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SUSTAINABLE TOURISM INDICATORS:

WHAT'S NEW WITHIN THE SMART CITY/DESTINATION APPROACH?

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Abstract: Indicators are a fundamental tool for destinations in their progress towards a more sustainable tourism development. However, the lack of real progress and the accelerated technological change are obliging policy makers to rethink the existing indicator systems. This paper examines the relationship between smart cities and destinations and sustainable tourism indicators by analyzing proposals at different scales. It provides a critical review of international smart city standards and the role that sustainability indicators play within them. Then, it conducts a content analysis of planning instruments applied in smart strategies in Spain, focusing on how sustainability indicators are considered under the smart paradigm. At the regional-local scale, this research compares two sets of indicators and tests the scientific validity of one of them for addressing the imbalance suffered by many indicators between their usefulness for policy makers and their academic rigor. The results show that little progress has been achieved despite the appropriation of the sustainability discourse by smart city and smart destination promoters. These findings reveal the (limited) real contribution made by smart cities/destinations to sustainable tourism development and contribute to identifying weaknesses and opportunities so as to redirect smart policies and projects. A final discussion contextualizes the findings within the novel framework of *smart sustainability* and highlights the need to reinforce public governance of urban and tourist spaces.

Keywords: smart destinations, smart cities, sustainable tourism indicators, standards, tourism planning

1. Introduction

The construction of indicators is a process embedded in the complex and controversial discussion on the relationship between tourism and sustainable development, which can be traced back to the 1970s (Hall, Gössling & Scott, 2015; Hunter, 1997; Miller & Twining-Ward, 2005). The evolution experienced by tourism academia in its understanding of this interrelationship is reflected in the four positions captured by Jafari (1989): advocacy, cautionary, adaptive and knowledge-based. These changing thinking patterns have largely influenced how the tourism and sustainable development dyad is interpreted. By the end of the 1980s, the knowledge-based approach introduced the need to progress towards more sustainable tourism models (Jafari, 1989) and promoted the development of indicators as a tool to monitor progress towards sustainability ideals (Miller & Twining-Ward, 2005). The United Nations Earth Summit, held in Rio de Janeiro in 1992, marked a turning point in the implementation of indicators for measuring the evolution towards sustainability, which began to be developed at different scales and gained support from many organizations from then on (EC, 2016; Torres-Delgado & Saarinen, 2014; UNWTO, 2004; Vera & Ivars, 2003).

The understanding of sustainable tourism development as a process instead of its conception as an idealized state links the advances made in sustainability to the need to measure the evolution of destinations through indicators (Sharpley, 2000). Hence, indicators constitute a fundamental instrument to overcome the problem identified by Hunter & Green (1995) of implementing sustainable tourism principles and policies in real contexts. Indicators are inevitably associated with the construction of a more sustainable tourism development; they make it tangible and objective through observable variables (Manning, 1999). Similarly, Butler (1999: 16) considers that without measures or indicators, the use of the term “sustainable tourism” is meaningless.

Nonetheless, there is still a lack of consensus on the conceptualization of sustainable tourism development. As argued by Bramwell & Lane (2012: 3), sustainable tourism is a socially constructed and contested concept approached from a wide range of views that "reflect economic interests, the ethical beliefs of different actors and the strength and effectiveness of various lobbies". Despite this diversity of conflicting interests, the most widely adopted definition is the one provided and supported by international organizations such as UNWTO, based on the notion of a balance between economic, social and environmental issues (Bramwell & Lane, 2012; UNWTO, 2004). Today this vision has been broadened to also include the Sustainable Development Goals (SDGs) defined by the 2030 Agenda for Sustainable Development (Rasoolimanesh et al. 2020; UNWTO, 2017).

The dominance of “balanced” models of development has resulted in a bias towards economic growth (Hall, Gössling & Scott, 2015; Hunter, 2002), the appropriation of the concept by mainstream discourses (Hughes, Weaver & Pforr, 2015; Gössling, Hall & Weaver, 2009) and very little progress towards a real sustainable tourism development (Hall, 2011; Tanguay, Rajaonson & Therrien, 2013). This problem is even recognized by the UNWTO (2017). Within this context, the emergence of smart tourism destinations (SDs) as a new planning and management approach for destinations (Jovicic, 2016; Ivars-Baidal et al., 2019) introduces some novelties in the dialectic between tourism and sustainability. This paper focuses on the association between the two concepts through the lens of sustainable tourism indicators, their construction and application. SDs are derived from the smart city concept (Boes, Buhalis & Inversini, 2016; Gretzel et al. 2015) as an urban management paradigm (Komninos, 2015), and therefore their foundations and development are closely linked to that of smart cities. In both cases, sustainability plays a central role, at least on a theoretical, managerial and political-discursive level. This smart approach should not be confused with SMART criteria (Specific, Measurable, Achievable, Relevant and Time-bound), usually applied to project management.

Smart cities adopt sustainability as part of their agenda while adding the technological and informational components as additional layers (Marsal-Llacuna et al. 2015). The increasing use of data and information and communication technologies (ICTs) for city management has given rise to a new scenario in urban sustainability monitoring, which had already been fostered in the 1990s through the implementation of the United Nations Agenda 21 action plan (Marsal-Llacuna et al. 2015). This period is marked by the crystallization of a new vision to make public sector management "more efficient, effective, transparent and value for money, combined with citizen and funder demands for evidence-based decision-making" (Kitchin, Lauriault & McArdle, 2015: 8). Building on these ideals, smart city projects proliferated from 2010 onwards even though the meaning of the concept was not understood (Ahvenniemi, Huovila, Pinto-Seppä, Airaksinen, 2017; Caragliu, del Bo & Nijkamp, 2011; Hollands, 2008). This is also the case in the definition and implementation of sustainable tourism principles. Therefore, it is paradoxical that the smart destination agenda includes sustainability even though it has not been attained through the manifold initiatives deployed over the last four decades. This raises reasonable suspicion with respect to the current propagandistic and rhetorical appropriation of sustainability by the smart movement.

The confluence between smartness and sustainability is proved by the existence of indicators that specify, measure and apply their principles to cities and tourist destinations. Very few studies have been conducted on the contribution of ICTs to sustainable tourism to date (Ali & Frew, 2013), but the topic is slowly becoming a consolidated research line with a large potential (Benckendorff, Sheldon & Fesenmaier, 2014; Gössling, 2017). This trend is further reinforced by the claim made by Huovila, Bosch & Airaksinen (2019) that the understanding of sustainability as being composed of three main pillars (social, environmental and economic dimensions), may become obsolete in today's hyper-digitalized society. ICTs are generating new frameworks within which to explore sustainable tourism and the synergistic relationships that "smart sustainability" can create (Perles-Ribes & Ivars-Baidal, 2018). This is the case of the implementation of smart solutions that, despite maximizing efficiency, are also triggering increased consumption and demand for tourism services (Becken, 2019). Overall, the lack of real improvement in terms of sustainability, the overlapping implementation of different sets of indicators and the new scenario arising from the emergence of smart cities and destinations, call for a deeper understanding of suitability indicators under the new smart paradigm and their role in the construction of sustainable tourism.

Based on these research needs, this study seeks to identify the new contributions that the smart city and smart destination approaches generate in the design and application of sustainable tourism indicators for destinations. Hence, this paper aims to provide a more nuanced vision of how indicators can actually contribute to a real progress towards sustainable practices within a smart tourism context by conducting a critical analysis of indicators, their content and their internal coherence and technical-statistical quality. By doing so, it contributes to the debate around smart sustainability and raises critical questions regarding the role that smart policies and projects are actually playing in the construction of a more sustainable tourist destination development. Through this process, weaknesses and potential improvements are detected and different ways to readdress policies are also suggested.

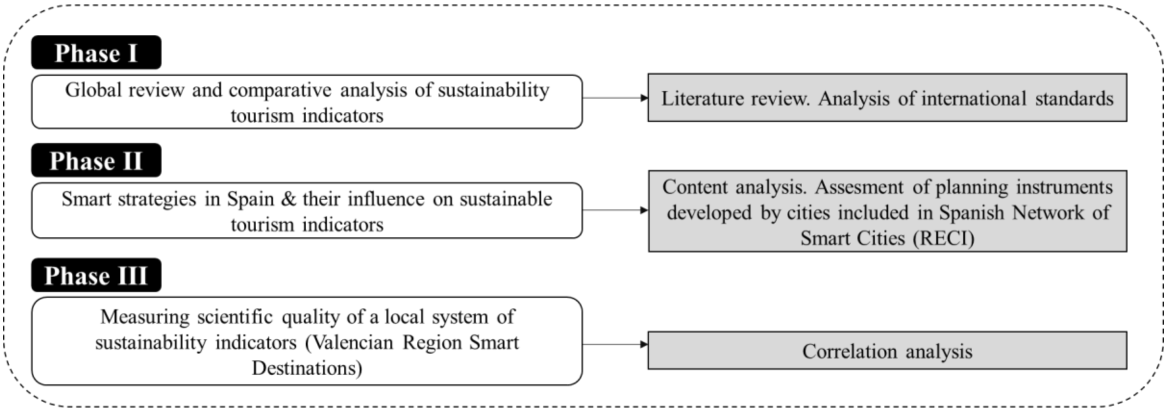
2. Methodology

To achieve the proposed objectives, this paper draws on a mixed-methods approach, combining qualitative methods (content analysis, review of existing contributions) with quantitative methods (correlations analysis for survey results) on three different geographical scales and socio-political contexts (see Figure 1). The mixed-methods approach has many advantages, including richer, more consistent results and a holistic integration of findings in order to fully depict the phenomenon that is being studied (Teddlie & Tashakkori, 2010). A combination of methods facilitates the integration of different types of data into a seamless discussion of results and a more comprehensive understanding of their implications (Creswell & Plano-Clark, 2017).

Mixed methods are particularly appropriate in the social sciences for topics in which an interdisciplinary vision is required, such as smart and sustainable tourism. Their strength lies in combining and connecting qualitative and quantitative data collection methods and types of analysis to understand complex problems. In this study, we follow a sequential strategy that seeks to build knowledge in a new field that requires this type of comprehensive approach (Creswell & Creswell, 2017).

First, the study conducts a critical and comparative review of international standards, indicators and rankings for smart cities to detect their intersection with tourism and sustainability through the inclusion or omission of indicators for both aspects. Second, it analyzes the contents of planning instruments for smart city and smart destination development in Spain in order to understand the presence (or absence) and actual implementation of sustainability indicators in each of the plans studied. This analysis on a national scale provides a holistic vision of how and to what extent sustainability has actually been embodied in the planning and strategies of smart cities and destinations. Spain has been selected as a case study because it is a leader in smart tourism development and due to the increasing number of smart city and destination initiatives being developed across the country (Gomis-López & González-Reverté, 2020; OECD, 2018). Third and finally, the research examines a specific set of indicators currently being implemented in destinations of the Region of Valencia (Spain) to assess their progress towards smart destinations standards in order to determine their statistical properties and consistency. This analysis provides a clear understanding of the scientific quality of indicators being used for smart destinations through a detailed examination of correlations matrices for the items of which they are composed. This analysis responds to the need to develop indicators that fulfill the criteria of both scientific legitimacy and relevance for policy makers (Tanguay, Rajaonson & Therrien, 2013), and validates a set of indicators that are currently being applied in local destinations. By doing so, this paper also looks at the regional and municipal scales, which have many competences and raises the need to scrutinize indicators whose results are being used to support decisions made by local and regional tourism administrations. Therefore, this paper proposes a sequential mixed method approach with three phases, conducted at different scales (international, national and regional-local) so as to depict how global discourses around sustainable and smart tourism permeate national and regional tourism agendas and how these ideas are translated into factual indicators at the lowest administrative level, represented by local destinations.

Figure 1. Methodology



Own elaboration

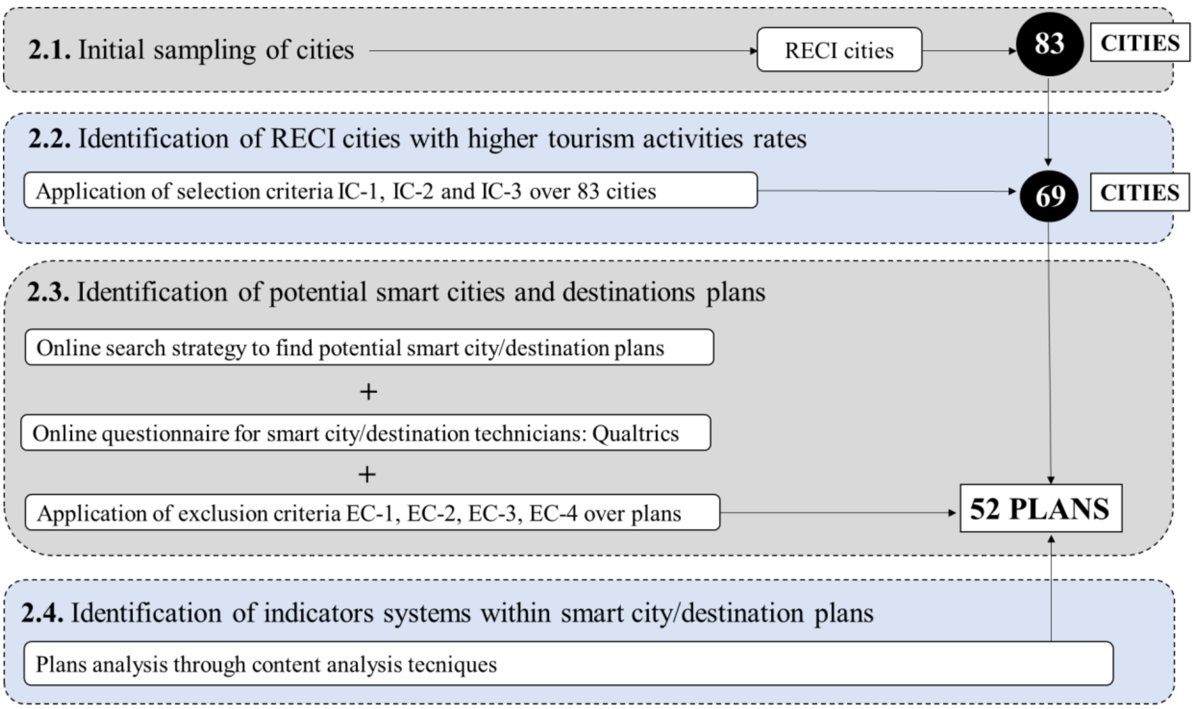
The details of the second phase of this methodology (plans content analysis), are as follows. An analysis of the planning instruments that guide the development of smart cities and smart destinations in Spain reveals the level of the inclusion of sustainability management as part of the strategy and the use of indicators in each case. This provides key information on how sustainability is considered on a local scale and to what extent the smart approach contributes to the use of indicators for tourism sustainability. The plans of both smart cities and smart destinations are included in this analysis. With respect to selecting which plans to examine, initially all the Spanish municipalities that belong to the Spanish Network of Smart Cities (RECI: *Red Española de Ciudades Inteligentes*) were scrutinized. The main objective of this network is to facilitate the exchange of knowledge and experiences between urban spaces interested in developing models that foster sustainability and quality of life through technologies, innovation and knowledge generation (RECI, 2020). In order to further refine the sample so as to detect those cities in which tourism plays a more important role, three inclusion criteria (IC) were defined:

- IC-1. Accommodation supply volume criterion: RECI cities that are tourist hubs according to the National Institute of Statistics (INE). That is, municipalities where the tourism supply volume is significant.
- IC-2. Participation in smart destination initiatives criterion: RECI cities included in the Smart Tourist Destinations programme, within the framework of the National Plan for Smart Territories (2017-2020).
- IC-3. Relevant tourist cities criterion: Being a World Heritage City, an official historic-artistic city or a municipality with special tourist interest according to regional administrations.

The fulfillment of at least one of these criteria was required for a city to be included in the sample. After applying the inclusion criteria, the sample was reduced to 69 cities, which were subject to a systematic online search using search engines (Google) to identify all potential plans related to their smart strategy. A total of four search strings were introduced for each of these 69 cities and the first twenty results were analyzed. A preliminary set of 145 plans were identified, which could potentially be addressed as developing smart cities and smart destinations strategies. It must be noted that in many cases, the plans found were announced in the media and press releases, but official documents were not available online. These inaccessible plans were discarded. To further understand and contrast the representativeness and relevance of each of the detected plans, an online questionnaire addressed to the municipal technical officers responsible for applying the plans was designed using Qualtrics©. The questionnaire included both open and Likert scale questions and was distributed between May and December 2019 via email. The objective of this questionnaire was to double check the information available online and to obtain further details for each of the plans (approval date, budget, basic design, etc.).

From the preliminary plans found through the online search process, a total of 62 plans were related to the implementation of Integrated Sustainable Urban Development initiatives (*EDUSI* in the Spanish acronym), funded by the European Regional Development Fund (EU) with more than 1,000 million euros and available to Spanish cities with over 20,000 inhabitants. Among the thematic lines of this program, number two was aimed at enhancing the access, use and quality of information and communication technologies (Nasarre y de Goicoechea et al., 2017). This was translated by many Spanish cities into projects and plans to progress towards smart city models and to improve e-administration. Through this assimilation process, the EDUSI have become one of the more important drivers of change in urban strategies in the country.

Figure 2. Smart city and destination plans: sampling process



Own elaboration

When analyzing the content of the EDUSI plans, we observed that these documents did not include any sustainability indicator system, but rather results and productivity indicators linked to the implementation of the proposed lines of action. Therefore, these plans were discarded from the final sample. In step number 2.3 (see Figure 2), four more exclusion criteria were applied to further refine the sample of plans:

- EC-1. Plans that have not been selected for the public tender to which they were presented or that have withdrawn their proposal.
- EC-2. Plans which do not include a smart city or smart destination project, strategy or actions.
- EC-3. Plans which have not been updated according to the subsequently implemented plans for smart city or destination development.
- EC-4. Plans that are not available online

After this selection process, a final sample of 52 plans was obtained (see Appendix B). These plans were analyzed thoroughly to identify and study the potential sustainability indicators they may include as well as how the smart approach has influenced the design of these indicators. In order to extract key data, content analysis techniques were applied and a total of six inductively developed categories were systematically applied to all of the plans (See details and results in Table 2). The categories are: Data collection; Data intelligence; Data connection; Data communication; Indicator system and Tourism data.

Finally, the details and results of the analysis conducted in phase three (indicators applied to Valencian destinations) are provided in section 5.

Overall, this methodology seeks to contrast the expected benefits that the smart approach supposedly generates for tourism sustainability with the reality of destinations and cities. These potential benefits have been identified in previous studies and are directly related to the use of the indicators (Perles & Ivars, 2018; Bibri & Krogstie, 2017).

3. Measuring sustainable tourism using a smart city approach from an international perspective

Despite the ambiguousness of the smart city concept and the lack of a generally accepted definition, smart cities include sustainability among their principles for action (Caragliu & Del Bo, 2012; Giffinger et al. 2007; Sharma & Dubey, 2017; Trindade et al. 2017). Jong et al. (2015) consider that the generalization of the smart city label instead of information, digital or *intelligent city*, responds to the aim of connecting technology with systems and services for people. There is a strong critical discourse of smart cities, understood by Vanolo (2014, p.894) as “an urban imaginary combining the concept of green cities with technological futurism and giving a name to technocentric visions of the city of tomorrow”.

Theoretically, the development of a smart strategy fosters a greater flow of information in terms of both quantity and quality, which facilitates monitoring, information, communication and participation processes and also transparency in destination management. Furthermore, the new data sources and ICT application should enable a greater efficiency in the use of resources, real-time management, personalization of services, development of an innovation ecosystem or the building of simulation models for predictive purposes (Bibri and Krogstie, 2017; Kitchin, 2014; Offenhuber & Ratti, 2014). Smart city indicators incorporate sustainability as one of their pillars and in doing so, they open a new perspective for the analysis of the role of sustainability in urban strategies that now discuss "how sustainability targets can be achieved with the help of smartness" (Ahvenniemi et al., 2017: 240). New smart city assessment frameworks are developed in this way following different objectives that allow the classification and ranking of cities according to the theoretical models and benchmarking practices. One of the first groups of indicators for smart cities was developed by Giffinger et al. (2007), resulting in a European Medium-sized Smart Cities index, a model that was followed by other rankings in subsequent years (e.g. Berrone & Ricart, 2019; Caragliu et al. 2011).

Recently, Ahvenniemi et al. (2017) compared eight smart city rankings with eight sustainable city rankings/assessment frameworks. The results reveal a higher emphasis on economic, social and technological aspects in smart city indexes, while there is also a clear lack of some basic environmental indicators, which are however present in urban sustainability indicators. Indicators for transport and energy, two issues which concentrate a large share of smart city investments, are frequently absent in their indicators (Vanolo, 2014). Smart city indicators are mostly oriented towards the comparison between cities as sustainable projects that are more developed at the municipal level (Haarstad, 2017). However, it must be considered that "the implementation of the smart city concept follows very varied paths depending on each city's specific policies, objectives, but also size, funding and scope" (Borsekova et al. 2018). Going beyond conventional rhetoric, the limited integration of sustainability in the smart cities agenda recommends the use of more precise terminology and a better understanding of the initiatives that are being developed under the concept of smart sustainable cities (Ahvenniemi et al. 2017; Bibri and Krogstie, 2017; Huovila, Bosch & Airaksinen, 2019). This approach has been adopted by international standardization bodies (European Telecommunications Standards Institute, International Standardization Organization -ISO- and International Telecommunication Union -ITU-), which have recently published a total of six sets of smart and sustainable city indicators (Huovila, Bosch & Airaksinen, 2019) that will be complemented with a forthcoming ISO standard (37123) with indicators for resilient cities. Merricks (2019) argues that ISO standards for smart cities developed from 2014 onwards are being considered as leadership guidelines and management recommendations rather than real technical specifications. The connection between smart city and smart destination management standards which will be analyzed below, has generated a new motivation to develop indicators linked to urban policies that bring together smartness and sustainability.

The analysis conducted by Huovila, Bosch & Airaksinen (2019) reveals some differences between sustainability and smartness, with a predominance of sustainability indicators in all standards except for ISO37122 and ITU 4901. These types of standards have favored the comparison between cities through initiatives such as the one carried out by the World Council on City Data (WCCD), which certifies cities based on the ISO 37120 indicators. As warned by Merricks (2019), the implementation of international standards clears the way for the harmonization of city governance models within a neoliberal logic that aims to facilitate the exchange of private services and technologies. This tendency permeates the standards that correlate indicators with Sustainable Development Goals (ISO and ITU), and their connection with the vision of sustainability fostered by the UN Habitat's City Prosperity Index (ITU). Finally, the high number of standard systems related to smart cities makes it difficult for interested cities to select the most appropriate one. In this context, we must question the effects that the development of these standards has had on urban tourism sustainability indicators.

Overall, the results from the analysis of international standards reveal a clear absence of indicators for tourism within the mentioned standards (Table 1).

Table 1. International standards for smart cities and tourism indicators

STANDARD	INDICATORS RELATED TO TOURISM INCLUDED IN THE STANDARD
ISO 37120	Squared meters of recreational public space per capita
ISO 37122	Percentage of the city´s cultural records that have been digitized
ETIS KPIs for Smart Cities ETIS GS OEU 019 V1.1.1 (2017-08)	Tourism activity intensity: Number of tourist overnights per year per 100,000 inhabitants
ITU 4901 (06/2016) (Key performance indicators related to the use of information and communication technologies in smart sustainable cities)	No tourism indicators
ITU 4902 (06/2016) (Key performance indicators related to the sustainability impacts of information and communication technologies in smart sustainable cities)	No tourism indicators
ITU 4903 (10/2016) (Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals)	Proportion of employees working in the tourism industry

Own elaboration based on ETIS (2017), ISO (2018; 2019) and ITU (2016)

The marginal role of tourism indicators within smart sustainability standards invalidates these instruments as real contributions to the measurement of sustainable tourism. They do not contemplate the information needs for tourist city management and even overtourism suffered by many urban spaces (Peeters et al., 2018), at least before the COVID-19 crisis. Thus, indicators derived from smart sustainable frameworks do not introduce any substantial novelty in sustainable tourism indicators. The main reference in the scope of destination management are those sustainability indicators that are independent of any smart strategy (European Tourism Indicator System -EC, 2016-) or the new ones linked to the SDGs (The Global Sustainable Tourism Council Indicators -GSTC, 2019-), except for the case of Spain, where smart destination initiatives have generated some interesting results that are presented below.

4. Smart city and smart destination initiatives in Spain and their effects on sustainable tourism indicators

In this section, we present the results of the analysis of smart initiatives conducted in Spain, a country that has created public investment programs financed by European funds and designed in collaboration with local administrations to promote the development of smart cities and destinations. First, this section shows the impact of the smart city planning and management process on sustainable tourism indicators. Second, the real contributions made by the smart approach to sustainable tourism are revealed.

4.1 Smart plans and indicators

As described in the methods section, 52 plans for smart cities and smart destinations from different Spanish cities have been analyzed (see Appendix B). A summary of the content analysis results can be found in Table 2, and more details on the specific results for each city are available in Appendix B (Table B2).

Table 2. Plans content analysis summary

CATEGORY	GUIDING QUESTION	FINDINGS
Data Collection	Does the plan involve the collection of data from digital devices and new sources of information?	90% of plans expressly include the use of sensors to capture information: environmental, meteorological data, current state of the tourism resources. Also: social media data, telecommunications, Wi-Fi use or transactional data (credit cards).
Data Intelligence	Does the plan data involve processing and analysis through big data techniques? and/or open data sources?	94% of plans include data analysis instruments/techniques and open data strategies to share different types of information
Data Connection	Is there any relationship between different data layers derived from the smart city platform? i.e., environmental, traffic, socioeconomic data, etc.	90% of plans refer to interaction between different sets of data through smart city platforms of spatial data visualization tools
Data Communication	How are the collected data communicated to the public? i.e. dashboards, open data platforms, GIS, etc.	88% of the plans reflect strategies to communicate information through smart city platforms. However, most of these projects are under development and they are not accessible to the public.
Indicator System	Is the plan application using an indicator system/ standard?	More than 50% of the cities do not have any standards to follow. Only Barcelona and Valencia apply ISO37120. Most cities follow vaguely the indicators proposed by UNE 178501 but the only certified destination (fulfilling all requirements) is Benidorm.
Tourism Data	What type of tourism information is being collected according to the plan?	Most plans capture data related to tourism activity from sources such as connections to public Wi-Fi, use of telecommunication infrastructures (roaming), street cameras, etc.

Own elaboration

The plans, which are in most cases linked to the availability of public funds, reveal a qualitative and quantitative leap forward in the obtaining and analysis of data by cities. In contrast, the results from the questionnaire addressed to the technical officers of smart cities and destinations show a rather limited implementation of these tools. Most projects are still under execution and their effective application has been postponed due to legal, organizational or technical problems (including interoperability issues). The results from the questionnaire show that smart city platforms are still "under development" in most cities (73.4%) with only 26.6% of cities currently using a technological platform to collect, aggregate and visualize data. Many of these platforms have been implemented by large telecommunication companies such as Telefónica, NEC or INDRA. With respect to indicators related to smart city strategies, these are still rare in the analyzed sample: most cities (87%) do not have any set of indicators associated with their projects.

With respect to smart destination strategies, we can observe a shift towards business intelligence systems aimed at enhancing digital marketing strategies, but these systems have hardly been implemented in the destinations of the sample. The questionnaire shows that only 21.7% of destinations have an integrated support system for decision making. Again, indicators (applied to destinations) are anecdotal. Only 8.7% of destinations have implemented indicators linked to their smart destination strategy. A few destinations have based their implementation on the UNE178501 standard.

4.2 Smart destinations and the new generation of smart sustainable indicators

Conceptual frameworks and theoretical models that define smart destinations usually include sustainability as one of their core principles (Buhalis & Amaranggana, 2014; Gretzel et al., 2015; Ivars-Baidal et al., 2019). In Spain, the public program launched in 2012 defines an SD as ‘‘an innovative tourist territory, accessible to everyone, built on an infrastructure of state-of-the-art technology that guarantees sustainable development of territories, which facilitates the visitor’s interaction with and integration into his or her surroundings and improves the quality of the experience at the destination as well as residents’ quality of life” (SEGITTUR, 2015: 104). This program has developed a series of actions in pilot destinations, and together with the Spanish standardization agency (AENOR), has created two standards: “Management system of smart tourist destinations. Requirements” (UNE 178501:2018) and a standard for “Indicators and tools of smart tourist destinations” (UNE 178502:2018).

SEGITTUR awards distinctive marks to destinations that adhere to the program, carry out a diagnosis process and develop an action plan. The diagnosis is structured into five dimensions: Governance, Innovation, Technology, Sustainability and Accessibility, which are the same as those included in the above-mentioned UNE standards (equivalent to ISO). The Ministry for Industry, Commerce and Tourism has created a national network of smart destinations (similar to RECI), in which a total of 148 entities are enrolled as of June 2020, of which 89 represent destination management organizations (DMOs). Similarly, regional governments, which are responsible for many tourism policies in Spain, also develop initiatives to support smart destination development in coordination with SEGITTUR. In the case of the Region of Valencia (*Comunitat Valenciana*), the regional authorities have fostered the creation of its own smart destinations network and since 2013 have been working on the application of a series of indicators (INVAT.TUR, 2015). In fact, the indicators utilized by the Comunitat Valenciana exhibit clear analogies with the UNE standard 178502:2018, as they were developed within a framework of close institutional collaboration.

But what novelties do smart indicators deliver compared to those indicators focused solely on destination sustainability? To compare the two perspectives, the ETIS (European Tourism Indicator System) for sustainable tourism (EU, 2016) was compared to the smart destination indicators developed by the regional network of Smart Destinations of the Region of Valencia (SDRV) (Ivars-Baidal et al. 2017). The first remarkable difference is the magnitude of the systems. ETIS is composed of a total of 43 core indicators that reflect the basic dimensions of sustainability (Economic Value, Social and Cultural Impact and Environmental Impact) and destination management aspects in their structure. The SDRV encompasses 72 indicators in a total of nine dimensions (Governance, Sustainability, Accessibility, Innovation, Connectivity, Intelligence, Information, Marketing online and Tourism Performance) (See Appendix A). A somewhat intermediate position is represented by the proposal of *Diputació de Barcelona* (a sub-regional governmental institution), which promotes the adoption of a set of 34 sustainable tourism indicators (Diputació de Barcelona, 2019; López Palomeque et al. 2018), structured into three dimensions (economic, socio-cultural and environmental). This institution has also developed a set of smart destination indicators, made up of 83 indicators, systematized into four thematic axes: Governance, Innovation, Technology and Sustainability, the last category including a total of 12 indicators adapted to the previously mentioned sustainability system (González-Reverté, 2018).

After closely examining the ETIS and SDRV indicators, the following novelties can be identified, which illustrate the contributions made by the smart approach to sustainability indicators:

i. Reinforcement of governance, with a higher number of indicators in this regard and recognition of the fundamental role played by DMOs in guiding the process towards smart destination models.
ii. Simplification of environmental sustainability indicators derived from the reduction of the number of indicators and the non-inclusion of some dimensions such as the carbon footprint. In any case, both systems are closer to a "weak" sustainability model when considering the adaptive concept of Hunter (1997).
iii. Clear recognition of accessibility as a priority. ETIS revision in 2016 incorporated some supplementary indicators for accessibility.
iv. Deficit in the measurement of social inclusion, while economic value is assessed with indicators that, to some extent, are comparable to tourism performance.
v. Marginal role given to local heritage and territorial identity from the perspective of conservation and its almost exclusive consideration in terms of management and improvement of the tourist experience through the use of new technologies.
vi. Incorporation of technology and innovation dimensions, which could stimulate green innovation processes and compensate the scarce attention given to socioeconomic and tourism digitalization by traditional indicators.
vii. Development of indicators linked to intelligence, marketing and digital information that facilitate the promotion of more sustainable behavioral patterns in the whole trip cycle, both from the supply and the demand sides.

5. Scientific validation of SDRV as a system of sustainable tourism indicators

As briefly introduced in the methods section, one of the most salient difficulties to obtain a wide consensus on indicators for tourism sustainability is the need to combine the scientific validity of instruments with their acceptance and adoption by policy makers who can find value in them and perceive them as useful in their decision-making processes (Schianetz, & Kavanagh, 2008; Tanguay, Raaonson & Therrien, 2013). Indicators proposed by academia are usually discarded by policy makers because of their complexity, while scholars often criticize indicators proposed by policy makers for being over simplistic, lacking scientific rigor or being biased according to the interests of stakeholders. This issue is easily translated from sustainability to new frameworks, such as smart cities/destinations. Therefore, below we present the findings from the analysis of the SDRV indicators used by the authorities of the region of Valencia to make decisions on funding strategies. This analysis discerns whether this example of smart destinations indicators is also sound and consistent from a scientific point of view.

The above-mentioned network of Valencian destinations and the SDRV introduced the 72 indicators (see Appendix A) in a self-diagnosis online tool that was completed by the representative technicians from each destination. This diagnosis and its results constitute the starting point for the detection of areas requiring improvement and the identification of strategies and actions with the support of the Regional Institute for Tourism Technologies (INVAT.TUR). The fulfillment of the indicators is expressed through numeric values between 0 (non-compliance) to 100 (full compliance). In these indicators, the sustainability dimension is composed of a total of 15 indicators. The indicators and the diagnosis tool containing them have been recently deployed by the INVAT.TUR and completed by a total of 13 destinations from the region (Alcoi, Calp, Benicarló, Benicàssim, Benidorm, Finestrat, Gandia, La Vila Joiosa, Morella, Peníscola, València, Villena, and Vinaròs) which are the most advanced destinations in terms of smart destination plans and projects. Although this limited sample does not allow us to draw definitive conclusions, it is useful to conduct a pretest to assess the metric properties and the preliminary deficiencies of the indicators.

The analysis carried out builds on the conceptual framework provided by Hair, Hult, Ringle & Sarstedt (2017). Specifically, the procedure attempts to explore whether the constructs included in the system are closer to a formative or reflexive conception. According to Hair et al. (2017), the reflective measurement model is based on the classical test theory and is the most widely adopted in social sciences. In reflective measures, a causality is assumed between the construct and the items of which it is composed. For this reason, items are expected to be interchangeable and have a high correlation between one another. The objective of the reflective measurement approach is to maximize the overlap between interchangeable indicators. A set of reflective measures is commonly called a scale. Conversely, formative measures assume that causal indicators form the construct by means of linear combinations. For this reason, this type of measurement model is known as a formative index. Each indicator in the formative construct captures a specific aspect of the construct's domain. Thus, omitting an indicator potentially alters the nature of the construct. From the metrics viewpoint, formative items are not interchangeable and there is no requirement for the items to be correlated. In fact, collinearity between formative items can be problematic, with unstable and non-significant coefficients in further analysis. The construction of composite indicators usually corresponds to the definition of formative measurement models.

Given the importance of correlations in this context, the analysis of the tool is based on the matrix of correlations of the different constructs of the system of indicators proposed. Based on the correlation, we examine whether each dimension in the tool clearly fits into the framework of formative or reflective constructs. When it is clear that the constructions have characteristics of both conceptions, potential lines of improvement are suggested that could provide greater coherence to the measurement instrument.

The results show, first, that the measurement tool could be better balanced if a similar number of items were considered for each construct. The path to smartness can be diverse and not necessarily linear. The fact that some constructs are made up of 15 items (e.g. sustainability) and others of 7 or 8, with no theoretical justification a priori, gives more relative weight to some constructs that could bias the path to be adopted by tourist destinations. Second, the existence of negative correlations between items in practically all constructs suggests that the items would not be measuring the same dimension. A reformulation of the items would yield positive correlations and would substantially improve the metric properties of the indicators. Third, the system should clearly opt for a formative or reflective approach to constructs, simplifying or improving the potential inconsistencies. In this sense, the “Governance”, “Accessibility”, “Connectivity”, “Intelligence” and “Evaluation” dimensions have low correlations between their items, bringing those constructs closer to the characteristics of formative ones. Conversely, “Sustainability”, “Innovation”, “Information”, “Online marketing” have medium and high correlation levels within their items, so those constructs appear to be more reflective than formative. Further details on the correlations analysis results can be found in Appendix C.

From a practical point of view, the SDVR indicators constitute an innovation effort that supports destinations, decision and policy makers in the transformation process into smart destinations. The indicators are relevant and pertinent. However, from the perspective of their scientific validity, the analysis conducted reveals that in its current state, the indicator system resembles a scorecard. The analysis shows that there is room for improvement in the smart destination indicator system deployed by the tourism authorities of the Region of Valencia. New sub-constructs need to be defined that could later be grouped into higher order constructions, and improve the general coherence of the tool according to the findings here reported. It is highly likely that these deficiencies are not exclusive to the system of indicators implemented in the Region of Valencia. Therefore, we recommend that this analysis is conducted for other sustainability and smart city/destination measurement methods. In this way we could identify their deficiencies and propose the necessary improvements in order to enrich their practical validity and the possibilities of achieving real progress in the sustainability of destinations.

6. Conclusions and discussion: towards a smart sustainable paradigm?

Sustainability and smartness as theoretical frameworks display common objectives, problems and complementarities that suggest the existence of many potential synergies (Perles-Ribes & Ivars-Baidal, 2018). Within this context, this study seeks to understand the contribution made by smart cities and smart destinations to the design and implementation of sustainable tourism indicators for destinations. To do so, this paper has proposed a mixed-methods approach encompassing multi-scale analyses including the international perspective provided by prevailing indicators and standard systems, developed under the smart and sustainable approach; the national reality of Spain, a pioneer country in supporting smart initiatives; and finally a detailed examination of a regional-local tourism indicators system, that exemplifies the new generation of indicators developed under the smart tourism framework.

The research conducted reflects that very little progress has been made in sustainability measures despite the potential that smart cities and destinations theoretically have to offer. The design of smart city indicators should facilitate a comprehensive approach towards sustainable tourism in line with the proposals of Miller & Twining-Ward (2005), as they promote a systemic understanding of urban spaces aimed at breaking down the city silos (Merricks, 2019). The smart city could contribute to enhancing or understanding and improving the management of tourist cities and to identifying the effects of tourism on the urban structure and metabolism. Nonetheless, the limited role conferred to tourism in urban indicator systems reflects a clear disassociation between urban and tourism indicators. The analyses conducted also show clear deficiencies with respect to their integration into smart city platforms, which epitomize the integral management of cities through technologies and data.

The smart cities discourse is frequently cited as the appropriate response to the need to manage growing populations who live in urban areas worldwide, which requires a connection of local impacts with global issues (Torres-Delgado & Saarinen, 2014). Nonetheless, smart indicator sets do not include this multi-scale perspective in their design. Calculating the carbon footprint of the tourism activity is, for instance, an essential line of work, not necessarily related to smart cities, which can expand the available knowledge on the interaction between the local and the global and support the implementation of measures. In tourism destinations, there was an initial phase marked by sustainability initiatives that lacked credibility and were more akin to marketing strategies (Gössling, 2011). The current proposals, such as that of Helsinki (City of Helsinki, 2018) or Barcelona (Ajuntament de Barcelona, 2019), focus on the environmental externalities of tourism and seem to be more consistent. However, many city initiatives require greater soundness and methodological harmonization, two aspects which can be improved under the smart sustainability framework and the new possibilities that data collection and analysis tools have to offer.

The smart *movement* is mainly understood as a management approach for a new governance in which indicators play a critical role. Interestingly, sustainability indicators have traditionally tended to overlook governance issues (Rasoolimanesh et al. 2020). However, the analysis conducted of smart city and destination initiatives in Spain reflects multiple inconsistencies in the progress towards real governance. The economic incentives for developing smart initiatives, co-funded by the European Union programmes, are focused on the search and application of technological solutions, which reflects a technocratic, top-down understanding of governance (Borsekova et al. 2018). These initiatives lack a holistic urban development view and do not embrace social participation mechanisms, particularly in the case of smart city/destination projects as opposed to EDUSI programs. This prevailing situation reinforces the neoliberal logic of smart cities (Cardullo & Kitchin, 2018; Merricks, 2019) as spaces based on technology consumption and the application of standards that are implemented to control the whole process and provide feedback of the business around them. In this regard, smart city agendas vary between the possibilities outlined by Ahvenniemi et al. (2017): technology oriented *vs* people oriented; hard infrastructures (transport, water, energy,...) *vs* soft infrastructures (social and human capital, knowledge,...); top-down *vs.* bottom-up initiatives; supply *vs.* demand-driven approach. And while this dichotomic vision simplifies a complex reality, it helps us to understand and classify the existing smart city initiatives and their evolutive processes. The shift taken by Barcelona after the 2015 local elections, when a progressive political force came into office, illustrates these dichotomies. The city has reoriented its smart city strategy, recovering technological sovereignty, fostering higher social and public participation and re-politicizing decisions (Cardullo & Kitchin, 2018).

The smart city/destination requires a management built on data and technology which should render advances in the application of sustainable tourism indicators. However, the marginal presence of tourism in the smart and sustainable urban indicator systems limits these potential benefits, which is reflected in our results. This diagnosis reveals the need to develop specific tourism indicators that can be integrated into urban space management and to create interrelationships between the tourism activity and the urban quality of life, in the same way as the ISO37120 standard. Bringing together these variables is fundamental for cities suffering from overtourism. Therefore, it seems that smart city development is not enough to face the challenges that tourism generates for urban management. Consequently, a complementary smart destination strategy is required, together with tourist specific indicators integrated into the smart and sustainable urban framework.

Additionally, the indicators generated within smart city/destination strategies are clearly biased from the point of view of sustainability. On the one hand, in smart initiatives there is a clear improvement in terms of business intelligence and availability of data on markets, while on the other hand, environmental indicators are oversimplified and social inclusion variables are virtually discarded, except for accessibility issues. Based on this situation, González-Reverté (2019) argues that smart destination initiatives have not actually contributed to sustainable tourism development, although we should remember that SD plans are still in their infancy. The consolidation of smart initiatives over time is essential in a phenomenon that has been subject to considerable hype and has therefore been politically capitalized. The mere adoption of smart strategies does not necessarily mean any progress in sustainability, and further research is required to understand the real impact of policy implementation. In Spain, a well-known example in this field is Benidorm, the only destination that has actually implemented UNE standard 178501:2018 for smart tourist destination management. The outcomes of smart development in this city show a clear improvement in the identification of key indicators and an intensification of innovation and public-private collaboration in the destination, which have resulted in enhanced market intelligence and improved digital marketing strategies (Femenia-Serra & Ivars-Baidal, 2020). Benidorm has also experienced other positive effects resulting from its smart project, such as higher efficiency in terms of water use and supply system.

Finally, it is also apparent that indicator systems for smart cities and destinations are subject to the complex equilibrium between scientific reliability and relevance for policy makers (Tanguay, Rajaonson & Therrien, 2013). The example set by the SDRV system is representative: its usefulness for destination managers is clear, but its scientific validity is weak, as shown in the correlation analysis. Smart indicators are relatively new and are progressively evolving, similarly to sustainable indicators in recent years. In this evolution it is fundamental to find the right balance between their utility and soundness, and to introduce dynamic indicators, designed through the participation of different stakeholders that socially legitimize them. These indicators need to be interoperable, should reflect systemic interactions and have a great analytic power to facilitate decision making. Advances in all of these areas are essential to develop real smart sustainable tourism indicators.

Overall, this paper has made several contributions. On the one hand, it has enabled us to discern the real contribution of smart cities and destinations to sustainable development through the analysis of the design and use of indicators, revealing the limited progress achieved under this new approach to urban and tourist space management. The findings show a lack of real integration of sustainability principles in smart initiatives and poor coordination between indicators for destinations sustainability and smart destination indicators. This poses a challenge that remains unsolved. Without this integration, the potential of ICTs in data collection, connection, exploitation and communication, one of the main pillars of smart sustainability will remain underused.

On the other hand, this study has provided a holistic perspective based on a multi-scale and mixed-methods approach. From this stance, it has contributed to bridging international discourses around smart cities and destinations with the regional and local initiatives permeated by these ongoing ideas and debate. This has shown that while sustainability is part of the philosophy of both smart cities and destinations, these intentions are not translated into the real plans and indicators being applied at smaller scales. Finally, the results obtained have implications for researchers, policy makers and planners. These are mainly the need to redesign indicator systems so they offer both scientific consistency and utility for public actors and a commitment to integrate sustainability indicators (in their full scope) into smart city and smart destination agendas, models and continuous management.

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Appendix A

Table A1. European Tourism Indicator System (ETIS core Indicators)

Section A: Destination management		
Criteria	**Indicator reference#**	**ETIS core indicators**
A.1 Sustainable tourism public policy	A.1.1	Percentage of tourism enterprises/establishments in the destination using a voluntary certification/labelling for environmental /quality/sustainability and/or Corporate Social Responsibility
A.2 Customer satisfaction	A.2.1	Percentage of tourists and same-day visitors that are satisfied with their overall experience in the destination
	A.2.2	Percentage of repeat/return visitors (within 5 years)

Section B: Economic value		
Criteria	**Indicator reference#**	**ETIS core indicators**
B.1 Tourism flow (volume and value) at destination	B.1.1	Number of tourist nights per month
	B.1.2	Number of same-day visitors per month
	B.1.3	Relative contribution of tourism to the destination's economy (% GDP)
	B.1.4	Daily spending per overnight tourist
	B.1.5	Daily spending per same-day visitors
B.2 Tourism enterprise(s) performance	B.2.1	Average length of stay of tourists (nights)
	B.2.2	Occupancy rate in commercial accommodation per month and average for the year
B.3 Quantity and quality of employment	B.3.1	Direct tourism employment as percentage of total employment in the destination
	B.3.2	Percentage of jobs in tourism that are seasonal
B.4 Tourism supply chain	B.4.1	Percentage of locally produced food, drinks, goods and services sourced by the destination's tourism enterprises

Section C: Social and cultural impact		
Criteria	**Indicator reference#**	**ETIS core indicators**
C.1 Community/social impact	C.1.1	Number of tourists/visitors per 100 residents
	C.1.2	Percentage of residents who are satisfied with tourism in the destination (per month/season)
	C.1.3	Number of beds available in commercial accommodation establishments per 100 residents
	C.1.4	Number of second homes per 100 homes
C.2 Health and safety	C.2.1	Percentage of tourists who register a complaint with the police
C.3 Gender equality	C.3.1	Percentage of men and women employed in the tourism sector
	C.3.2	Percentage of tourism enterprises where the general manager position is held by a woman
C.4 Inclusion/ accessibility	C.4.1	Percentage of rooms in commercial accommodation establishments accessible for people with disabilities
	C.4.2	Percentage of commercial accommodation establishments participating in recognised accessibility information schemes
	C.4.3	Percentage of public transport that is accessible to people with disabilities and specific access requirements
	C.4.4	Percentage of tourist attractions that are accessible to people with disabilities and/or participating in recognised accessibility information schemes
C.5 Protecting and enhancing cultural heritage, local identity and assets	C.5.1	Percentage of residents that are satisfied with the impacts of tourism on the destination's identity
	C.5.2	Percentage of the destination's events that are focused on traditional/local culture and heritage

Section D: Environmental impact		
Criteria	**Indicator reference#**	**ETIS core indicators**
D.1 Reducing transport impact	D.1.1	Percentage of tourists and same-day visitors using different modes of transport to arrive at the destination
	D.1.2	Percentage of tourists and same-day visitors using local/soft mobility/public transport services to get around the destination
	D.1.3	Average travel (km) by tourists and same-day visitors from home to the destination
	D.1.4	Average carbon footprint of tourists and same-day visitors travelling from home to the destination
D.2 Climate change	D.2.1	Percentage of tourism enterprises involved in climate change mitigation schemes — such as: CO2 offset, low energy systems, etc.— and 'adaptation' responses and actions
	D.2.2	Percentage of tourism accommodation and attraction infrastructure located in 'vulnerable zones'
D.3 Solid waste management	D.3.1	Waste production per tourist night compared to general population waste production per person (kg)
	D.3.2	Percentage of tourism enterprises separating different types of waste
	D.3.3	Percentage of total waste recycled per tourist compared to total waste recycled per resident per year
D.4 Sewage treatment	D.4.1	Percentage of sewage from the destination treated to at least secondary level prior to discharge
D.5 Water management	D.5.1	Water consumption per tourist night compared to general population water consumption per resident night
	D.5.2	Percentage of tourism enterprises taking actions to reduce water consumption
	D.5.3	Percentage of tourism enterprises using recycled water
D.6 Energy usage	D.6.1	Energy consumption per tourist night compared to general population energy consumption per resident night
	D.6.2	Percentage of tourism enterprises that take actions to reduce energy consumption
	D.6.3	Percentage of annual amount of energy consumed from renewable sources (Mwh) compared to overall energy consumption at destination level per year
D.7 Landscape and biodiversity protection	D.7.1	Percentage of local enterprises in the tourism sector actively supporting protection, conservation and management of local biodiversity and landscapes

Source: European Commission, ETIS (2016)

Table A2. SDRV Indicators (Valencian Network of Smart Destinations)

Section 1: Governance	
Indicator reference#	**Basic description**
1.1	Implementation of a strategic tourism plan
1.2	Coordination mechanisms between local administration departments for the smart destination project development
1.3	Implementation of a smart destination project
1.4	Existence of a smart destination coordinator (responsible technician)
1.5	Existence of an annual operations plan for the destination
1.6	Mechanisms to facilitate public-private partnership
1.7	Development of E-Government/open government strategies
1.8	Implementation of quality management systems with a destination approach
1.9	Development of social awareness campaigns on tourism impacts among citizens
1.10	Application of ROI analysis on tourism initiatives

Section 2: Sustainability	
Indicator reference#	**Basic description**
2.1	Implementation of urban planning regulations adjusted to sustainability principles
2.2	Implementation of specific plans for a sustainable tourism development
2.3	Public promotion of sustainable mobility (transport)
2.4	Existence of enhancement of energy efficiency strategies (public lightening)
2.5	Collection and treatment of hazardous waste
2.6	Efficiency in water supply, purification and re-use of wastewater
2.7	Implementation of tourism indicators for sustainable destination management
2.8	Development of awareness campaigns targeted at residents about sustainability
2.9	Creation of climate change adaptation programmes
2.10	Use of ethical codes on tourism (regulation of activity, governance, impacts)
2.11	Calculation of Maximum Human Pressure Index and floating population evolution
2.12	Legal provisions and environmental or quality certifications implemented on tourism resources
2.13	Percentage of companies awarded with environmental certifications (standanrds)
2.14	Development of awareness campaigns targeted at tourists about sustainability
2.15	Surface of green areas per *de facto* population

Section 3: Accessibility	
Indicator reference#	**Basic description**
3.1	Accessibility of tourism resources and attractions
3.2	Information services adapted at a technical level to the needs of people with disabilities
3.3	Compliance on content accessibility with the Web Accessibility Initiative (WAI)
3.4	Initiatives for promoting accessible tourism
3.5	Public transport system adapted at a technical level to the needs of people with disabilities
3.6	Existence of a dynamic inventory about tourism resources, companies and accessible services for tourists

Section 4: Innovation	
Indicator reference#	**Basic description**
4.1	Existence of support programmes for innovation in the tourism sector
4.2	Implementation of innovation management systems in companies and public bodies
4.3	Development of innovation projects in collaboration with universities and R&D institutions
4.4	Promotion of collaborative innovation between agents (events and joint activities)
4.5	Encouragement of entrepreneurship through support programmes
4.6	Population educational level and occupation in highly innovative sectors

Section 5: Connectivity	
Indicator reference#	**Basic description**
5.1	Internet connection quality at the destination
5.2	Free Wi-Fi availability in tourist information office(s)
5.3	Free Wi-Fi availability in tourist points of interest (POI) (main attractions)
5.4	Proportion of tourism businesses providing free Wi-Fi to tourists
5.5	Implementation of sensors for data collection at the destination

Section 6: Intelligence	
Indicator reference#	**Basic description**
6.1	Implementation of a barometer to measure level of confidence of business owners
6.2	Analysis of tourism demand (trends, markets) – business intelligence
6.3	Development of analysis on social media networks and website traffic
6.4	Implementation of a digital platform for data integration and information management
6.5	Existence of community management (professionalized)
6.6	Existence of open data on tourism activity (available online to everyone)
6.7	Mechanisms for monitorization and constant evaluation of points of interest (POI) situation
6.8	Implementation of georeferencing systems for tourist resources

Section 7: Information system	
Indicator reference#	**Basic description**
7.1	Existence of digitalized promotional material
7.2	Existence of a 24/7 information point (touchscreen or similar)
7.3	Implementation of virtual assistant on website (chatbot)
7.4	Adaptation of DMO website to any device
7.5	Active presence on social media by DMO to provide information
7.6	Destination certified by “Q quality” (standard about quality of services, including information)
7.7	Availability of information on connectivity and public Wi-Fi networks
7.8	Implementation of sensors in signage
7.9	Existence of an official destination mobile app

Section 8: Online marketing	
Indicator reference#	**Basic description**
8.1	Development of brand monitoring and reputation analysis
8.2	Implementation of social media Plan
8.3	Development of SEO positioning and actions
8.4	Investment in online advertising-SEM
8.5	Implementation of CRM & email marketing strategy
8.6	Existence and application of an online marketing plan
8.7	Investment in social media advertising
8.8	Commercialization through own website (DMO site)

Section 9: Evolution of tourism activity	
Indicator reference#	**Basic description**
9.1	Tourist satisfaction level among tourism demand
9.2	Evolution of occupancy rate in tourism accommodation
9.3	Evolution of tourism expenditure at destination
9.4	Level of seasonality of tourism demand
9.5	Unemployment level in the services sector

Source: Ivars-Baidal et al. (2017)

Appendix B

Table B1. Identified smart city and smart destination plans (accessible here by links)

City/Area		Plan name	Publication year
1	A Coruña	Agenda Digital Smart City (2012-2020)	2013
2	Alicante	Alicante se mueve:Being Smart	2016
3	Ávila	Smart Heritage City	2016
4	Badajoz	Alba-Smart 2020	2015
5	Barcelona	Pla Barcelona Ciutat Digital 2017-2022	2016
6	Benalmádena	Smart Costa del Sol	2015
7	Benidorm	Benidorm, Destino Turístico Inteligente y Sostenible	2018
8	Bilbao	BIOTIP - Smart Tourism de Bilbao	2018
9	Burgos	SWING (Smart Water Innovation Network in the City of Burgos)	2017
10	Cáceres	Cáceres Patrimonio Inteligente	2016
11	Cartagena	Plan Director Smart City Ayuntamiento de Cartagena	2016
12	Castelldefels	Plan Estratégico Castelldefels Smart City	2018
13	Castelló de la Plana	Plan Smart City Castellón de la Plana	2017
14	El Hierro	El Hierro en Red	2016
15	Estepona	Smart Costa del Sol	2015
16	Fuengirola	Smart Costa del Sol	2015
17	Gijón	Gijón-IN: Ciudad Innovadora, Inteligente e Integradora	2016
18	Granada	Plan Estratégico Granada Smart City 2020	2018
19		Granada Human Smart City	2015
20	Huelva	Huelva Smart City Route	2015
21	Huesca	Huesca, Turismo Inteligente e Innovación	2018
22	Jaca	Smart Mountain Destination	2018
23	Las Palmas	LPA Inteligencia Azul	2016
24	León	Plan Estratégico León ciudad inteligente	2018
25	Lloret de mar	Lloret destino inteligente	2018
26	Logroño	Plan de Turismo de Reuniones y Deportivo de Logroño 2018-2022	2018
27	Lugo	Proyecto Lugo Smart. Impulsando Lugo como ciudad inteligente y sostenible	2016
28	Madrid	Proyecto MiNT Madrid Inteligente, modelo y estrategia Smart City para la ciudad de Madrid	2014
29.a	Málaga	Málaga Smart. Plan Estratégico de Innovación Tecnológica	2018
29.b		Smart Costa del Sol	2015
30	Marbella	Smart Costa del Sol	2015
31.a	Murcia	MiMurcia. Tu Ayuntamiento Inteligente, Cercano, Abierto e Innovador	2016
31.b		Plan Operativo de Desarrollo Turístico del municipio de Murcia 2017-2020	2018
32	Orihuela	Plan Director Smart Orihuela	2017
33	Oviedo	Plan Estratégico Oviedo 2025	2014
34	Palencia	DigiPal	2016
35	Palma de Mallorca	Smart Island Mallorca	2016
36	Pamplona	Definición de la Estrategia Smart City Pamplona	2013
37	Ponferrada	Ponferrada 3.0. Administración Inteligente para Ciudades Inteligentes	2016
38	Roquetas de Mar	Roquetas de sMart	2018

39	San Bartolomé de Tirajana	*Maspalomas Smart Destination*	2018
40	San Cristóbal de La Laguna	*Estrategia Municipal para el Desarrollo de la Ciudad Inteligente*	2015
41	Santa Cruz de Tenerife	*Estrategia Turística de Tenerife 2017-2020/2030*	2017
42	Santander	*Santander Smart Citizen*	2016
43	Santiago de Compostela	*Smart iAgo. Estrategia de Smart City en una ciudad Patrimonio*	2012
44	Segovia	*Smart Digital Segovia*	2016
45.a	Sevilla	*Sevilla Smart Accesibility & Tourist & Events*	2015
45.b		*Plan Director de Innovación*	2015
46	Tarragona	*Pla Estratègic Tarragona 2022*	2011
47	Toledo	*Toledo Ciudad Inteligente*	2015
48	València	*Impulso VLCi*	2016
49.a	Valladolid	*S2CITY-Sistema Inteligente de Servicios al Ciudadano y al Turista (RED.ES)*	2016
49.b		*Plan Estratégico de Turismo de la Ciudad de Valladolid 2016-2019*	2016
50	Vigo	*Vigo Smart City*	2015
51	Vitoria-Gasteiz	*Plan Vitoria-Gasteiz Smart Green City 2017-2024*	2018
52	Zaragoza	*Estrategia de Gobierno Abierto en la ciudad digital 2012-2015. Ciudadanía Inteligente*	2012

Own elaboration

Table B2. Detail of categories and plans analysis findings

City/Area		Data Collection	Data Intelligence	Data Connection	Data Communication	Indicator System	Tourism Data
1	A Coruña						
2	Alicante						
3	Ávila						
4	Badajoz						
5	Barcelona						
6	Benalmádena						
7	Benidorm						
8	Bilbao						
9	Burgos						
10	Cáceres						
11	Cartagena						
12	Castelldefels	*U.D.*	*U.D.*	*U.D.*	*U.D.*	*U.D.*	*U.D.*
13	Castelló de la Plana						
14	El Hierro						
15	Estepona						
16	Fuengirola						
17	Gijón						
18	Granada						
19							
20	Huelva						
21	Huesca						
22	Jaca	*U.D.*	*U.D.*	*U.D.*	*U.D.*	*U.D.*	*U.D.*
23	Las Palmas						
24	León						

25	Lloret de Mar						
26	Logroño						
27	Lugo						
28	Madrid						
29.a	Málaga						
29.b							
30	Marbella						
31.a	Murcia						
31.b							
32	Orihuela						
33	Oviedo						
34	Palencia						
35	Palma de M.						
36	Pamplona						
37	Ponferrada						
38	Roquetas de M.						
39	S. Bartolomé de Tirajana						
40	San Cristóbal de La Laguna						
41	Santa Cruz de Tenerife						
42	Santander						
43	Santiago de Compostela						
44	Segovia						
45.a	Sevilla						
45.b							
46	Tarragona						
47	Toledo						
48	València						
49.a	Valladolid						
49.b							
50	Vigo						
51	Vitoria-Gasteiz						
52	Zaragoza						

Methodological notes:

(1) Shaded cells represent that the plan meets the category. Blank cells indicate non-compliance.
(2) The cells marked with the acronym UD indicate projects under development.

Own elaboration

Appendix C

Table C1. Linear correlation matrix for Governance items.

		G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
G1	Pearson Correlation	1	,386	,578*	,272	,532	,303	,332	,178	-,398	,321
	Sig.		,193	,038	,368	,061	,314	,268	,561	,178	,284
G2	Pearson Correlation	,386	1	,243	,537	,198	,167	,461	-,395	-,051	,146
	Sig.	,193		,423	,059	,517	,587	,113	,182	,867	,634
G3	Pearson Correlation	,578*	,243	1	-,034	,213	,272	,162	-,290	-,136	,378
	Sig.	,038	,423		,911	,485	,368	,596	,336	,658	,203
G4	Pearson Correlation	,272	,537	-,034	1	,469	,382	,539	,101	,184	,244
	Sig.	,368	,059	,911		,106	,198	,057	,742	,546	,421
G5	Pearson Correlation	,532	,198	,213	,469	1	,368	,402	,029	,247	,390
	Sig.	,061	,517	,485	,106		,216	,173	,926	,415	,188
G6	Pearson Correlation	,303	,167	,272	,382	,368	1	,135	,487	,201	,437
	Sig.	,314	,587	,368	,198	,216		,659	,091	,510	,135
G7	Pearson Correlation	,332	,461	,162	,539	,402	,135	1	-,182	,284	,298
	Sig.	,268	,113	,596	,057	,173	,659		,552	,347	,323
G8	Pearson Correlation	,178	-,395	-,290	,101	,029	,487	-,182	1	-,178	-,117
	Sig.	,561	,182	,336	,742	,926	,091	,552		,561	,704
G9	Pearson Correlation	-,398	-,051	-,136	,184	,247	,201	,284	-,178	1	,507
	Sig.	,178	,867	,658	,546	,415	,510	,347	,561		,077
G10	Pearson Correlation	,321	,146	,378	,244	,390	,437	,298	-,117	,507	1
	Sig.	,284	,634	,203	,421	,188	,135	,323	,704	,077	

N=13, *. Sig. (2-tailed), Correlation is significant at the 0.05 level (2-tailed).

Table C2. Linear correlation matrix for Sustainability items.

		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
S1	Pearson Correlation	1	,485	,354	,224	,733**	,396	,222	.[a]	-,045	-,102	,471	-,234	,167	,349	,395
	Sig.		,093	,236	,461	,004	,180	,467	.	,884	,741	,104	,441	,586	,243	,181
S2	Pearson Correlation	,485	1	,566*	,229	,465	,336	,477	.[a]	,216	,274	,300	,133	-,137	,068	,068
	Sig.	,093		,044	,451	,109	,261	,100	.	,479	,366	,319	,664	,656	,826	,826
S3	Pearson Correlation	,354	,566*	1	,183	,611*	,213	-,031	.[a]	,172	,359	,313	,348	,307	,089	,281
	Sig.	,236	,044		,550	,026	,484	,920	.	,575	,228	,298	,244	,308	,773	,352
S4	Pearson Correlation	,224	,229	,183	1	,384	,534	,520	.[a]	,068	-,290	,069	-,039	,051	,506	,698**
	Sig.	,461	,451	,550		,195	,060	,069	.	,826	,337	,823	,899	,869	,078	,008
S5	Pearson Correlation	,733**	,465	,611*	,384	1	,413	,296	.[a]	,034	,056	,634*	-,116	,063	-,031	,375

	n															
	Sig.	,004	,109	,026	,195		,161	,326	.	,913	,855	,020	,705	,838	,919	,206
S6	Pearson Correlation	,396	,336	,213	,534	,413	1	,588*	.[a]	-,076	-,331	,401	,216	,236	,503	,716**
	Sig.	,180	,261	,484	,060	,161		,035	.	,805	,269	,174	,478	,438	,079	,006
S7	Pearson Correlation	,222	,477	-,031	,520	,296	,588*	1	.[a]	,361	-,189	,370	-,162	-,145	,219	,105
	Sig.	,467	,100	,920	,069	,326	,035		.	,225	,536	,213	,597	,637	,472	,733
S8	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
S9	Pearson Correlation	-,045	,216	,172	,068	,034	-,076	,361	.[a]	1	,297	-,088	,281	,502	,023	-,128
	Sig.	,884	,479	,575	,826	,913	,805	,225	.		,324	,775	,352	,081	,940	,678
S10	Pearson Correlation	-,102	,274	,359	-,290	,056	-,331	-,189	.[a]	,297	1	-,199	,234	-,105	-,337	-,337
	Sig.	,741	,366	,228	,337	,855	,269	,536	.	,324		,514	,442	,734	,260	,260
S11	Pearson Correlation	,471	,300	,313	,069	,634*	,401	,370	.[a]	-,088	-,199	1	,041	-,075	-,232	,042
	Sig.	,104	,319	,298	,823	,020	,174	,213	.	,775	,514		,895	,809	,445	,891
S12	Pearson Correlation	-,234	,133	,348	-,039	-,116	,216	-,162	.[a]	,281	,234	,041	1	,444	,000	,289
	Sig.	,441	,664	,244	,899	,705	,478	,597	.	,352	,442	,895		,129	1,000	,338
S13	Pearson Correlation	,167	-,137	,307	,051	,063	,236	-,145	.[a]	,502	-,105	-,075	,444	1	,435	,464
	Sig.	,586	,656	,308	,869	,838	,438	,637	.	,081	,734	,809	,129		,138	,110
S14	Pearson Correlation	,349	,068	,089	,506	-,031	,503	,219	.[a]	,023	-,337	-,232	,000	,435	1	,675*
	Sig.	,243	,826	,773	,078	,919	,079	,472	.	,940	,260	,445	1,000	,138		,011
S15	Pearson Correlation	,395	,068	,281	,698**	,375	,716**	,105	.[a]	-,128	-,337	,042	,289	,464	,675*	1
	Sig.	,181	,826	,352	,008	,206	,006	,733	.	,678	,260	,891	,338	,110	,011	

N=13, Sig. (2-tailed), ** Correlation is significant at the 0.01 level.
a. Cannot be computed because at least one of the variables is constant.
*. Correlation is significant at the 0.05 level.

Table C3. Linear correlation matrix for Accessibility items.

		A1	A2	A3	A4	A5	A6
A1	Pearson Correlation	1	-,170	,291	,182	,267	,083
	Sig.		,580	,335	,551	,377	,787
A2	Pearson Correlation	-,170	1	-,370	,503	,308	,170
	Sig.	,580		,214	,080	,306	,580
A3	Pearson Correlation	,291	-,370	1	,257	,246	,339
	Sig.	,335	,214		,397	,418	,257
A4	Pearson Correlation	,182	,503	,257	1	,394	,303
	Sig.	,551	,080	,397		,182	,315
A5	Pearson Correlation	,267	,308	,246	,394	1	,312
	Sig.	,377	,306	,418	,182		,300
A6	Pearson Correlation	,083	,170	,339	,303	,312	1
	Sig.	,787	,580	,257	,315	,300	

N=13, Sig. (2-tailed)

Table C4. Linear correlation matrix for Innovation items.

		I1	I2	I3	I4	I5	I6
I1	Pearson Correlation	1	,247	,810**	,440	,039	,654*
	Sig.		,416	,001	,132	,898	,015
I2	Pearson Correlation	,247	1	,225	-,399	,318	,276
	Sig.	,416		,459	,177	,290	,362
I3	Pearson Correlation	,810**	,225	1	,299	,220	,742**
	Sig.	,001	,459		,320	,471	,004
I4	Pearson Correlation	,440	-,399	,299	1	-,326	-,067
	Sig.	,132	,177	,320		,277	,829
I5	Pearson Correlation	,039	,318	,220	-,326	1	,445
	Sig.	,898	,290	,471	,277		,127
I6	Pearson Correlation	,654*	,276	,742**	-,067	,445	1
	Sig.	,015	,362	,004	,829	,127	

N=13, (2-tailed), ** Correlation is significant at the 0.01 level.
*. Correlation is significant at the 0.05 level.

Table C5. Linear correlation matrix for Connectivity items.

		C1	C2	C3	C4	C5
C1	Pearson Correlation	1	,033	,395	-,033	-,014
	Sig.		,915	,182	,915	,965
C2	Pearson Correlation	,033	1	-,071	-,381	,290
	Sig.	,915		,817	,199	,337
C3	Pearson Correlation	,395	-,071	1	-,548	-,194
	Sig.	,182	,817		,053	,525
C4	Pearson Correlation	-,033	-,381	-,548	1	,349
	Sig.	,915	,199	,053		,243
C5	Pearson Correlation	-,014	,290	-,194	,349	1
	Sig.	,965	,337	,525	,243	

N=13, Sig. (2-tailed)

Table C6. Linear correlation matrix for Intelligence items.

		IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8
IN1	Pearson Correlation	1	,410	,307	,690**	-,154	,340	-,104	-,156
	Sig.		,164	,308	,009	,616	,256	,736	,611
IN2	Pearson Correlation	,410	1	,810**	,463	-,054	,097	,165	-,202
	Sig.	,164		,001	,111	,862	,752	,591	,507
IN3	Pearson Correlation	,307	,810**	1	,492	,161	,271	,031	,010
	Sig.	,308	,001		,088	,600	,371	,921	,974
IN4	Pearson Correlation	,690**	,463	,492	1	-,044	,167	,195	,191
	Sig.	,009	,111	,088		,886	,585	,522	,531
IN5	Pearson Correlation	-,154	-,054	,161	-,044	1	,366	-,093	,463
	Sig.	,616	,862	,600	,886		,219	,762	,111
IN6	Pearson Correlation	,340	,097	,271	,167	,366	1	-,515	-,278
	Sig.	,256	,752	,371	,585	,219		,072	,358
IN7	Pearson Correlation	-,104	,165	,031	,195	-,093	-,515	1	,435
	Sig.	,736	,591	,921	,522	,762	,072		,137
IN8	Pearson Correlation	-,156	-,202	,010	,191	,463	-,278	,435	1
	Sig.	,611	,507	,974	,531	,111	,358	,137	

N=13, (2-tailed), **. Correlation is significant at the 0.01 level

Table C7. Linear correlation matrix for Information system items.

		IF1	IF2	IF3	IF4	IF5	IF6	IF7	IF8	IF9
IF1	Pearson Correlation	1	,537	,161	,316	,239	,715**	,488	,258	,334
	Sig.		,059	,599	,293	,431	,006	,091	,394	,265
IF2	Pearson Correlation	,537	1	,217	,501	,471	,843**	,286	,228	,601*
	Sig.	,059		,477	,081	,104	,000	,344	,453	,030
IF3	Pearson Correlation	,161	,217	1	,302	,216	,183	,716**	-,285	-,209
	Sig.	,599	,477		,317	,478	,550	,006	,345	,494
IF4	Pearson Correlation	,316	,501	,302	1	,488	,278	,241	-,433	,141
	Sig.	,293	,081	,317		,091	,358	,428	,139	,646
IF5	Pearson Correlation	,239	,471	,216	,488	1	,146	,359	,184	,219
	Sig.	,431	,104	,478	,091		,633	,228	,546	,472
IF6	Pearson Correlation	,715**	,843**	,183	,278	,146	1	,241	,192	,507
	Sig.	,006	,000	,550	,358	,633		,428	,529	,077
IF7	Pearson Correlation	,488	,286	,716**	,241	,359	,241	1	-,104	,056
	Sig.	,091	,344	,006	,428	,228	,428		,735	,856
IF8	Pearson Correlation	,258	,228	-,285	-,433	,184	,192	-,104	1	,415
	Sig.	,394	,453	,345	,139	,546	,529	,735		,159
IF9	Pearson Correlation	,334	,601*	-,209	,141	,219	,507	,056	,415	1
	Sig.	,265	,030	,494	,646	,472	,077	,856	,159	

N=13, Sig. (2-tailed) ** Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.

Table C8. Linear correlation matrix for Online marketing items.

		OM1	OM2	OM3	OM4	OM5	OM6	OM7	OM8
OM1	Pearson Correlation	1	,788**	,016	,010	,217	,586*	,501	-,171
	Sig.		,001	,958	,975	,476	,035	,081	,577
OM2	Pearson Correlation	,788**	1	,035	-,058	,108	,242	,290	-,085
	Sig.	,001		,910	,851	,724	,425	,336	,782
OM3	Pearson Correlation	,016	,035	1	,530	,240	,089	,215	,131
	Sig.	,958	,910		,062	,430	,773	,481	,670
OM4	Pearson Correlation	,010	-,058	,530	1	,018	,296	,155	,277
	Sig.	,975	,851	,062		,954	,326	,612	,360
OM5	Pearson Correlation	,217	,108	,240	,018	1	,267	,743**	-,179
	Sig.	,476	,724	,430	,954		,377	,004	,559
OM6	Pearson Correlation	,586*	,242	,089	,296	,267	1	,525	,197
	Sig.	,035	,425	,773	,326	,377		,066	,519
OM7	Pearson Correlation	,501	,290	,215	,155	,743**	,525	1	-,160
	Sig.	,081	,336	,481	,612	,004	,066		,602
OM8	Pearson Correlation	-,171	-,085	,131	,277	-,179	,197	-,160	1
	Sig.	,577	,782	,670	,360	,559	,519	,602	

N=13, Sig. (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table C9. Linear correlation matrix for Evolution of tourism activity items.

		EV1	EV2	EV3	EV4	EV5
EV1	Pearson Correlation	1	,346	,234	-,397	-,365
	Sig.		,247	,443	,179	,220
EV2	Pearson Correlation	,346	1	,385	,131	-,142
	Sig.	,247		,193	,670	,644
EV3	Pearson Correlation	,234	,385	1	,014	-,178
	Sig.	,443	,193		,965	,561
EV4	Pearson Correlation	-,397	,131	,014	1	,071
	Sig.	,179	,670	,965		,817
EV5	Pearson Correlation	-,365	-,142	-,178	,071	1
	Sig.	,220	,644	,561	,817	

N=13, Sig. (2-tailed)