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Empirical Research Article

Dimensions of Smart Tourism and Its Levels: An Integrative Literature Review

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Abstract

Smart tourism is seen as a revolution in the tourism industry, involving innovative and transformative theoretical-practical approaches for the sector. As a result of its application in the tourist context, benefits can be seen such as more sustainable practices, greater mobility and better accessibility in destinations, evolution of processes and experiences of tourists. Much of this is achieved through the support of technological solutions. However, despite the immense expectations, and the many researches carried out on it, a literature summary regarding the dimensions that can be observed in each application of this smart tourism has not yet been proposed. Therefore, supported by the PRISMA recommendation, this research proposed to carry out an integrative review of the literature on smart tourism (in its different levels of application, such as the city, the destination and the smart tourism region), with the objective of mapping the dimensions that underlie it. Thus, from an initial scope of 833 intellectual productions obtained, inputs were found for the dimensions in 363 of them after a thorough analysis. The compilation of data obtained from these productions supported the proposition of 14 operational dimensions of smart tourism, namely: collaboration, technology, sustainability, experience, accessibility, knowledge management, innovation management, human capital, marketing, customized services, transparency, safety, governance and mobility. With this set of dimensions, it is envisaged that the implementation of smart tourism projects can present more comprehensive and assertive results. In addition, shortcomings and opportunities for new research that support the evolution of the theory and practice of smart tourism are highlighted.

Keywords

smart tourism; smart tourism business; smart tourism city; smart tourism destination; smart tourism ecosystem; smart tourism region; smart tourist; PRISMA

1. Introduction

The traditional approach of the tourism industry may not be able to attract the tourist enough to revive the economy (Gautam et al., 2016), as it naturally faces many challenges (Muthuraman & Al Haziazi, 2019), such as being vulnerable to external events. Events that involve demographic changes, political and economic conditions, health and safety issues, environmental concerns, changes in weather/season, etc. (Pierce, 2016), having as an example the impact on the current scenario of the coronavirus pandemic.

Added to this is the trend towards greater use of technology in tourism, a circumstance that was even driven by the pandemic itself (Fong et al., 2021). And that it has provided a series of mutations in the dynamics and global structure of production and consumption of tourist destinations, such as the increase competition in the tourist market (Şchiopu et al., 2016) and the change in the behavior of tourists (Gajdošík, 2018).

Considering all these complex dynamics faced by the sector and the highlighted impact of technologies, Jasrotia and Gangotia (2018) state that it is necessary to be smart to survive in the tourism industry. The adoption of technologies by the tourism sector itself is considered the first step in the migration from the traditional tourism industry to the smart tourism industry (Hassannia et al., 2019). Thus, technological advances transform tourism resources into smart tourism resources (Shafiee et al., 2019).

And so smart tourism, among other things, promises new ways to manage tourist flows, better services, new advertising models (Gretzel et al., 2016) and new collaborative ventures based on cloud services and open data (Xiang & Fesenmaier, 2017). Aiming to innovate beyond traditional industry boundaries (Gretzel et al., 2016), enhancing business competitiveness (Buhalis & Leung, 2018), increasing operational efficiency and decreasing business costs (Li et al., 2017), and evolving the tourist experience (Gretzel et al., 2015a).

In this context, smart tourism, at all its levels, receives growing interest in the sector itself and in academia (Lim et al., 2019). However, as the attention to smart tourism increases (Ye et al., 2020), it also becomes clearer all the needs that can be addressed so that the approach actually empowers the tourism sector and its interested, as it is understood to still be at the forefront of the development and full understanding of this smart tourism (Gretzel & Scarpino-Johns, 2018).

Whether in academia, where, even though the literature on smart tourism is growing (Ghaderi et al., 2018) and despite the high quality of some studies, there is the report of a lack of research, both conceptual and empirical, for a better understanding of the phenomenon (Wang et al., 2016), or to analyze the concept of smart tourism in the technical point of view

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(Bošnjak et al., 2017). Therefore, establishing a robust research agenda is essential to fill the many gaps present in this emerging field of study (Vargas-Sánchez, 2016).

Or in market practice, where, according to Gretzel et al. (2015a), the smart has also become a very confusing concept and is often used to drive specific policy agendas and sell technology solutions. This is also seen in the case of smart tourism, being frequently used in open data initiatives or for quite trivial projects, such as the promotion of free wi-fi or the development of mobile applications.

While these technologies and new approaches to data collection, management and sharing are important stepping stones in implementing smart tourism, they do not provide the full picture of what it encompasses (Gretzel et al., 2015a). Xiang et al. (2015) complement by exposing that, sometimes, smart tourism is misunderstood as something strictly related to the adoption and use of technology in tourism offerings or considering technology as the only driver of innovation goals.

Instead, it should be realized that the smart tourism era is not the so-called traditional tourist standardization and the simple integration of the tourism industry with technology, but rather a focus on future development, value promotion and development strategy (Yong & Hui-Ying, 2013). Smart tourism should be seen as a mentality or philosophy of tourism development and management, with greater implications for the governance and strategic orientation of the tourist destination (Gretzel, 2018).

From this situation, which considers the potential and the scientific and market needs in the development of smart tourism, the opportunity arises to carry out a systematic research in the related scientific production, in order to highlight the dimensions that support it, and their behavior over time. Dimensions that represent a specifiable aspect of a concept, or a grouping of common characteristics, attributes or behaviors of that concept (Babbie, 2010). With these dimensions mapped, there is an understanding that smart tourism projects can have a comprehensive reference (going with, but beyond technology, for example) to define more assertive directions and obtain more concrete results.

To fulfill this purpose, this research develops an integrative review of the smart tourism literature and its levels of approach, mapping and synthesizing the dimensions involved in the accessed intellectual productions. A study that is developed according to the present introduction, following for the conceptual bases of smart tourism, for the methodology used, and arriving at the results and conclusions of the work.

2. Smart Tourism

2.1 Origins of Smart Tourism

The notion of smart tourism has its origins in the 2000s (Xiaojing, 2017), based on two principal references: the smart city (Khan et al., 2017), and the e-tourism (Bulti et al., 2019).

The smart city is seen as a response to the various obstacles resulting from globalization and population growth, which force cities to find smart solutions to manage these problems (Jasrotia & Gangotia, 2018); representing knowledge centers that manage information, technology and innovation, seeking to achieve efficient management, sustainable development and a better quality of life for residents (Caragliu et al., 2011). For this, it encompasses a variety of industries, such as tourism (Guo et al., 2014), not least because this sector sustains a source of income for many cities (Taaffe, 2014).

And when linking with tourism, it is seen that smart cities are closely related to smart tourism (Khan et al., 2017), which is an important part of the pillars that underlie the concept of them (Matos et al., 2019), and that contributes to its development (Wise & Heidari, 2019). Likewise, the dimensions of a smart city can also represent development factors for smart tourism (Savić & Pavlović, 2018).

However, while smart cities prioritize their residents, smart tourism is mainly aimed at visitors/tourists (Çizel & Ajanovic, 2019), dealing with a much more dynamic ecosystem, in which the residents themselves can be producers of experiences, with seasonal demands for infrastructure, the suppliers being from different sectors and going beyond the scope of the city (Gretzel, 2018).

On the other hand, e-tourism or electronic tourism is seen as a predecessor of smart tourism (Bulti et al., 2019). Being e-tourism defined by Kazandzhieva and Santana (2019) as the process of digitizing all managerial and business functions, services and stages of the value chain of the tourism system in order to increase efficiency in interactions between tourist companies, consumers and the public sector, thus achieving competitive sustainability.

According to Femenia-Serra et al. (2019), however, while e-tourism allows the creation of networks for the exchange of information and connections between companies and consumers (digital connections), smart tourism facilitates the integration and connection of digital infrastructures with physical ones of a destination. In other words, unlike e-tourism, whose development was and continues to be driven mainly by commercial interests, smart tourism depends on coordination and public-private partnerships (Gretzel & Scarpino-Johns, 2018).

From this link with the e-tourism and the technologies, it is observed that smart tourism emerged in the context of the revolutionary advance in communication infrastructures and interactive digital technologies based on a smart revolution (Yoo, 2012), but also considering other factors together and beyond of this technology. Factors that, supported by the references that gave rise to smart tourism, guide its evolution and constant development.

2.2 Smart Tourism Development

There are a variety of ways in which the term smart is used (Hollands, 2008). Starting with the very possibility of using "smart" or "intelligent." But, in general, the smart is related to the ability to understand and solve problems using knowledge, data and information (Vargas-Sánchez, 2016).

Another fundamental component of smart, according to Jasrotia and Gangotia (2018), is the technology. This one that enables economic and social developments through sensors, big data, open data, new forms of connectivity and exchange of information via the internet of things, among other benefits, and that helps to characterize what smart is (Gretzel et al., 2015a). In fact, smart gained immense popularity after being applied to describe the characteristics and attributes of certain technologies (Mehraliyev et al., 2020).

However, Perfetto and Vargas-Sánchez (2018) also argue that most of the Information and Communication Technologies (ICTs) applied in smart approaches already exist and that, therefore, it is not so much individual technological advances, but the interconnection, synchronization and combined use of different technologies that constitute the smart. Furthermore, smart initiatives not only imply technological changes, but also investments in human capital and changes in the practices and conditions of urban life (Neirotti et al., 2014).

Thus, in the context of tourism, the smart implies speed, convenience and cheap for a traveler, and also efficient, effective, productive and creative for business in terms of supply and consumption of tourism products and services, through a network of cooperating of companies in the exchange of data and information between them or with institutions aiming to achieve mutual goals (Koo et al., 2017).

Still focusing on tourism, Wang et al. (2016) report that research was carried out in various areas involving smart, such as, for example, about smartphone apps for tourism; on smart hotels, examining the use of information technology in the hotel industry and digital marketing resolutions; about smart guides, which

describe the implementation of context-based information for the smart tour guide; between others.

In this scenario, smart tourism has become a fashionable term, widely used by researchers and professionals from various disciplines (Gretzel et al., 2015a). However, different researchers also describe some shortcomings linked to its conceptualization. As Park et al. (2016) and Li et al. (2017), who highlight that there is still much confusion about the concept in academic research, in corporate environments and in government sectors, due to a wide range of meanings used.

One of the possible causes for not reaching a consensus on the concept of smart tourism lies in the fact that the term "intelligent tourism" is also frequently used as its synonym, even though there is a difference between the two words (Xiaojing, 2017). Where Li et al. (2017) describes that the distinction between smart and intelligent is clear, with the first focusing on the anticipation of needs and technological results for people, while the second is based on the basic usefulness of knowledge and information, and in the scope of technology as a process or means.

Smart tourism is also attributed to "wisdom tourism," indicating that both are the same thing, as seen in Wu (2020). The author also lists smart tourism as being synonymous with intelligent tourism (Wu, 2020). This whole panorama highlights the challenges of the study areas involved and, on the other hand, reveals opportunities for researches to consolidate the effective literature of each concept, as in the case of smart tourism, which is the focus of this work. Smart tourism that has its theoretical and practical operationalization through different levels of approach.

2.3 Levels of Approach of Smart Tourism

It is identified in the literature the categorization of components of smart tourism, where they were contemplated the tourist (Gajdošík, 2019), the business (Gretzel et al., 2015a) and the destinations (Gajdošík, 2019). More than that, through the integrative literature review that will be presented following this research, seven levels of smart tourism approach were mapped, which are revealed and conceptualized in Table 1.

Table 1. Conceptualization of the levels of approach to smart tourism

Level	Definition
Smart tourism	Conceptualized by Gretzel et al. (2015a) such as tourism supported by integrated efforts in a destination to collect and aggregate/harness data derived from physical infrastructure, social connections, governmental/organizational sources and human bodies/minds combined with the use of advanced technologies to transform this data into on-site experiences and business value propositions with a clear focus on efficiency, sustainability and enrichment of experiences.
Smart tourist	Defined by Femenia-Serra et al. (2019) as the tourist who, by being open to sharing their data and using smart technologies, dynamically interacts with other stakeholders, co-creating an enhanced and personalized smart experience.
Smart tourism business	According to Gretzel et al. (2015a), the business layer refers to the complex business ecosystem that creates and supports the exchange of tourism resources and the co-creation of the tourism experience. Xiang and Fesenmaier (2017) add that the business level is based on access to shared data, promoting cooperation and sharing of resources between companies.
Smart tourism city	The smart tourism city is seen as arising from the convergence between the components of the smart city (services, infrastructure, etc.) and smart tourism (transport, accommodation, gastronomy, etc.), and being defined as an innovative tourist destination, which guarantees sustainable development, which facilitates and improves the interaction of visitors with experiences at the destination and also improves the quality of life of residents (Lee et al., 2020).
Smart tourism destination	The smart tourism destination represents a consolidated innovative space, based on the territory and a state-of-the-art technological infrastructure. A territory committed to the environmental, cultural and socioeconomic factors of its habitat, equipped with an intelligence system that captures information in a procedural way, analyzes and understands events in real time, in order to facilitate the visitor's interaction with the environment and the decision-making by destination managers, increasing their efficiency and substantially improving the quality of tourist experiences (de Avila Muñoz & Sánchez, 2013).
Smart tourism region	Priano et al. (2016) defines a smart tourism region as one that correctly identifies its strengths and opportunities and, in addition, adequately coordinates available - and generally limited - resources to produce maximum productivity in the areas that comprise it.
Smart tourism ecosystem	The smart tourism ecosystem is defined by Gretzel et al. (2015b) as a tourism system characterized by intense knowledge sharing and value creation, using smart technology in the creation, management and provision of smart tourism services/experiences, as well as assessments of technological developments.

At this juncture, a total of seven different identified levels of theoretical and practical approach to smart tourism is reached, where the most explored in the scientific literature (until this work) are the construct smart tourism and the smart tourism destination, according to the result quantitative located and also mentioned by Femenia-Serra et al. (2019). The other five levels still lack further scientific research, having, as in the case of the smart tourism region, little research carried out so far.

Based on the seven identified levels of smart tourism, and the way they are addressed in the literature, a spatial dynamic of these levels is proposed, as shown in Figure 1.

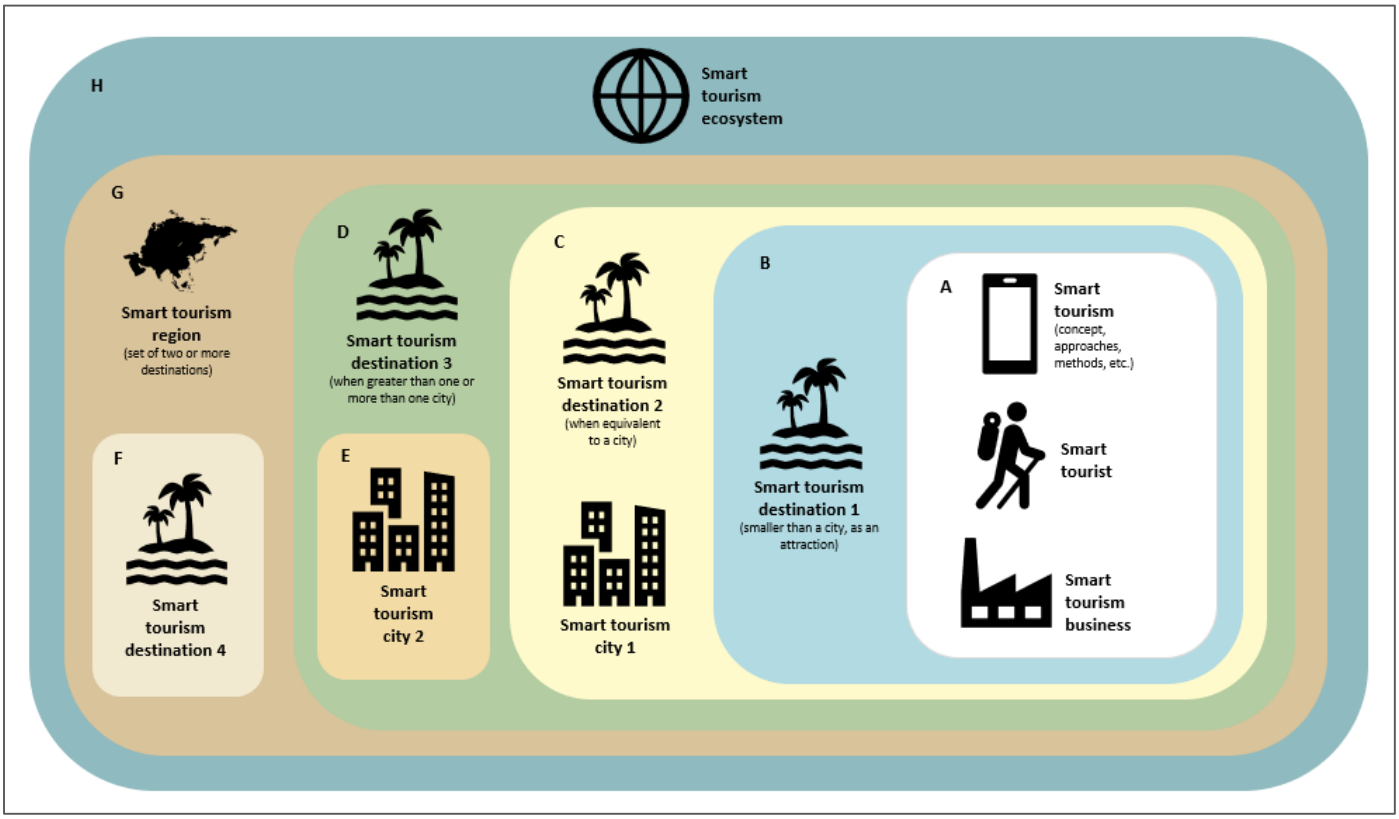


Fig. 1. Spatial illustration of smart tourism levels

Figure 1 which demonstrates smart tourism as, obviously, one of the central elements of the illustration (in area A), even because it is the basic construct and supports the intelligent dynamics throughout the rest of this model. In the same area are the smart tourist, who enjoy the smart dynamics and also demand it to have their travel needs more fully met; and the smart tourism business, which supports the offer of smart tourism solutions to this tourist and contributes to highlighting the most comprehensive smart tourism spaces (such as city and destination). It is also worth mentioning the mobility of the smart tourist in the other broader levels of smart tourism.

As in smart tourism destinations, which in their smaller version (area B in Figure 1) may involve one or more tourist attractions and/or businesses located in a locality or part of a city. Or, going further, in the smart tourism city, which is also often designated as a smart tourism destination – so both occupy the same space (area C). The destination, according to area D, can still go beyond the borders of a smart tourism city, or contemplate more than one city.

On the other hand, the broader spatial contexts in which smart tourism occurs are usually ignored, as pointed out by Gretzel and Koo (2021) and verified by the results of this research. Among them, when there is an effort to jointly develop two or more smart tourism destinations, the level of the smart tourism region is observed, which is represented in area G in Figure 1. And, finally, involving all other levels, is the smart tourism ecosystem (area H), which includes the joint relationship of all stakeholders in smart tourism, from tourists to smart businesses, and others, as well as considering the public-governmental role in this dynamic.

It was also observed in the literature on smart tourism the existence of research approaches that consider its aggregation with technical or operational components of tourism dynamics, such as technology (smart tourism systems) in Kim and Canina (2015), the experience (smart tourism experience) in Gretzel et al. (2015a), among others. These are seen as factors that can represent cross-cutting inputs or tools at all levels already presented in Table 1. Even in this research, the components in question will serve as a basis for defining the dimensions that support the practical application of smart tourism, according to the methodology that is presented in the next topic.

3. Methodology

For the prospection and synthesis of the dimensions of smart tourism and its levels, an integrative literature review was developed, which was determined for this purpose as it is considered the broadest methodological approach when it comes to reviews, since it includes both studies empirical and theoretical for a complete understanding of the phenomenon studied (Webb & Roe, 2008).

Integrative literature review that was operationalized in a systematic way, following the guidelines of Doolen (2017). Thus, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) recommendation was used, which also has the purpose of helping researchers to improve the reporting of their reviews (Moher et al., 2009). PRISMA is supported by a checklist with 27 items and a flowchart with four steps (PRISMA, 2022).

Briefly, the 27 items of the PRISMA checklist guide the review processes and content on topics such as the methods used and the results achieved, and the four steps of the flowchart support the prospection, analysis and selection of the productions included in the review. Based on these PRISMA guidelines, the integrative review stipulated for this thesis seeks to answer the following research question: *what are the dimensions that support smart tourism at its different levels of application, and what is their trend over time?*

The eligibility criteria of the productions to be weighted in the systematic literature search were established, which are scored below: knowledge areas – all; language – all, despite the search sentence in the databases being in English; geographical origin – all; temporality – productions registered until the year 2021 (12/31/2021); type of document – all; and topic considered in the selection of productions – contain, in English, in its title some reference to smart tourism or for its application levels.

The approach with most criteria for the "all" configuration is due to the fact that it seeks to contemplate a wide spectrum of application of smart tourism. The most limiting criterion is having the term smart tourism or one of its application levels in the title of the productions, which was defined by understanding that,

since one of these levels is a relevant theme in the production, it should be represented in its title.

As sources of information for the systematic search, the Scopus and Web of Science databases were determined. The choice for these bases, among other reasons, is justified by the identification that other research in tourism, such as the integrative review by Sanches et al. (2018), also used Scopus and Web of Science as sources of information.

The search strategy used in the two databases is shown in Table 2, considering the specificities of the advanced search in both cases, which involves Boolean operators specific to each platform. The keyword used is repeated for both bases, since the search objective is the same, and it is the term smart tourism in English, but with the reduction of each of the two words to its radical.

Table 2. Database search settings

Data base	Period	Amplitude	Sentence	Additional
Scopus	Until 2021	Title	TITLE("smart* tour*")	-
Web of Science	Until 2021	Title	TI=("smart* tour*")	All databases

After searching the databases, the archives of the intellectual productions were prospected, on which the verification of new eligibility criteria was carried out, but now for the evaluation of the productions regarding their adherence to the research question:

• The production effectively addresses smart tourism or any of its levels, either theoretically or through an empirical approach.

• Have in the production some dimension of smart tourism presented and authored by the person(s) responsible for this production.

Based on these criteria, productions with full text files underwent a detailed analysis in order to identify (i) the different possibilities of approaching smart tourism by their levels, such as, for example, and according to each case, "smart tourism" or "STD" (short for smart tourism destination); and (ii) the respective possible authorial dimensions of smart tourism.

According to the progress in the analysis of productions and identification of dimensions, a matrix was used where the mapped dimensions of smart tourism were placed on the vertical axis and, on the horizontal axis, the seven levels of this smart tourism. The intersection between these two axes was given by the references that supported the theoretical or empirical evidence that such dimension is observed at such level of smart tourism. The outline of this matrix is presented in Figure 2.

		Levels of approach to smart tourism						
		Smart tourism	**Smart tourist**	**Smart tourism business**	**Smart tourism city**	**Smart tourism destination**	**Smart tourism region**	**Smart tourism ecosystem**
Operational dimensions of smart tourism	**Dimension A**	References	References	References	References	References	References	References
	Dimension n	References	References	References	References	References	References	References

Fig. 2. Matrix for mapping the dimensions at each level of smart tourism

During the processes of prospecting the files of the productions presented by the systematic search and analysis of them, complementary works were identified, for example, located in common repositories or used in the theoretical references of these productions, which were not found in the aforementioned systematic search in the two databases, but which also met the criteria of this search, except for a single exception. That the title is not only in English, contemplating variations of the "smart tour" used in the systematic search, such as the term "destino turístico inteligente," applied both in Portuguese and in Spanish.

These complementary productions then had their files also prospected so that they could be added to the scope of the integrative literature review, but being framed as coming from a search called, in this research, exploratory. The productions found by the exploratory research also underwent the same process of analysis as those arising from the systematic search, with the allocation of dimensions located, in both cases, in a matrix such as Figure 2.

The results of the integrative literature review, and the systematic and exploratory searches that supported it, will be revealed in the next topic.

4. Results

4.1 Integrative Literature Review

Based on the entire context described in the topic of methodology, Figure 3 presents the flowchart with the different phases of the review, mapping the number of identified, included and excluded records, and the reasons for the exclusions. This flowchart and its related processes were developed based on the PRISMA.

In Figure 3, it is seen that the integrative review initially included a set of 833 intellectual productions, 369 from Scopus and 418 from Web of Science, based on systematic search, plus 46 productions arising from the exploratory search. From the records obtained by the systematic search, it was identified that 235 were repeated between the two related bases, which were discarded.

Further along with the process, another 140 productions were disregarded from the integrative review due to lack of access to its full text, all of which were also related to the systematic search. With this, arrives at the panorama of 458 intellectual productions with access to its full text, so that could proceed with

the analyzes in search of constituent elements of smart tourism at its different levels, considering the eligibility criteria.

Criteria that initially determined the exclusion of 29 records in total, originating from the systematic search, because it was identified in the reading of them that they did not include any context of application of smart tourism. Then, when verifying the eligibility criteria about showing authorial dimension of smart tourism, another 20 records from Scopus, six from Web of Science, another 35 from these two databases and another five from the exploratory search were excluded.

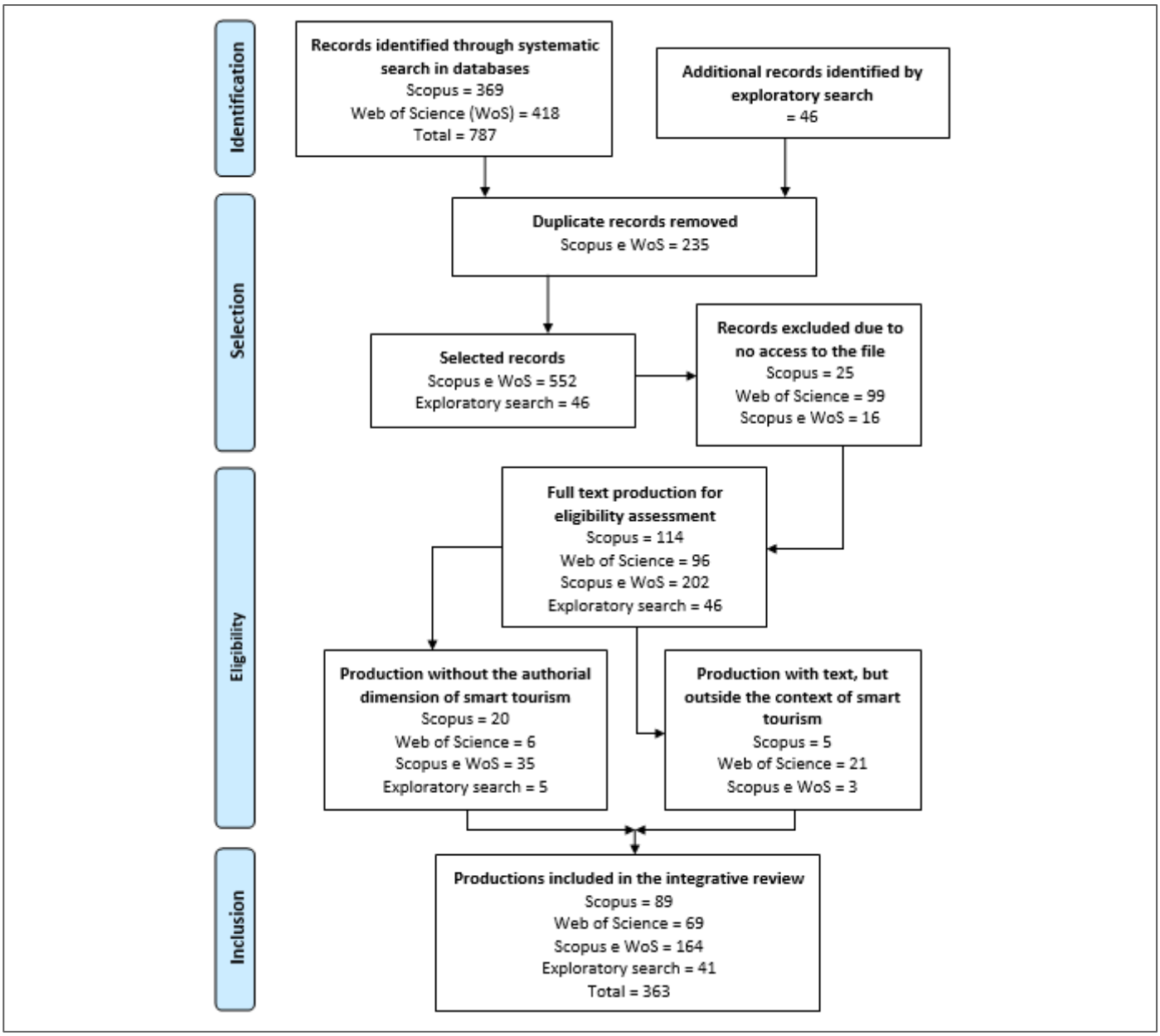


Fig. 3. Identification and selection flowchart of productions for integrative review

Finally, a sample of intellectual productions was obtained that provided elements to establish the dimensions of smart tourism and its levels, covering a total of 363 records. This total is based on 89 productions from Scopus, 69 from Web of Science, 164 from Scopus and Web of Science and, finally, 41 occurrences of the exploratory search.

Another organizational format for the quantity of intellectual productions worked on in this research can be seen in Tables 3 and 4, which separate these productions by the search that originated them (systematic or exploratory, and in the first one still being stratified by base) and by the levels of tourism identified in the title of these.

First, in Table 3, the 429 records that were identified as working in some context of smart tourism are detailed, where it is observed that most of them (271 or 63.17%) are related to the level of the smart tourism construct, followed by smart tourism destinations (98 items or 22.84%). It is still noteworthy that only five of the works reveal the smart tourism business in their title, while the smart tourism region reveals only two occurrences.

In Table 4, there is a presentation of the intellectual productions that provided inputs for the dimensions of smart tourism and at its different levels, from Table 3.

From this Table 4, it is possible to observe that only in the case of productions that had in their title the smart tourism region that all generated elements for the mapped dimensions. In addition, it is noteworthy that the works exclusively from the Web of Science presented the highest conversion rate for dimensions (92.00%). This context of the 363 productions is unfolded, based on the matrix in Figure 2, in a long file[1], which has a small excerpt from it exemplified in the Appendix.

[1] Accessed, in its full version, at:
https://figshare.com/s/c1e7449ad262850a5a4a

Table 3. Stratification of the productions analyzed by the integrative review

Smart tourism levels	Systematic search			Exploratory search	Total
	Scopus	Scopus e Web of Science	Web of Science		
Smart tourism	78	129	45	19	271
Smart tourist	5	10	2	1	18
Smart tourism business	2	3	0	0	5
Smart tourism city	9	9	6	0	24
Smart tourism destination	12	40	20	26	98
Smart tourism region	0	1	1	0	2
Smart tourism ecosystem	3	7	1	0	11
Total	109	199	75	46	429
% of total (429)	25.41%	46.39%	17.48%	10.72%	-

Table 4. Stratification of productions that provide a basis for dimensions

Smart tourism levels	Reference for dimensions				Total
	Scopus	Scopus e Web of Science	Web of Science	Exploratory search	
Smart tourism	65	102	40	15	222
Smart tourist	0	6	2	1	9
Smart tourism business	2	2	0	0	4
Smart tourism city	8	9	6	0	23
Smart tourism destination	11	38	19	25	93
Smart tourism region	0	1	1	0	2
Smart tourism ecosystem	3	6	1	0	10
Total	89	164	69	41	363
% of used (363)	24.52%	45.18%	19.00%	11.30%	Average
% analyzed x used per base	81.65%	82.41%	92.00%	89.13%	86,30%

Also noteworthy, based on the grouping of intellectual productions according to the levels of smart tourism, in Tables 3 and 4, the lower incidence of research, for example, on smart tourists and smart tourism businesses. This is worrying because both tourists and tourist businesses are important pillars of tourism supply and demand. Regarding ecosystems and smart tourism regions, the lack of research may be due to the complexity of working with a greater geographical scope, considering different destinations, with cultures, attributes, policies and tourist offers that do not always align.

4.2 Dimensions of Smart Tourism and Its Levels

Appendix presents fourteen dimensions mapped in the literature for smart tourism and their levels, which are also shown in Figure 4. From Appendix, it can be seen that the technology and experience dimensions are the only unanimities, that is, being present at all considered levels of smart tourism. On the other hand, the knowledge management dimension, for example, revealed less depth in the literature on smart tourism, which may represent a future trend for the area, a topic still little explored or more tangential.

Fig. 4. Mapped dimensions of smart tourism and its levels

Other points that are highlighted in Appendix involve the broad base of references for the "technology" dimension and especially at the levels of the construct's smart tourism and the smart tourism destination; the obtaining a greater reference for the dimensions at these two levels; and the lower achievement of references for the tourist, region and smart tourism business levels.

These dimensions mapped for all levels of smart tourism are still characterized in Table 5 based on references from the integrative literature review itself.

Table 5. Contextualization of the dimensions of smart tourism (in all its levels)

Dimension	Context
Collaboration	As no stakeholder in the smart tourism ecosystem will have all the necessary resources to implement smart tourism projects on a large scale, the co-production capacity resulting from the cooperation and coordination of different stakeholders (e.g., the formation of partnerships) becomes critical in the organization resources for the development of these projects (Arenas et al., 2019). A collaborative process that needs to be public-private (de Avila Muñoz & Sánchez, 2013).
Technology	Information and communication technologies represent the key component of the development of smart tourism (Savić & Pavlović, 2018), and show the growing dependence on tourist destinations, their companies and tourists to technologies, which allow large amounts of data to be transformed into value propositions (Gretzel et al., 2015a), and provide tourist information and travel-related services (such as food and transport) to tourists through technological devices (Koo et al., 2013). Furthermore, technologies contribute to the provision of richer, more efficient and more effective services through data and information feedback (Tsai et al., 2018).
Sustainability	Both smart tourism and smart tourism destinations seek to ensure the sustainable development of their territory in the social, cultural, environmental and economic aspects (Kuang & Ai, 2016), with the strong support of technologies, aiming to increase tourist satisfaction and improve the quality of life of residents (Santos Júnior et al., 2019), and promote or preserve these sustainability attributes. In this scenario, the smart tourism paradigm is based on the transversal use of sustainability, since a destination cannot be considered smart if it is not sustainable either (González-Reverté, 2019).
Experience	One of the main focuses of smart tourism is the experience at the destination (Polese et al., 2018), which is highly mediated and enhanced by technologies (Muthuraman & Al Haziazi, 2019), which allows tourists to communicate and interact more closely with local residents, businesses and government, and tourist attractions in cities (Gretzel et al., 2016) and that have enriched, high-value, meaningful and memorable tourist experiences (Masseno & Santos, 2018), before, during and after the trip (Xu et al., 2018).
Accessibility	Smart tourism destinations must allow maximum accessibility, for all potential visitors, in their territories and in the products and services present in them, including their digital channels and offers, adapting to the needs of people with any type of disability, as well as children, pregnant women, the elderly, the sick, etc., through the elimination of architectural or mobility barriers, to facilitate access to all kinds of cultural, nature, leisure proposals, etc. (López De Ávila et al., 2015). Specifically, about the digital, with the central connotation of smart tourism to ubiquity, it is envisaged a continuous connection to the internet, accessible anywhere, integrated into people's lives and providing various services everywhere (Li et al., 2017).
Knowledge management	A smart tourism destination can be considered a knowledge-based destination (Jovicic, 2019), involving a process of collective construction of this knowledge by local actors plus the tourist (Ruiz et al., 2018), where ICTs are used to provide a technological platform on which information and knowledge related to tourism can be exchanged instantly (Jovicic, 2019). So, learning and knowledge management are considered focal factors and, at the same time, smart tourism results (Del Chiappa & Baggio, 2015).
Innovation management	Innovation is described in the literature both as an input (Gajdošík, 2018) and as a result of smart tourism (Shafiee et al., 2019), and its levels, as the smart tourism destination (Gretzel et al., 2015a).
Human capital	Human capital is considered a fundamental construct in the development of smart tourism (Savić & Pavlović, 2018). Likewise, an intelligent tourist destination is established based on human capital (Lopes & Oliveira, 2018), which forms the basis for building leadership, entrepreneurship and innovation (Boes et al., 2015). In this scenario, the literature describes the importance of skilled labor or, as agreed by different authors, tourist/technical talent for the realization of smart tourism (Xu et al., 2018), including professionals from the areas of tourism, information technology, e-commerce and marketing (Kuang & Ai, 2016).
Marketing	Smart tourism involves tourism marketing (Rongrong, 2017). Where, considering the wide use of digital technologies by tourists throughout their consumption process, and the potential of these technologies to shape the tourist experience, there is a need for a new marketing approach for the context of smart tourism (Çizel & Ajanovic, 2019). Which can be through smart marketing, which drastically modifies the traditional marketing pattern by introducing new and creative digital media and communication technologies (Rongrong, 2017), by supporting the development of effective marketing strategies to attract customers to smart tourism destinations, and by offering unique tourist experiences (Jeong & Shin, 2020).
Customized services	The smart tourist wants to have a super connected experience, relating the sharing of different types of information with different stakeholders in the destination, in search of also personalized experiences (Femenia-Serra et al. 2019), not just consuming the service, but still co-creating it (Aktaş & Kurgun, 2019). As a reflection, smart tourism provides these tourists with personalized travel services (Lee, 2017), which meet the preferences of users at the right time (Buhalis & Amaranggana, 2015) and create a tourist offer that is more adequate to the needs of tourists (Del Vecchio et al., 2018).

Transparency	When choosing a destination, a decisive factor for smart tourists are the evaluations, which, thanks to information technologies, are updated and visible to everyone (Gajdošík, 2020). Nevertheless, Gajdošík (2020) also points out that using social media to share the experience is quite common among smart tourists. And thus, the bidirectional communication flow, with feedback from tourists, can be very useful for stakeholders in order to improve the offerings of the smart tourism ecosystem (Bošnjak et al., 2017).
Safety	Herrero Crespo et al. (2019) provide empirical evidence that the value of the smart tourism destination is significantly influenced by smart security services. These services are aimed at improving public safety and which can be useful to reduce the perceived risk in destinations considered unsafe, in the case of massive events and to improve the perception of tourists and residents about security issues associated with tourism (Herrero Crespo et al., 2019).
Governance	Governance is particularly important for the development of smart tourism (Gretzel & Scarpino-Johns, 2018) and smart tourism destinations (Santos Júnior et al., 2019). Therefore, a smart tourism destination project with a potentially transformative reach must be guided by adequate tourism governance, with a well-defined strategy, high levels of public-private cooperation and efficient coordination between different authorities and public organizations (Ivars-Baidal et al., 2017), stimulating and regulating multiple relationships between the different actors and users of its system (Hodžić & Alibegović, 2019).
Mobility	One of the ultimate goals of smart tourism is to support mobility (Xiang & Fesenmaier, 2017). Thus, in the smart tourism destination, mobility represents a fundamental aspect of its implementation (Herrero Crespo et al., 2019) and, at the same time, a final product of this (Lim et al., 2019), involving both physical mobility and digital mobility (Tran et al., 2017), as well as using technology to seek a deeper understanding of the characteristics and meaning of human mobility (Lamsfus et al., 2015).

Based on these dimensions located from the integrative literature review, it is understood that smart tourism projects, at their different levels, can have a greater scope and a better assertiveness from their planning, through implementation and monitoring of results. Where the dimensions revealed here can guide requirements of the referred projects or even performance evaluation indicators.

In this sense, it is seen that this research can represent a relevant input for different stakeholders in the evolution of smart tourism, such as governments in their different spheres of geographic coverage, Destination Management Officers (DMOs), tourism planning and development institutions, business entities, tourist business, among others. As well as it can support the development of complementary researches that empirically assess the dimensions of smart tourism and its impacts in practical situations.

Not enough, understanding the temporal trend of application of the dimensions of smart tourism can also help to identify opportunities or gaps for those interested in tourism to prioritize their efforts in related projects and research. This is what will be dealt with in the next topic.

4.3 Temporal Evolution of Smart Tourism Dimensions

The dimensions of smart tourism, at all levels, had their occurrences grouped according to the year of publication of the work to which they are linked. Where the same work may contain more than one occurrence of a dimension if it is evidenced at different levels of smart tourism, but considering at most one dimension per level per work. These guidelines support the results presented in Figure 5.

From this Figure 5 it is possible to highlight different points. Starting with the fact that the first inputs of the smart tourism dimensions were identified from the year. (2013). Another highlight is that the total and individual amount of occurrence of the dimensions shows a predominantly increasing trend in research, despite, for example, a drop recorded in 2021 in relation to 2020 for the grand total. *A result that aligns with previous research that points to the growth of research in smart tourism (as Bastidas-Manzano et al., 2021)*.

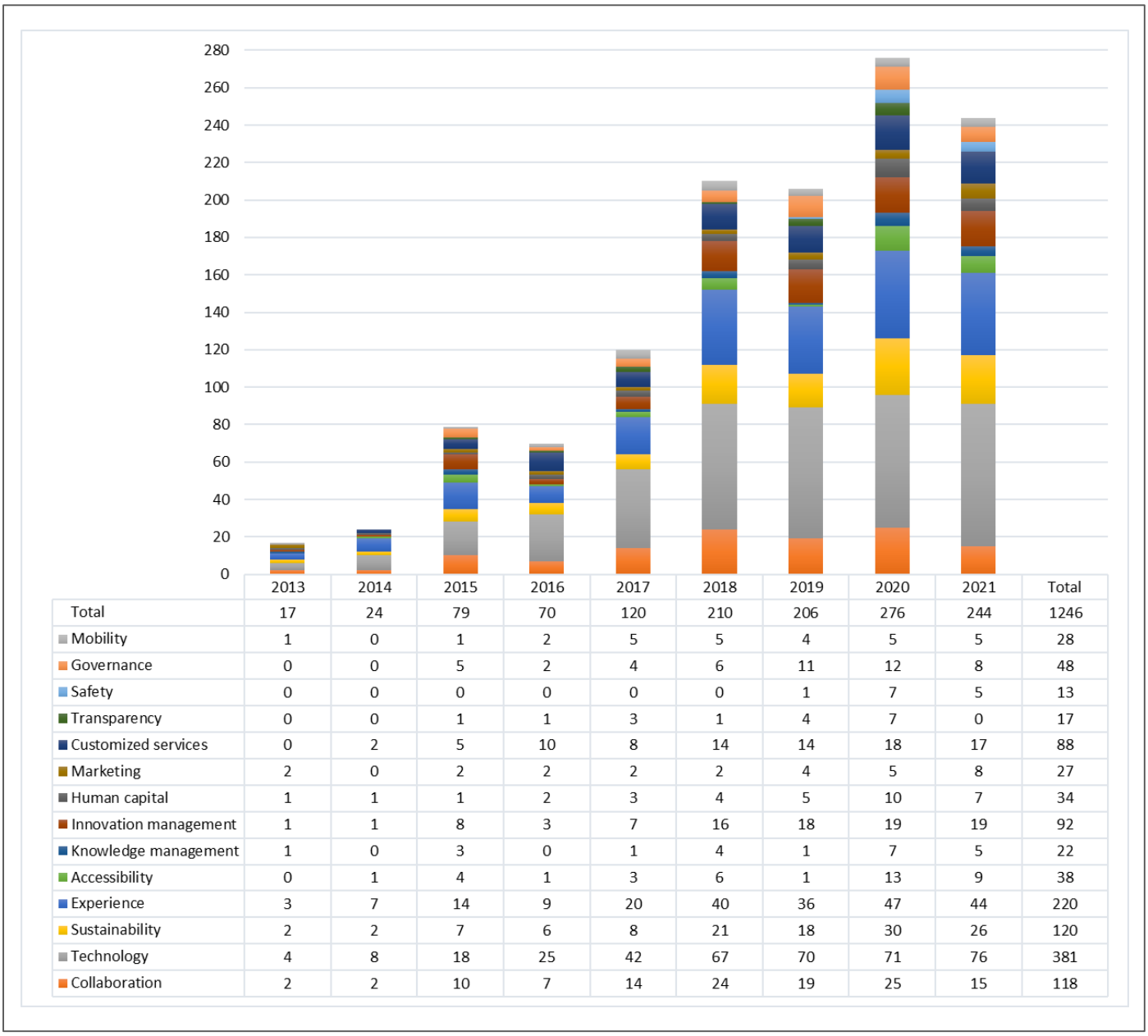
The technology dimension presents itself as the most frequent input in all years, from 2013 to 2021, which is inevitably related to the origins of smart tourism, as in its relationship with e-tourism. Other dimensions of greater quantitative prominence in the smart tourism literature are (in this order): experience, sustainability and collaboration.

On the other hand, the least explored dimensions in smart tourism (based on the number of occurrences revealed by Figure 5) are: safety, which had its first occurrence identified only in 2019; transparency, which had no record identified in 2021; knowledge management, which has shown a fickle trend over the years; and marketing, which showed a stable trend until 2018, and growth in occurrences from 2019.

From these considerations and the overview shown by Figure 5, it is expected that future approaches to smart tourism (whether academic, governmental or market) can consider broader elements (or dimensions) of smart tourism, with a view to increasing positive impacts. for all stakeholders. Which denotes to consider, for example, greater attention to dimensions not yet prioritized in smart tourism, according to an adequate verification of applicability and usefulness of each dimension, of course.

Still, analyzing the temporal parallel of the COVID-19 pandemic, relating the years from 2019 to 2021, there is a possibility that its effects (such as social isolation and the expansion of the use of technological devices) have contributed to maintain the growth of research in smart tourism. Especially because the pandemic, for example, helped more people to have access to destination information through technologies, laying the foundations for the popularization of smart tourism (Ye et al., 2021).

However, as works that effectively consider smart tourism with COVID-19, only eight were identified in the total scope of those analyzed. These relate mainly to the application of dimensions: technology, as a means of enhancing tourism in the midst of the pandemic (such as Kang & Oh, 2020); and experience, aiming to assess the impacts on it during the pandemic (as in Anita et al., 2021). In this way, it is envisaged that the pandemic highlights the importance of smart tourism, which, in turn, proves to be an important approach at times during and after tourism crises (Kim & Lee, 2021).



	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Total	17	24	79	70	120	210	206	276	244	1246
Mobility	1	0	1	2	5	5	4	5	5	28
Governance	0	0	5	2	4	6	11	12	8	48
Safety	0	0	0	0	0	0	1	7	5	13
Transparency	0	0	1	1	3	1	4	7	0	17
Customized services	0	2	5	10	8	14	14	18	17	88
Marketing	2	0	2	2	2	2	4	5	8	27
Human capital	1	1	1	2	3	4	5	10	7	34
Innovation management	1	1	8	3	7	16	18	19	19	92
Knowledge management	1	0	3	0	1	4	1	7	5	22
Accessibility	0	1	4	1	3	6	1	13	9	38
Experience	3	7	14	9	20	40	36	47	44	220
Sustainability	2	2	7	6	8	21	18	30	26	120
Technology	4	8	18	25	42	67	70	71	76	381
Collaboration	2	2	10	7	14	24	19	25	15	118

Fig. 5. Temporal evolution of the dimensions of smart tourism

5. Conclusion and Future Research

A growing trend towards addressing smart tourism is observed in academic research (Ye et al., 2020; Bastidas-Manzano et al., 2021), in government projects (Government of Spain, 2021) and even in web searches (Gretzel, 2018). A situation that points to smart tourism as a defining guideline in 21st century tourism (Savić & Pavlović, 2018), indicating a rich field of exploration both in theoretical and practical approaches (Ghaderi et al., 2018; Xiang, 2021).

However, different research limitations (Wang et al., 2016; Bošnjak et al., 2017; Gretzel & Scarpino-John, 2018; Xiang, 2021) and of the practical application of smart tourism (Gretzel et al., 2015a; Xiang et al., 2015; Ballina, 2020; Lee et al., 2021), show a parallel of needs and opportunities to advance related knowledge to the subject (Xiang, 2021).

Among the possibilities observed for this smart tourism to advance both in theory and in practice, it was glimpsed that the broad mapping of the dimensions that support it can support the development of more comprehensive, efficient and sustainable research and projects. This is because, when considering different operational characteristics of smart tourism, it becomes possible for its applications to contemplate each of these characteristics, whenever feasible, of course, instead of focusing only on specific or more restricted points. Since the contemplation of every nuance of smart tourism can allow for greater success in its applications.

Based on this perspective, the integrative review of the literature on smart tourism, carried out in this research, prospected and evidenced fourteen dimensions that underpinned applications of smart tourism in different contexts (geographic, methodological, etc.). Dimensions in which one can observe, on the one hand, topics that are already well explored in smart tourism, such as technology and experience; and, on the other hand, topics that can still receive greater attention and also add greater value to smart tourism, such as knowledge management and security. Thus, the results of this study can also support the theoretical and practical deepening of attributes still little explored in smart tourism, as well as the evolution of smart tourism as a whole.

In this sense, in order to highlight the results of this research, Table 6 presents a summary of the main theoretical contributions, and the main opportunities for future research:

Table 6. Theoretical contributions and future research opportunities in smart tourism

Topic	Theoretical contributions	Research opportunities
Smart tourism levels	The composite approach of smart tourism, according to the seven levels mapped, defined and positioned (including spatially in Figure 1), contributes to a better understanding of the dynamics involved, and to draw attention that smart tourism needs to consider, together, many of these facets (or levels) in your projects	- Analyze how the relationships between the different levels of smart tourism and stakeholders occur - Identify and/or propose mechanisms, practices, tools, models and other means that enhance the relationships between levels of smart tourism - Deepen knowledge about the levels with less attention in the literature, such as the smart tourist and the smart tourism business, given their relevance to the tourist operation; and at its broader levels, such as region and ecosystem
Smart tourism dimensions	The mapping, conceptualization and proposition of a set of dimensions of smart tourism, as shown in Figure 4 and Table 5, summarizes years of research, highlights attributes that can guarantee greater success in related projects (which might not consider some(es) dimensions) and establishes inputs for proposing new academic and market approaches (models, tools, etc.) for smart tourism. Understanding the temporal evolution of the application of the dimensions of smart tourism, according to the scope of intellectual productions analyzed and Figure 5, allows trends to be identified that can guide or prioritize research and projects in smart tourism. Both to keep up with market or tourist demands, as well as to ensure greater likelihood of success in the initiatives.	- Develop research that considers, if possible, the set of fourteen dimensions of smart tourism, in order to verify the impacts generated. Or even consider smaller sets of dimensions, or dimensions that are "more recent trends" or "less prioritized" in the literature. - Implement and test approaches, such as measurement instruments, that can lead and evaluate smart tourism practices, considering the dimensions presented in this work, at its different levels. - To deepen the literature on smart tourism, theoretically and empirically, to establish all the essential attributes (characteristics, components, background, etc.) in each of the dimensions, aiming to guide the most adequate and efficient operationalization of the projects.

In this context, the dimensions highlighted by this work can establish a platform for a new phase of research and projects in smart tourism and in each of its identified application levels. Both with the aim that this smart tourism represents an effective and widespread philosophy throughout the tourism industry, as well as to enable relevant results for all stakeholders and to support the next advances in smart tourism itself and in the tourism sector. The opportunities, as highlighted, are many.

This research has its limitations, such as the fact that it only considers two databases, despite the complement with the exploratory search; to involve search terms for intellectual productions predominantly based on the English language and without considering all possible grammatical variations for the application of smart tourism and; of being conditioned to the sieve and worldview of the researchers involved.

From these facts, future works may expand the scope of the current study to other databases, also considering search terms beyond the English language, as well as terms related to smart tourism that were not used here as "smart destination" and "smart hospitality." In addition, the involvement of other researchers and the temporal update itself with the consideration of intellectual productions published after the time horizon of this research, can bring new views and contributions to the theme.

Declaration of competing interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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References

Adnan, H. R., Hidayanto, A. N., Purwandari, B., & Nazief, B. A. A. (2020, November 3–4). *Rocky roads towards smart tourism: A multi-dimensional challenges review*. Paper presented at the 2020 Fifth International Conference on Informatics and Computing (ICIC), Gorontalo, Indonesia.

Aktaş, E., & Kurgun, A. (2019). Smart tourism ecosystems' impacts on tourism destinations. In D. Gursoy & R. Nunkoo (Eds.), *The Routledge handbook of tourism impacts* (pp. 428–439). London: Routledge.

Angelaccio, M., Basili, A., & Buttarazzi, B. (2013, June 17–20). *Using geo-business intelligence and social integration for smart tourism cultural heritage platforms*. Paper presented at the 2013 Workshops on Enabling Technologies: Infrastructure for Collaborative Enterprises, Hammamet, Tunisia.

Anita, T. L., Wijaya, L., Sarastiani, A., & Kusumo, E. (2021, March 7–11). *Smart tourism experiences: Virtual tour on museum*. Paper presented at the 11th Annual International Conference on Industrial Engineering and Operations Management, IEOM 2021, Singapore.

Arenas, A. E., Goh, J. M., & Urueña, A. (2019). How does IT affect design centricity approaches: Evidence from Spain's smart tourism ecosystem. *International Journal of Information Management, 45*, 149–162.

Babbie, E. R. (2010). *The practice of social research*. 12th ed. London: Cengage Learning.

Ballina, F. J. (2020). Smart business: The element of delay in the future of smart tourism. *Journal of Tourism Futures*. Advance online publication.

https://doi.org/10.1108/JTF-02-2020-0018
Bastidas-Manzano, A. B., Sánchez-Fernández, J., & Casado-Aranda, L. A. (2021). The past, present, and future of smart tourism destinations: A bibliometric analysis. *Journal of Hospitality and Tourism Research, 45*(3), 529–552.
Boes, K., Buhalis, D., & Inversini, A. (2015). Conceptualising smart tourism destination dimensions. In I. Tussyadiah & A. Inversini (Eds), *Information and communication technologies in tourism 2015* (pp. 391–403). Cham: Springer.
Bošnjak, A., Sladić, G., & Luburić, N. (2017, March 12-15). *Smart tourism destinations: Enhancing interconnection between stakeholders and tourist through information personalization and feedback system*. Paper presented at the Seventh International Conference on Information Society and Technology ICIST, Kopaonik, Serbia.
Brennan, B. S. (2020). A convergence of mobile device application use and smart tourism: A comparison of Korean and non-Korean smart tourists. *Journal of Internet Electronic Commerce Resarch*, *20*(4), 145–160.
Buhalis, D., & Amaranggana, A. (2015). Smart tourism destinations enhancing tourism experience through personalisation of services. In I. Tussyadiah & A. Inversini (Eds.), *Information and communication technologies in tourism 2015* (pp. 377–389). Cham: Springer.
Buhalis, D., & Leung, R. (2018). Smart hospitality—Interconnectivity and interoperability towards an ecosystem. *International Journal of Hospitality Management, 71*, 41–50.
Bulti, A. G., Ray, A., & Bhuyan, P. (2019). Smart tourism system architecture design using the internet of everything (IOE) over cloud platform. *International Journal of Innovative Technology and Exploring Engineering*, *8*(6), 421–426.
Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology, 18*(2), 65–82.
Çizel, B., & Ajanovic, E. (2019). Smart tourism ecosystem impacts. In D. Gursoy & R. Nunkoo (Eds.), *The Routledge handbook of tourism impacts* (pp. 403–417). London: Routledge.
Coca-Stefaniak, J. A. (2019). Marketing smart tourism cities – A strategic dilemma. *International Journal of Tourism Cities, 5*(4), 513–518.
Corrêa, S. C. H., & Gosling, M. S. (2021). Smart tourism destinations from the perspective of travelers with disability. *Almatourism -. Journal of Tourism, Culture and Territorial Development*, *12*(23), 1–20.
de Avila Muñoz, A. L., & Sánchez, S. G. (2013). Destinos turísticos inteligentes: Antonio López De Ávila, Presidente de Segittur [Smart tourism destinations: Antonio López De Ávila, President of Segittur]. *Harvard Deusto Business Review*, *224*, 58–67.
De las Heras-Pedrosa, C., Jambrino-Maldonado, C., Iglesias-Sánchez, P. P., & Lugo-Ocando, J. (2019). Importancia de las relaciones con los públicos en la reputación en un destino turístico inteligente. Propuesta de un modelo sostenible [Importance of public relations in reputation in a smart tourism destination. Proposal for a sustainable model]. *Revista Internacional de Relaciones Públicas, 9*(17), 117–138.
Del Chiappa, G., & Baggio, R. (2015). Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure. *Journal of Destination Marketing and Management, 4*(3), 145–150.
Del Vecchio, P., Malandugno, C., Passiante, G., & Sakka, G. (2021). Circular economy business model for smart tourism: The case of Ecobnb. *EuroMed Journal of Business*, *17*(1), 88–104.
Del Vecchio, P. D., Mele, G., Ndou, V., & Secundo, G. (2018). Creating value from social big data: Implications for smart tourism destinations. *Information Processing and Management, 54*(5), 847–860.
Doolen, J. (2017). Meta-Analysis, systematic, and integrative reviews: An overview. *Clinical Simulation in Nursing, 13*(1), 28–30.
Femenia-Serra, F., Neuhofer, B., & Ivars-Baidal, J. A. (2019). Towards a conceptualisation of smart tourists and their role within the smart destination scenario. *Service Industries Journal, 39*(2), 109–133.
Femenia-Serra, F., Perles-Ribes, J. F., & Ivars-Baidal, J. A. (2019). Smart destinations and tech-savvy millennial tourists: Hype versus reality. *Tourism Review, 74*(1), 63–81.
Fong, S. J., Dey, N., & Chaki, J. (2021). AI-enabled technologies that fight the coronavirus outbreak. In *Artificial intelligence for coronavirus outbreak. SpringerBriefs in applied sciences and technology* (pp. 23–45). Singapore: Springer.
Gajdošík, T. (2018). Smart tourism: Concepts and insights from Central Europe. *Czech Journal of Tourism, 7*(1), 25–44.
Gajdošík, T. (2019). Big data analytics in smart tourism destinations. A new tool for destination management organizations? In V. Katsoni & M. Segarra-Oña (Eds.), *Smart tourism as a driver for culture and sustainability*. *Springer Proceedings in Business and Economics* (pp. 15–33). Cham: Springer.
Gajdošík, T. (2020). Smart tourists as a profiling market segment: Implications for DMOs. *Tourism Economics, 26*(6), 1042–1062.
Gautam, B. P., Asami, H., Batajoo, A., & Fujisaki, T. (2016, August 25–28). *Regional revival through IOT enabled smart tourism process framework (STPF): A proposal*. Paper presented at the 2016 Joint 8th International Conference on Soft Computing and Intelligent Systems (SCIS) and 17th International Symposium on Advanced Intelligent Systems (ISIS), Sapporo, Japan.
Ghaderi, Z., Hatamifar, P., & Henderson, J. C. (2018). Destination selection by smart tourists: The case of Isfahan, Iran. *Asia Pacific Journal of Tourism Research, 23*(4), 385–394.
Ghorbani, A., Danaei, A., Zargar, S. M., & Hematian, H. (2019). Designing of smart tourism organization (STO) for tourism management: A case study of tourism organizations of South Khorasan province, Iran. *Heliyon, 5*(6), e01850.
González-Reverté, F. (2019). Building sustainable smart destinations: An approach based on the development of Spanish smart tourism plans. *Sustainability, 11*(23), 6874.
Government of Spain. (2021, March 31). España colaborará con el Banco Interamericano de Desarrollo (BID) para impulsar los destinos turísticos inteligentes en América Latina y Caribe. [Spain will collaborate with the Inter-American Development Bank (IDB) to promote smart tourism destinations in Latin America and the Caribbean.]. https://www.lamoncloa.gob.es/serviciosdeprensa/notas Prensa/industria/paginas/201/310321-dti.aspx.
Gretzel, U. (2018). From smart destinations to smart tourism regions. *Investigaciones Regionales – Journal of Regional Research*, *42*, 171–184.
Gretzel, U., & Koo, C. (2021). Smart tourism cities: A duality of place where technology supports the convergence of touristic and residential experiences. *Asia Pacific Journal of Tourism Research*, *26*(4), 352–364.
Gretzel, U., & Scarpino-Johns, M. (2018). Destination resilience and smart tourism destinations. *Tourism Review International, 22*(3), 263–276.
Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015a). Smart tourism: Foundations and developments. *Electronic Markets, 25*(3), 179–188.
Gretzel, U., Werthner, H., Koo, C., & Lamsfus, C. (2015b). Conceptual foundations for understanding smart tourism ecosystems. *Computers in Human Behavior, 50*, 558–563.
Gretzel, U., Zhong, L., & Koo, C. (2016). Application of smart tourism to cities. *International Journal of Tourism Cities, 2*(2), 1-4.
Guo, Y., Liu, H., & Chai, Y. (2014). The embedding convergence of smart cities and tourism internet of things in China: An advance perspective. *Advances in Hospitality and Tourism Research (AHTR), 2*(1), 54–69.
Gusakov, A. A., Haque, A. U., & Jogia, A. V. (2020). Mechanisms to support open innovation in smart tourism destinations: Managerial perspective and implications. *Polish Journal of Management Studies*, *21*(2), 142–161.
Hassannia, R., Vatankhah Barenji, A., Li, Z., & Alipour, H. (2019). Web-based recommendation system for smart tourism: Multiagent technology. *Sustainability, 11*(2), 323.
Herrero Crespo, Á., San Martín Gutiérrez, H., & García de los Salmones, M. D. M. (2019). Servicios "Smart" y valor de los destinos turísticos inteligentes: Análisis desde la perspectiva de los residentes ["Smart" services and value of smart tourism destinations: Analysis from the perspective of residents]. *Investigaciones Regionales – Journal of Regional Research, 45*(2019/3), 77–91.
Hodžić, S., & Alibegović, D. J. (2019). The efficiency of regional government expenditure in smart tourist destination: The case of Croatia. *Tourism in South East Europe, 5,* 307–318.
Hollands, R. G. (2008). Will the real smart city please stand up?: Intelligent, progressive or entrepreneurial? *City, 12*(3), 303–320.
Huang, S., Li, Y., & Dai, P. (2017). Evaluation of tourism competitiveness of Chinese smart tourism city. *Acta Geographica Sinica, 72*, 242–255.
Ivars-Baidal, J. A., Celdrán-Bernabeu, M. A., López, J. M., & Ivars, A. P. (2017). Towards an ICT road map for smart tourism destinations based on prospective analysis. *e-Review of Tourism Research, 8*, 1–5.
Jasrotia, A., & Gangotia, A. (2018). Smart cities to smart tourism destinations: A review paper. *Journal of Tourism Intelligence and Smartness, 1*(1), 47–56.
Jeong, M., & Shin, H. H. (2020). Tourists' experiences with smart tourism technology at smart destinations and their behavior intentions. *Journal of Travel Research, 59*(8), 1464–1477.
Jovicic, D. Z. (2019). From the traditional understanding of tourism destination to the smart tourism destination. *Current Issues in Tourism, 22*(3), 276–282.
Kang, H., & Oh, M. (2020). A convergence smart tourism service brand based on the 4th Industrial Revolution new technology. *Brand Design Studies*, *18*(3), 267–276.
Kaur, M. J., & Maheshwari, P. (2016, October 14–16). *Smart tourist for Dubai city*. Paper presented at the 2016 2nd International Conference on Next Generation Computing Technologies (NGCT), Dehradun, India.
Kazandzhieva, V., & Santana, H. (2019). E-tourism: Definition, development and conceptual framework. *Tourism: an International Interdisciplinary Journal*, *67*(4), 332–350.

Khan, M. S., Woo, M., Nam, K., & Chathoth, P. K. (2017). Smart city and smart tourism: A case of Dubai. Sustainability, 9(12), 2279.

Kiatkawsin, K., Sutherland, I., & Lee, S. K. (2020). Determinants of smart tourist environmentally responsible behavior using an extended norm-activation model. *Sustainability*, *12*(12), 4934.

Kim, J., & Lee, K. (2021). A study on the effect of COVID-19 risk perception, smart tourism perception, smart tourism attitude, and behavioral intention. *Journal of the Korean Food Service Industry Association*, *17*(1), 147–161.

Kim, J. Y., & Canina, L. (2015). An analysis of smart tourism system satisfaction scores: The role of priced versus average quality. *Computers in Human Behavior, 50*, 610–617.

Koo, C., Park, J., & Lee, J. N. (2017). Smart tourism: Traveler, business, and organizational perspectives. *Information and Management, 54*(6), 683–686.

Koo, C., Shin, S., Kim, K., Kim, C., & Chung, N. (2013, June 18-22). *Smart tourism of the Korea: A case study*. Paper presented at the 17th Pacific Asia Conference on Information Systems, PACIS 2013, Jeju Island, Republic of Korea.

PACIS 2013 Proceedings, 138.

Kostadinova Popova, K., & Malinova Malcheva, M. (2020). Assessment of the potential of Varna city as a smart tourist destination. *Tourism*, *68*(3), 308–321.

Kuang, X., & Ai, S. (2016). Research on the development of smart tourism in Jiangxi Province under the background of the "Internet+". *Economic and Social Changes: Facts, Trends, Forecast*, *4*(4 (46)), 199–205.

Lamsfus, C., Martín, D., Alzua-Sorzabal, A., & Torres-Manzanera, E. (2015). Smart tourism destinations: An extended conception of smart cities focusing on human mobility. In I. Tussyadiah & A. Inversini (Eds.), *Information and communication technologies in tourism 2015* (pp. 363–375). Cham: Springer.

Lee, H., & Hlee, S. (2021). The intra- and inter-regional economic effects of smart tourism city Seoul: Analysis using an input–output model. *Sustainability*, *13*(7), 4031.

Lee, P., Hunter, W. C., & Chung, N. (2020). Smart tourism city: Developments and transformations. *Sustainability, 12*(10), 3958.

Lee, P., Zach, F. J., & Chung, N. (2021). Progress in smart tourism 2010–2017: A systematic literature review. *Journal of Smart Tourism, 1*(1), 19–30.

Lee, S. J. (2017). A review of audio guides in the era of smart tourism. *Information Systems Frontiers, 19*(4), 705–715.

Li, Y. (2019, October 26–27). *Study on the design of smart scenic spots based on smart tourism–A case study on the ancient City of Suzhou*. Paper presented at the 2019 12th International Conference on Intelligent Computation Technology and Automation, Xiangtan, China.

Li, Y., Hu, C., Huang, C., & Duan, L. (2017). The concept of smart tourism in the context of tourism information services. *Tourism Management*, *58*, 293–300.

Lim, C., Baba, K., & Iijima, J. (2019). Smart tourism capability maturity framework: A design science research approach. *Asia Pacific Journal of Information Systems, 29*(3), 503–523.

Liu, Y. (2020). Research of smart tourism management model under the background of big data. In *Journal of Physics: Conference Series*, *1601*(3), 032003.

Lopes, I. M., & Oliveira, P. (2018, June 13–16). *The relationship between smart cities and smart tourism in low density regions*. Paper presented at the 2018 13th Iberian Conference on Information Systems and Technologies (CISTI), Caceres, Spain.

López De Ávila, A., Lancis, E., García, S., Alcantud, A., García, B., & Muñoz, N. (2015, September). *Informe destinos turísticos inteligentes: Construyendo el future* [Smart tourism destinations report: Building the future]. Madrid, Spain: SEGITTUR. https://www.thinktur.org/media/Libro-Blanco-Destinos-Tursticos-Inteligentes-construyendo-el-futuro.pdf

Masseno, M. D., & Santos, C. (2018). Smart tourism destinations privacy risks on data protection. *Revista Eletrônica Sapere Aude, 1*(1), 125–149.

Matos, A., Pinto, B., Barros, F., Martins, S., Martins, J., & Au-Yong-Oliveira, M. (2019). Smart cities and smart tourism: What future do they bring?. In Á. Rocha, H. Adeli, L. Reis, & S. Costanzo (Eds.), *New knowledge in information systems and technologies. WorldCIST'19 2019. Advances in intelligent systems and computing* (Vol. 932, pp. 358–370). Cham: Springer.

Mehraliyev, F., Chan, I. C. C., Choi, Y., Koseoglu, M. A., & Law, R. (2020). A state-of-the-art review of smart tourism research. *Journal of Travel and Tourism Marketing, 37*(1), 78–91.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA statement. *PLOS Medicine, 6*(7), e1000097.

Muthuraman, S., & Al Haziazi, M. (2019, March 24–27). *Smart tourism destination-new exploration towards sustainable development in sultanate of Oman*. Paper presented at the 2019 5th International Conference on Information Management (ICIM), Cambridge, UK.

Nam-Ho, C., & Do-Seung, K. (2021). A public legal task for the development of a smart tourism city. *American Constitutional Study*, *32*(1), 211–241.

Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some stylised facts. *Cities, 38*, 25–36.

Park, J. H., Lee, C., Yoo, C., & Nam, Y. (2016). An analysis of the utilization of Facebook by local Korean governments for tourism development and the network of smart tourism ecosystem. *International Journal of Information Management, 36*(6), 1320–1327.

Perfetto, M. C., & Vargas-Sánchez, A. (2018). Towards a smart tourism business ecosystem based on industrial heritage: Research perspectives from the mining region of Rio Tinto, Spain. *Journal of Heritage Tourism, 13*(6), 528–549.

Pierce, A. K. (2016, June 19-21). *The financing activities of Canadian small and medium-sized enterprises in tourism industries*. Paper presented at the 2011 TTRA International Conference, London, Ontario, Canada.

Polese, F., Botti, A., Grimaldi, M., Monda, A., & Vesci, M. (2018). Social innovation in smart tourism ecosystems: How technology and institutions shape sustainable value co-creation. *Sustainability, 10*(2), 140.

PRISMA - Transparent reporting of systematic reviews and meta-analyses. (2022). *PRISMA statement*. http://www.prisma-statement.org/PRISMAStatement/

Priano, F. H., Armas, R. L., & Guerra, C. F. (2016). A model for the smart development of island territories. In Y. Kim & M. Liu (Eds.), *dg.o '16: Proceedings of the 17th International Digital Government Research Conference on Digital Government Research* (pp. 465–474— New York: Association for Computing Machinery.

Rongrong, Y. (2017, October 15–16). *A mobile smart tourism and marketing system design for Harbin*. Paper presented at the 2017 International Conference on Robots & Intelligent System (ICRIS), Huai An City, China.

Ruiz, D. F., Burgos, J. P., & Ugarte, B. M. (2018). ¿Destinos turísticos inteligentes o territorios inteligentes?. Estudio de casos en España [Smart tourism destinations or smart territories? Case study in Spain]. *Revista de Estudios Regionales*, *3*, 193–219.

Sanches, A. C., Sauer, L., Binotto, E., & Bortolocci Espejo, M. M. (2018). Análise dos estudos sobre indicadores de sustentabilidade no turismo [Analysis of studies on sustainability indicators in tourism]. *Revista Turismo em Análise, 29*(2), 292–311.

Santos Júnior, A., Biz, A. A., García, F. A., & Mendes Filho, L. (2019). Entendiendo la gobernanza de los destinos turísticos inteligentes: El caso de Florianópolis-Brasil [Understanding the governance of smart tourism destinations: The case of Florianópolis-Brazil]. *International Journal of Information Systems and Tourism (IJIST), 4*(1), 29–39.

Savić, J., & Pavlović, G. (2018). Analysis of factors of smart tourism development in Serbia. *Menadžment u Hotelijerstvu i Turizmu, 6*(1), 81–91.

Șchiopu, A. F., Pădurean, A. M., Țală, M. L., & Nica, A. M. (2016). The influence of new technologies on tourism consumption behavior of the millennials. *Amfiteatru Economic Journal, 18*(10), 829–846.

Shafiee, S., Rajabzadeh Ghatari, A. R., Hasanzadeh, A., & Jahanyan, S. (2019). Developing a model for sustainable smart tourism destinations: A systematic review. *Tourism Management Perspectives, 31*, 287–300.

Shen, S., Sotiriadis, M., & Zhou, Q. (2020). Could smart tourists be sustainable and responsible as well? The contribution of social networking sites to improving their sustainable and responsible behavior. *Sustainability*, *12*(4), 1470.

Taaffe, J. (2014, September 22). Europe's cities get smarter on tourism. *Cisco Newsroom*. https://newsroom.cisco.com/press-release-content?articleId=1488545

Tavitiyaman, P., Qu, H., Tsang, W. L., & Lam, C. R. (2021). Smart tourism application and destination image: Mediating role of theory of mind (ToM). *Asia Pacific Journal of Tourism Research*, *26*(8), 905–920.

Tran, H. M., Huertas, A., & Moreno, A. (2017). (SA) 6: A new framework for the analysis of smart tourism destinations. A comparative case study of two Spanish destinations. In J. F. Vera-Rebollo, J. A. Ivars-Baidal, M. A. Celdrán Bernabeu (Eds.), *Actas del Seminario Internacional Destinos Turísticos Inteligentes: Nuevos horizontes en la investigación y gestión del turismo* [Proceedings of the International Seminar Smart Tourism Destinations: New horizons in tourism research and management] (pp. 190–214). Alicante: University of Alicante.

Tsai, T. H., Chang, H. T., Lin, Y. W., Yu, M. C., Lien, P. J., Yan, W. C., & Ho, W. L. (2018). Emerging social media and social networks analysis transforms the tourism industry: Living green smart tourism ecosystem. In. M. Antona & C. Stephanidis (Eds.), *Universal access in human-computer interaction. Virtual, augmented, and intelligent environments. UAHCI 2018. Lecture notes in computer science (Vol.*

10908, pp. 583–590). Cham: Springer.
Vargas-Sánchez, A. (2016). Exploring the concept of smart tourist destination. *Enlightening Tourism. a Pathmaking Journal, 6*(2), 178–196.
Wang, D., Li, X. (, & Li, Y. (2013). China's "smart tourism destination" initiative: A taste of the service-dominant logic. *Journal of Destination Marketing and Management, 2*(2), 59–61.
Wang, X., Li, X. (, Zhen, F., & Zhang, J. (2016). How smart is your tourist attraction?: Measuring tourist preferences of smart tourism attractions via a FCEM-AHP and IPA approach. *Tourism Management, 54*, 309–320.
Webb, C., & Roe, B. (Eds.). (2008). *Reviewing research evidence for nursing practice: Systematic reviews*. New Jersey: John Wiley & Sons.
Wise, N., & Heidari, H. (2019). Developing smart tourism destinations with the internet of things. In M. Sigala, R. Rahimi, & M. Thelwall (Eds), *Big data and innovation in tourism, travel and hospitality*, 21–29. Singapore: Springer.
Wu, W. (2020). Analysis of digital tourism, virtual tourism and wisdom tourism. In Z. Xu, R. Parizi, M. Hammoudeh, & O. Loyola-González (Eds.), *Cyber security intelligence and analytics. CSIA 2020. Advances in intelligent systems and computing* (Vol. 1147, pp. 18–25). Cham: Springer.
Xiang, Z. (2021). Journal of Smart Tourism: A new platform to support and define an emerging field. *Journal of Smart Tourism, 1*(1), 1–2.
Xiang, Z., & Fesenmaier, D. R. (2017). Big data analytics, tourism design and smart tourism. In Z. Xiang & D. Fesenmaier (Eds.), *Analytics in smart tourism design. Tourism on the verge* (pp. 299–307). Cham: Springer.
Xiang, Z., Tussyadiah, I., & Buhalis, D. (2015). Smart destinations: Foundations, analytics, and applications. *Journal of Destination Marketing and Management, 4*(3), 143–144.
Xiaojing, W. (2017, June 16–18). *An application of Kano model to identify quality attributes of smart tourism*. Paper presented at the 2017 International Conference on Service Systems and Service Management, Dalian, China.
Xu, C., Huang, X., Zhu, J., & Zhang, K. (2018, January 25–26). Research on the construction of Sanya smart tourism city based on internet and big data. Paper presented at the 2018 International Conference on Intelligent Transportation, Big Data and Smart City (ICITBS), Xiamen, China.
Ye, B. H., Ye, H., & Law, R. (2020). Systematic review of smart tourism research. *Sustainability, 12*(8), 3401.
Ye, H., Sun, S., & Law, R. (2021). An investigation of developing smart tourism from the perspective of stakeholders. *Asia Pacific Journal of Tourism Research*, *26*(10), 1156–1170.
Yong, M., & Hui-Ying, C. (2013, May 25-26). *Study on the value promotion and development strategy of smart tourism*. Paper presented at the WHICEB 2013 Proceedings, 45, 624-631, Wuhan, China.
Yoo, T. (2012, October 31). Korea leading global smart revolution. *The Korea Times*. http://www.koreatimes.co.kr/www/tech/2019/03/133_123643.html

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Appendix[2]**.** Matrix with the reference for the dimensions at each level of smart tourism.

Dimension of smart tourism	Smart tourism level						
	Smart tourism	**Smart tourist**	**Smart tourism business**	**Smart tourism city**	**Smart tourism destination**	**Smart tourism region**	**Smart tourism ecosystem**
Collaboration	Gretzel et al. (2015a); Lee et al. (2020)	Femenia-Serra et al. (2019); Shen et al. (2020)	Gretzel et al. (2016); Lee et al. (2020)	Lee et al. (2020); Gretzel and Koo (2021)	Vargas-Sánchez (2016); Savić and Pavlović (2018)	-	Gretzel et al. (2015b); Tsai et al. (2018)
Technology	Koo et al. (2013); Gajdošík (2019)	Gajdošík (2020); Brennan (2020)	Gretzel et al. (2015a); Jovicic (2019)	Xu et al. (2018); Gretzel and Koo (2021)	Gajdošík (2019); Kostadinova Popova and Malinova Malcheva (2020)	Gretzel (2018); Gusakov et al. (2020)	Park et al. (2016); Gajdošík (2018)
Sustainability	Xiang and Fesenmaier (2017); Bulti et al. (2019)	Kiatkawsin et al. (2020)	-	Huang et al. (2017); Lee and Hlee (2021)	Ghaderi et al. (2018); González-Reverté (2019)	-	Gretzel et al. (2015b); Polese et al. (2018)
Experience	Yong and Hui-Ying (2013); Hassannia et al. (2019)	Femenia-Serra et al. (2019); Gajdošík (2020)	Gretzel et al. (2015a); Lee et al. (2020)	Xu et al. (2018); Lee and Hlee (2021)	de Avila Muñoz and Sánchez (2013); Gajdošík (2019)	Gretzel (2018)	Bošnjak et al. (2017); Aktaş and Kurgun (2019)
Accessibility	Kuang and Ai (2016); Lee and Hlee (2021)	-	-	Lee et al. (2020); Lee and Hlee (2021)	Lopes and Oliveira (2018); Corrêa and Gosling (2021)	-	-
Knowledge management	Del Chiappa and Baggio (2015); Gajdošík (2018)	-	Del Vecchio et al. (2021)	-	Del Chiappa and Baggio (2015); Jovicic (2019)	-	-
Innovation management	Kuang and Ai (2016); Lim et al. (2019)	Femenia-Serra et al. (2019)	Gretzel et al. (2015a); Del Vecchio et al. (2021)	Huang et al. (2017); Gretzel and Koo (2021)	Boes et al. (2015); Jasrotia and Gangotia (2018)	-	Gretzel et al. (2015b); Polese et al. (2018)
Human capital	Yong and Hui-Ying (2013); Liu (2020)	-	Ghorbani et al. (2019)	Coca-Stefaniak (2019); Lee et al. (2020)	Boes et al. (2015); Kostadinova Popova And Malinova Malcheva (2020)	-	Aktaş and Kurgun (2019)
Marketing	Rongrong (2017); Çizel and Ajanovic (2019)	-	Ghorbani et al. (2019)	Huang et al. (2017)	Wang et al. (2013); Çizel and Ajanovic (2019)	-	-
Customized services	Ghaderi et al. (2018); Del Vecchio et al. (2021)	Kaur and Maheshwari (2016); Gajdošík (2020)	Wang et al. (2016); Del Vecchio et al. (2021	Xu et al. (2018); Lee et al. (2020)	Vargas-Sánchez (2016); Corrêa and Gosling (2021)	-	Arenas et al. (2019)
Transparency	Kim and Canina (2015); Li (2019)	Gajdošík (2020); Shen et al. (2020)	-	-	De las Heras-Pedrosa et al. (2019); Kostadinova Popova and Malinova Malcheva (2020)	-	Bošnjak et al. (2017)
Safety	Adnan et al. (2020); Tavitiyaman et al. (2021)	Brennan (2020)	-	Gretzel and Koo (2021); Nam-Ho and Do-Seung (2021)	Herrero Crespo et al. (2019); Corrêa and Gosling (2021)	-	-
Governance	Koo et al. (2017); Lim et al. (2019)	-	-	Coca-Stefaniak (2019); Gretzel and Koo (2021)	Ivars-Baidal et al. (2017); González-Reverté (2019)	-	Aktaş and Kurgun (2019)
Mobility	Angelaccio et al. (2013); Tavitiyaman et al. (2021)	-	-	Lee et al. (2020); Gretzel and Koo (2021)	Lamsfus et al. (2015); Corrêa and Gosling (2021)	Gretzel (2018)	-

[2] Accessed, in its full version, at: https://figshare.com/s/c1e7449ad262850a5a4a