schmidt-Traub, G.; Kroll, C.; Lafortune, G.; Fuller, G.; Woelm, F. The Sustainable Development Goals and COVID-19. In *Sustainable Development Report*; Cambridge University Press: Cambridge, UK, 2020.
55. Joo, Y.; Tan, T.-B. Smart Cities in Asia: An Introduction. In *Smart cities in Asia*, 1st ed.; Joo, Y., Tan, T.-B., Eds.; Edward Elgar Publishing: Cheltenham, UK, 2020; pp. 1–17.
56. Sun, Y.; Song, H.; Jara, A.J.; Bie, R. Internet of things and big data analytics for smart and connected communities. *IEEE Access* **2016**, *4*, 766–773. [CrossRef]
57. Pan, S.-Y.; Gao, M.; Kim, H.; Shah, K.J.; Pei, S.-L.; Chiang, P.-C. Advances and challenges in sustainable tourism toward a green economy. *Sci. Total Environ.* **2018**, *635*, 452–469. [CrossRef] [PubMed]
58. Shafiee, S.; Ghatari, A.R.; Hasanzadeh, A.; Jahanyan, S. Developing a model for sustainable smart tourism destinations: A systematic review. *Tour. Manag. Perspect.* **2019**, *31*, 287–300. [CrossRef]
59. Pencarelli, T. The digital revolution in the travel and tourism industry. *Inf. Technol. Tour.* **2020**, *22*, 455–476. [CrossRef]
60. Encalada, L.; Boavida-Portugal, I.; Cardoso Ferreira, C.; Rocha, J. Identifying tourist places of interest based on digital imprints: Towards a sustainable smart city. *Sustainability* **2017**, *9*, 2317. [CrossRef]
61. Clarivate Analytics, C. Journal Citation Reports. 2022. Available online: https://clarivate.com/webofsciencegroup/solutions/journal-citation-reports/?gclid=CjwKCAiAkrWdBhBkEiwAZ9cdcNSY61X9Mo5l2fqVqk9FAQ8MIOm48TBHQUjn_mJvUsH24zAWMYvsJhoCLncQAvD_BwE (accessed on 1 November 2022).

62. van Eck, N.J.; Waltman, L. VOSviewer manual. In *Manual for VOSviewer Version*; Universiteit Leiden: Leiden, The Netherlands, 2011; Volume 1. Available online: https://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.11.pdf (accessed on 7 December 2022).
63. White, M.D.; Marsh, E.E. Content analysis: A flexible methodology. *Libr. Trends* **2006**, *55*, 22–45. [CrossRef]
64. Krippendorff, K. *Content Analysis: An Introduction to Its Methodology*; Sage Publications: Thousand Oaks, CA, USA, 2018.
65. Del Vecchio, P.; Passiante, G. Is tourism a driver for smart specialization? Evidence from Apulia, an Italian region with a tourism vocation. *J. Dest. Mark. Manag.* **2017**, *6*, 163–165. [CrossRef]
66. Ivars-Baidal, J.A.; Celdran-Bernabeu, M.A.; Femenia-Serra, F.; Perles-Ribes, J.F.; Giner-Sanchez, D. Measuring the progress of smart destinations: The use of indicators as a management tool. *J. Dest. Mark. Manag.* **2021**, *19*, 100531. [CrossRef]
67. Gretzel, U.; Scarpino-Johns, M. Destination Resilience and Smart Tourism Destinations. *Tour. Rev. Int.* **2018**, *22*, 263–276. [CrossRef]
68. Mandic, A.; Pranicevic, D.G. Progress on the role of ICTs in establishing destination appeal Implications for smart tourism destination development. *J. Hosp. Tour.* **2019**, *10*, 791–813.
69. Ribes, J.F.P.; Baidal, J.I. Smart sustainability: A new perspective in the sustainable tourism debate. *Investig. Reg.* **2018**, *42*, 151–170.
70. Alfaro Navarro, J.L.; Andres Martinez, M.E.; Mondejar Jimenez, J.A. An approach to measuring sustainable tourism at the local level in Europe. *Curr. Issues Tour.* **2020**, *23*, 423–437. [CrossRef]
71. Romão, J.; Neuts, B. Territorial capital, smart tourism specialization and sustainable regional development: Experiences from Europe. *Habitat Int.* **2017**, *68*, 64–74. [CrossRef]
72. Polese, F.; Botti, A.; Grimaldi, M.; Monda, A.; Vesci, M. Social innovation in smart tourism ecosystems: How technology and institutions shape sustainable value co-creation. *Sustainability* **2018**, *10*, 140. [CrossRef]
73. Battino, S.; Lampreu, S. The role of the sharing economy for a sustainable and innovative development of rural areas: A case study in Sardinia (Italy). *Sustainability* **2019**, *11*, 3004. [CrossRef]
74. Kim, D.; Kim, S. The role of mobile technology in tourism: Patents, articles, news, and mobile tour app reviews. *Sustainability* **2017**, *9*, 2082. [CrossRef]
75. Tavitiyaman, P.; Qu, H.L.; Tsang, W.S.L.; Lam, C.W.R. The influence of smart tourism applications on perceived destination image and behavioral intention: The moderating role of information search behavior. *J. Hosp. Tour. Res.* **2021**, *46*, 476–487. [CrossRef]
76. Lee, P.; Hunter, W.C.; Chung, N. Smart Tourism City: Developments and Transformations. *Sustainability* **2020**, *12*, 3958. [CrossRef]
77. Sigalat-Signes, E.; Calvo-Palomares, R.; Roig-Merino, B.; Garcia-Adan, I. Transition towards a tourist innovation model: The smart tourism destination Reality or territorial marketing? *J. Innov. Knowl.* **2020**, *5*, 96–104. [CrossRef]
78. Del Vecchio, P.; Mele, G.; Ndou, V.; Secundo, G. Creating value from social big data: Implications for smart tourism destinations. *Inf. Process Manag.* **2018**, *54*, 847–860. [CrossRef]
79. Foray, D.; Goddard, J.; Beldarrain, X.G.; Landabaso, M.; McCann, P.; Morgan, K.; Nauwelaers, C.; Ortega-Argilés, R. *Guide to Research and Innovation Strategies for Smart Specialisations*; S3P-European Union: Brussels, Belgium, 2012.