CURRENT ISSUES IN TOURISM

Smart Destinations and the evolution of ICTs: A new scenario for destination management?

Journal:	*Current Issues in Tourism*
Manuscript ID	Draft
Manuscript Type:	Paper
Keywords:	Smart destinations, ICTs, Destination management organisations, Technololgy Forecast

Abstract:	The impact of information and communication technologies (ICTs) on tourism and their foreseeable future evolution seem to be shaping a new scenario for destination management. This new context has given rise to the need for new management models. One of these models is the emerging smart tourism destination (STD) which requires a greater conceptual precision for becoming a new paradigm for destination management. This paper proposes a systemic model for STDs which facilitates the interpretation of the role of ICTs in the management of tourism destinations. Therefore, the Delphi technique has been applied in order to determine the opinion of experts with respect to the feasibility of the STD approach, its advantages and limitations and also the degree of impact of ICTs on the management and marketing of tourism destinations. This prospective exercise highlights the intensification of the impact of ICTs over the coming years which will shape a new scenario for management marked by technology and data management. However, the efficiency of the STD approach will not depend exclusively on technology but also on an appropriate governance of the destination that systematically incorporates the three levels of the STD, namely the strategic-relational, instrumental and applied levels.

Smart Destinations and the evolution of ICTs: A new scenario for destination management?

The impact of information and communication technologies (ICTs) on tourism and their foreseeable future evolution seem to be shaping a new scenario for destination management. This new context has given rise to the need for new management models. One of these models is the emerging smart tourism destination (STD) which requires a greater conceptual precision for becoming a new paradigm for destination management. This paper proposes a systemic model for STDs which facilitates the interpretation of the role of ICTs in the management of tourism destinations. Therefore, the Delphi technique has been applied in order to determine the opinion of experts with respect to the feasibility of the STD approach, its advantages and limitations and also the degree of impact of ICTs on the management and marketing of tourism destinations. This prospective exercise highlights the intensification of the impact of ICTs over the coming years which will shape a new scenario for management marked by technology and data management. However, the efficiency of the STD approach will not depend exclusively on technology but also on an appropriate governance of the destination that systematically incorporates the three levels of the STD, namely the strategic-relational, instrumental and applied levels.

Keywords: Smart destinations; ICTs; Destination management organisations; technology forecast

Introduction

The evolution of information and communication technologies (ICTs), a basic pillar of the digital economy, has created a favourable environment for new management approaches for cities. The universalisation of the Internet has given rise to the emergence of different proposals: the Intelligent, Smart, Digital, Wired, Cibercity or Knowledge city (Komninos, 2002), of which the term "smart" has prevailed. The common denominator of these concepts lies basically in the identification of cities with knowledge centres that manage information, technology and innovation; aspects that favour more efficient management, sustainable development and a better quality of life for citizens (Giffinger, Fertner, Kramar, Meijers & Pichler-Milanovic, 2007; Caragliu, Del Bo & Nijkamp, 2011). A smart city is defined as "an urban imaginary combining the concept of green cities with technological futurism and giving a name to techno-centric visions of the city of tomorrow" (Vanolo, 2014, p. 894). This prominent technological relationship has generated criticism of this new imaginary as it benefits the large technological companies, it favours the privatisation of public services and technological dependency, it generates uncertainty regarding the privacy of citizens or it is used as a mechanism that serves to depoliticise urban management, when the concept of the smart city is far from apolitical and non-ideological (Greenfield, 2013; Kitchin, 2014; March & Ribera-Fumaz, 2014; Townsend, 2013; Vanolo, 2014)

Since its inception in the urban environment, the smart approach has been subsequently applied to tourism destination management, and the term smart tourism destination (STD) has been coined. This approach seems particularly relevant in a sector where the frenetic evolution of ICTs constitutes one of the most relevant factors for change (Law, Buhalis & Cobanoglu, 2014). The influence of ICTs is not new in such a highly information-intensive activity as tourism and their importance has been apparent since the evolution from central reservation systems (CRS) to global distribution systems (GDS) (Sheldon, 1997), although the consolidation of the Internet at the end of the 1990s marked the beginning of the digital revolution in the tourism industry, extended by the growing use of mobile devices and social media (Benckendorff, Sheldon & Fesenmaier, 2014; Buhalis, 2003; Buhalis & Law, 2008; Sigala, Christou & Gretzel, 2012; Xiang, Tussyadiah & Buhalis, 2015). The rapid adoption of ICTs by tourism demand has transformed the management and marketing of tourism (Gretzel, Yuan & Fesenmaier, 2000), making ICTs a basic factor of competitiveness for tourism destinations (Buhalis & Matloka, 2013).

As a result, combining the STD approach with the use of ICTs seems to have given rise to the emergence of a new scenario for tourism destination management. This article seeks to analyse the extent to which a new scenario is taking shape for managing destinations and the new references that define it. First, it will address the STD concept within the context of the new conceptual approaches to tourism destinations, with special emphasis on the role played by technology. Subsequently, through the use of the Delphi technique, the opinion of the experts regarding the concept of smart destinations and their feasibility will be analysed. Furthermore, a prospective exercise aimed at determining the impact of the evolution of ICTs on tourism and their repercussions on tourism destination management will be conducted. This will enable us to identify the fundamental references that would shape the new scenario for destination management based on STDs, their potentialities and limitations.

STD conceptualisation: Towards a systemic approach

The complexity of tourism destinations, of their components and internal and external inter-relationships is reflected in the new conceptual approaches and their attempts to systematise different theories (Pearce, 2014; Saarinen, 2005; Saraniemi & Kylänen, 2011; Jovicic, 2016). In an interesting summary of the conceptual foundations of destinations, Pearce points out that the way "we conceptualize and frame destinations is critical not only for the research that we do but also for practical matters such as destination management and marketing" (Pearce, 2014, p. 141). In his study, Pearce identifies five sets of concepts (industrial districts, clusters, networks, systems and social constructs) according to three major dimensions (geographic, mode of production and dynamic), in order to propose an integrative conceptual framework of destinations. This systematisation incorporates elements that are central to the STD concept, such as innovation or knowledge, but only minor references are made to ICTs.

The direct link between ICTs and destination management originated in the development of the first destination management systems (DMS) in the 1980s (Benckendorff et al., 2014). In the 1990s, Poon (1993) highlighted the growing and decisive importance of technology in the competitive strategy of destinations, but it was the Internet and the web-based systems that generated a quantitative and qualitative boost in the use of ICTs for destination management. The digitalisation of the tourism value chain gave rise to e-Tourism from which the e-Destination concept was derived in which the evolution of the DMS towards Destination integrated computerised information reservation management systems (DICIRMSs) played a fundamental role as a strategic tool for destination operational and strategic management (Buhalis, 2003).

The role of ICTs in tourism management can also be explained from the perspective of the digital ecosystems. Benckendorff et al. (2014) consider that a digital tourism ecosystem is composed of the interactions between living entities such as travellers or suppliers, and the non-living technological environment of devices, connections, etc., and that the concept could be applied to a specific destination, to a particular sector of the travel industry or to the global travel phenomenon. Del Chiappa & Baggio (2015) define a tourism destination, combining the digital business ecosystem and network theories, as a networked system of stakeholders delivering services to tourists, complemented by a technological infrastructure aimed at creating a digital environment which supports cooperation, knowledge sharing, and open innovation.

The differentiating feature of the proposals for conceptualising STDs is the role played by technology. Buhalis & Amaranggana (2014) identify the need for a technological platform that dynamically interconnects the different stakeholders and where the information is exchanged instantly and can be accessed by a variety of end-user devices that facilitate the creation of real-time tourism experiences and improve the efficiency of tourism resource management.

For Gretzel, Sigala, Xiang and Koo (2015), smart tourism constitutes a distinct step forward in the evolution of ICTs in tourism which is made up of three main layers (smart destinations, smart business ecosystems and smart experience), the key aspect of which is the integration of ICTs into physical infrastructures. Using this approach, it is clear that there is a complex relationship between the destination and the ecosystem, given that the term destination practically refers to a tourism-based ecosystem, which overlaps with other ecosystems (such as the residential one), and is made up of companies that operate on different scales (franchised companies, international distribution chains, etc.) and, of course, in connection with the tourism source markets (Gretzel, Werthner, Koo & Lamsfus, 2015). Following this reasoning, it is not simple, or advisable to isolate the STD inside the global tourism-based ecosystem, but it is better to identify the key elements of its integration in the tourism ecosystem, which is a fundamental aspect of a destination's level of smartness.

Furthermore, applying ICTs to destination management is common, so in the conceptual debate with respect to STDs, it is important to identify which technologies make a destination smart. Gretzel et al. (2015a) consider that smart tourism is a direct extension of e-Tourism and can be distinguished through the connection of the physical with the digital, thanks, mainly to the development of the Internet of things. E-Tourism, on the other hand, is focused on Internet-based business-consumer and consumer-consumer connections which facilitate electronic transactions. Bearing these considerations in mind, smart tourism is defined by the joint efforts in the destination to obtain information from physical and digital sources which, combined with advanced technologies, are capable of transforming the data into experiences and business value-propositions focused on efficiency, sustainability and experience enrichment (Gretzel et al. 2015a).

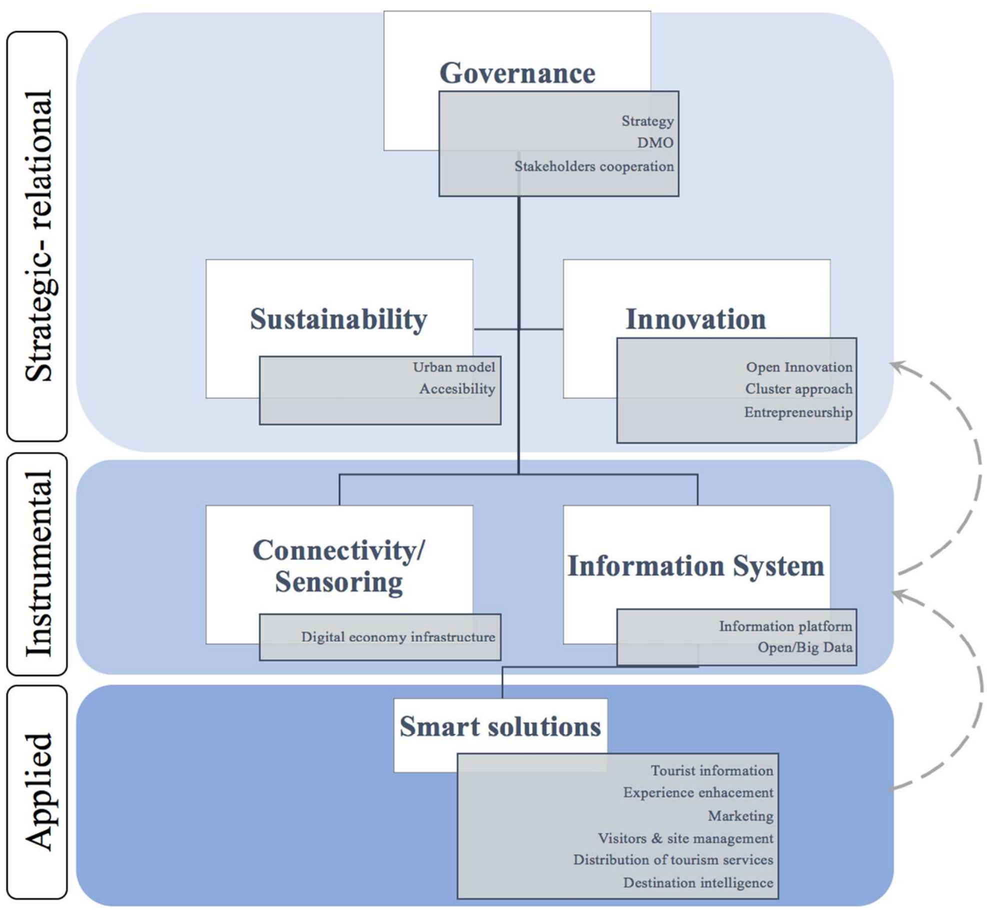
The reference to advanced technologies introduces another perspective in the analysis: to what extent do STDs use smart technologies? Gretzel et al. (2015b) refer to the six aspects or levels of smartness for technology proposed by W. Derzko which include adapting to the environment, learning capacity, anticipation and self-organisation. However, the STDs incorporate a large number of technologies, mixing the more advanced types, such as artificial intelligence with more conventional technologies, such as mobile applications.

The theoretical debate coexists with policies for developing smart tourist destinations. In Asia, China and South Korea, policies are oriented towards creating a technological infrastructure to develop smart tourism, utilising the opportunities of the ICTs for the marketing and management of the destinations and tourism resources (Gretzel et al. 2015a; Guo, Liu & Chai, 2014; Koo, Shin, Gretzel, Cannon & Chung, 2013; Li, Hu, Huang, Duan, 2017; Wang, Li & Li, 2013); in Europe, the initiatives are related to the innovation and competitiveness of the destinations through the development of smart end-user applications which are associated to smart city strategies, specific tourist programmes (Segittur, 2015), or in cases such as Italy, programmes that link culture and tourism (Graziano, 2015). Finally, in Australia, policies focus mainly on smart governance and the use of open data (Gretzel et al., 2015a).

Logically, the institutional support provided to the development of smart destinations is mostly related to management and has many similarities with the smart city strategies. The global concept of the smart city has been translated to more ambitious approaches which are free from a certain level of rhetoric and political-institutional propaganda. The holistic approach to the spheres of the smart city proposed by Giffinger et al. 2007 (smart economy, people, mobility, environment, living and governance) has been applied *mutatis mutandis* to the STD. The smart tourism destination programme developed in Spain by Segittur (Tourism Innovation and Technologies state-owned company), defines an STD as a tourism destination that is innovative, sustainable and accessible to everyone and which is based on an infrastructure of state-of-the-art technology that increases the quality of the experience at the destination and improves the quality of life of residents (Segittur, 2015). This is a practically perfect idea of a tourism destination with the difficulty residing in making it a reality. For this reason, operative STD models are necessary in order to provide bridges between scientific knowledge and destination management. According to Boes, Buhalis and Inversini (2015), a holistic perspective is necessary to take full advantage of ICT infrastructures and technological applications in the STDs.

The STD models contributing to this holistic and applied perspective include the model proposed by Ivars, Solsona and Giner (2016), which acknowledges the enabling role of ICTs in shaping an STD based on strategic and relational prior conditions that determine a destination's capacity for action and the scope of its STD strategy. The model is structured into three interrelated levels (Figure 1): the strategic-relational level, the foundation of which is governance, based on public-private cooperation to guarantee the sustainability of the destination and an open and collaborative environment of innovation; the instrumental level, based on digital connectivity and sensoring to configure a destination information system that is essential in decision-making; and, lastly, the applied level, which enables the development of smart solutions for the marketing and management of the destination, greater efficiency in communication actions and an improvement in the tourism experience.

Figure 1. Systemic STD model.



Own elaboration based on Ivars et al. 2016

For an optimum development of the instrumental role played by ICTs, it is essential to identify the management needs and capacity of the tourism destination. The STD strategy should respond to the local context and to the characteristics of the integration of each destination in the global tourism ecosystem. However, it is also possible to identify, in general terms, the technology-based solutions related to the STDs that represent substantial improvements in the following fields of tourism management:

(1) Experience enhancement in the destination through the application of different technologies that facilitate tourism consumption (local connectivity, mobile payments, biometric solutions, etc.), enrich the tourism experience (virtual and augmented reality, ambient intelligence, etc.) (Tussyadian, Wang & Jia, 2017), and increase the possibilities of the co-creation of tourist services (Neuhofer, Buhalis & Ladkin, 2012).

(2) More efficient management of visitors through the application of a sensor network that enables the development of the Internet of Things (Wang et al., 2013), particularly appropriate for fragile spaces (such as smart heritage applications for historical buildings that measure the degree of conservation and the impact of the visits) or for crowded areas. The contribution of this approach is twofold: it ensures the quality of the visitor's experience and the sustainable management of the tourist space or attraction. This perspective opens the possibility of analysing the degree of smartness of tourist attractions (Wang, Li, Zhen & Zhang, 2016).

(3) Ubiquitous information anytime, anywhere and in any device, with the possibility of influencing the whole tourist travel cycle (dreaming, planning,

booking, experiencing and sharing in accordance with Google's five stages of travel) and creating a new relationship framework between the tourist and the destination through user-generated content and a continuous interaction between the two, based mainly on the use of social networks (Chung & Koo, 2015; Munar & Jacobsen, 2014; Sigala et al. 2012).

(4) Greater knowledge of the demand and the management variables of the tourism destination. The use of the destination's website, social networks or mobile applications, among other technologies, provides the tourist with information and the tourism destinations with a large amount of data that can be crossed with other variables related to the tourist experience, such as weather, environmental or traffic information. Therefore, a new horizon for destination management systems has been created in which open data (Pesonen & Lampi, 2016) and the application of big data analysis techniques (Baggio & Scaglione, 2017; Fuchs, Höpken & Lexhagen, 2014; Mariné & Anton, 2015) are particularly interesting. Smart systems incorporate different technologies (recommender and context-aware systems or deep learning, among others) which transform them into essential instruments for supporting decision-making and the design of new tourist experiences (Gretzel et al., 2015a).

(5) Increased possibilities of marketing the tourism destination. The information available in real time enables considerable advances to be made towards a more personalised marketing (Niininen, March & Buhalis, 2003) and a greater development of location-based marketing (Berger, Lehmann & Lehner, 2003) with new proximity marketing, instant marketing or cross-selling approaches. This framework of context marketing encompasses the SOCOMO (social context mobile) model defined by Buhalis and Foerste (2015). Similarly, the use

of smart solutions may increase the transactional role of the DMO (Destination Management Organisation) through, for example, the increase in reservations made through the official website, facilitating the online reputation management of the destination or adapting traditional tools so that they can provide smart solutions, as in the case of the smart cards analysed by Angeloni (2016).

(6) The application of smart solutions fosters innovation, entrepreneurship and knowledge-based tourism management. The development of these solutions favours cooperation and the exchange of information between the stakeholders and promotes a type of management based on knowledge that is linked with the learning destination concept (Cooper & Sheldon, 2010; Fuchs et al. 2014; Schianetz, Kavanagh & Lockington, 2007) or the innovation-based learning economy (Hall & Williams, 2008).

This systemic approach highlights how smart solutions provide feedback of the basic aspects of the strategic-relational level (for example, innovation or the collaboration between stakeholders), and of the instrumental level (increase in the data available for the destination's information systems). In this way, the development of the STD generates synergies that give rise to continuous improvement and the creation of a process with a considerable capacity to transform tourism destination management.

Therefore, it seems that a new scenario is emerging for the management of tourism destinations which creates the need to assess the feasibility of the STD approach and measure the impact of the technological evolution in order to identify its current and future influence on destination management.

Objectives and Methodology

This study seeks to conduct an in-depth analysis of the STD approach from a theoretical and applied perspective. First, the STD has been conceptualised and the ICTs that enable the development of smart solutions have been identified. Subsequently, the Delphi technique has been used to obtain the opinion of experts with respect to the feasibility of the STD approach, its advantages and limitations as well as the forecast of the degree of impact of the ICTs related to the STDs and the period in which this impact will reach its maximum level. Using this approach, the fundamental objectives of this article are:

- To assess the STD as a future paradigm for the management of tourism destinations.
- To identify those ICTs which have the greatest impact on tourism management and their connection with the STD approach.
- To contribute to defining the new scenario for destination management shaped by the STD and the evolution of the ICTs, their potentialities and limitations.

The assessments from the experts were obtained through Internet-based Delphi research. This is a technique which was developed by RAND Corporation in the 1950s and has evolved into a widely-used tool in both academic and professional fields (Donohoe & Needham, 2009). Its main goal is to obtain a reliable consensus of a panel of experts with a high level of knowledge of the subject under analysis (Okoli & Pawloski, 2004), a method well-suited for analysing complex problems (Donohoe & Needham, 2009) and forecasting uncertain factors (Cole, Donohoe & Stellefson, 2013), as is the case of the impact of the evolution of ICTs on tourism. In fact, Kanama, Kondo and Yokoo (2008) vindicate the considerable potential of integrating the Delphi method in technology roadmapping. However, the Delphi method is not exempt from criticism, including the following: the sensitivity to design characteristics (panel expertise and composition, question clarity, outlier management and reporting, questionnaire administration); the vulnerability to high attrition rates; the use of subjective information; the limited interaction between the experts; the anonymity that frees the participants from responsibility; the generation of "deceptive consensus"; or the difficulty in guaranteeing the participation of experts with sufficient interest and dedication (Cole et al. 2013; Donohoe & Needham, 2009; Garrod & Fyall, 2000, 2004; Landeta, Barrutia & Lertxundi, 2011).

The Delphi method was developed and applied in three main stages: the design and testing of the questionnaire; the selection of the experts and the sending of the first and second round questionnaires; and the analysis of the results. Different versions of the questionnaire were produced and a pre-test analysis was performed to ensure its feasibility. In particular, the identification of the technologies was especially important, together with the inclusion of a glossary of terms in the questionnaire to facilitate understanding of the technologies and avoid individual interpretations not shared by all the participants. The review of the scientific literature on ICTs and tourism and the analyses and reports of technological and/or tourism consulting firms, such as Gartner or Phocuswright, enabled the ICTs that are related to STDs to be identified. This analysis generated an extensive inventory which had to be refined through an analysis conducted by tourism and ICT experts in order to select the list of technologies that would be included in the Delphi questionnaire.

The experts selected were all academics, specialised in tourism and ICT, who have published in journals with an international impact or have participated in international congresses on this subject, or professionals with ICT skills working in global tourism companies. With these criteria, 45 potential participants were selected, of whom a total of 24 responded to the first round of the questionnaire and 22 to the second round. Most of the experts are from the academic field (16), although many of them cooperate with tourism companies and destinations. The geographical distribution is highly varied, an advantage of the e-Delphi method, since eight experts develop their activity in Spain, five in the United Kingdom, two in Australia and one in Portugal, India, Finland, Poland, the United States, Brazil and Italy.

The sending and monitoring of the questionnaire, as well as the analysis of the results of the first round and their systematisation for the second round with the inclusion of the mean, median and standard deviation compared with each individual response, were performed using Qualtrics software. The first and second rounds of the questionnaires were sent out between October 2015 and June 2016. Without a doubt, the obtaining of a consensus is one of the most interesting and controversial aspects of the Delphi method. It is also one of the most costly in terms of the dedication of the experts during the different response rounds. In this study, the two rounds were considered sufficient to achieve the proposed objectives. The results reveal a high level of consensus in the assessment of the STD approach and a lesser degree of consensus in the forecast impact of technologies, and an even lower degree of consensus with respect to the time period when the ICTs will reach their maximum level of impact. In order to assess whether a third round of questionnaires was appropriate, the change in the coefficient of variation (CV) (the division of the standard deviation with the mean) was measured for each item between the two rounds. The coefficient of variation (CV) is a statistical measure of the dispersion of data which is particularly appropriate when levels of variability in data need to be compared. An absolute CV difference of close to zero for each item in the Delphi survey indicates a substantial stability of responses and could be considered as a stopping rule (Giannarou & Zervas, 2014; Landeta, 1999). In this sense, the difference between the CV of the second round and that of the first was higher than 0.10 in only 2.4% of the questionnaire items, therefore it was decided that a third round would not be carried out.

Results

The exploitation of the results of the Delphi method has been structured into two sections: one refers to the smart destination concept, the advantages to be gained and the extent to which the smart solutions are relevant and also the barriers to applying this approach. The second section refers to the forecasted impact of the destination management technologies. In the first section, focused on the assessment of the STD approach, the degree of consensus reached is higher, while in the section of the forecasted impact of the evolution of the technologies, the responses are more disperse.

STD concept and viability

The opinions of the experts reflect the need to engage in a theoretical debate that is not exempt from controversy. If we aggregate the responses that agree with the proposed issues (I agree and I strongly agree), on the one hand, the majority of the participants (86%) are unwilling to consider the smart destination concept as a passing trend, although a high percentage (70%) consider it to be a rhetorical and imprecise concept. The interest of the smart focus is evident in the high level of agreement regarding its validity for integrating ICTs in the management of destinations (91%), its capacity to transform the destinations (91%) and to incorporate added value into their management (95%). However, in line with the assessments regarding technological evolution, 68% of the experts consider that this focus is still experimental and requires a greater maturity of the technologies. Furthermore, 64% indicate that an international Standard should be created that accredits the STDs. This initiative is in the development phase in Spain and the Standard 178501 for the application of a smart destination management system has been approved by the *Agencia Española para la Normalización* (Spanish Standardisation Agency) (AENOR).

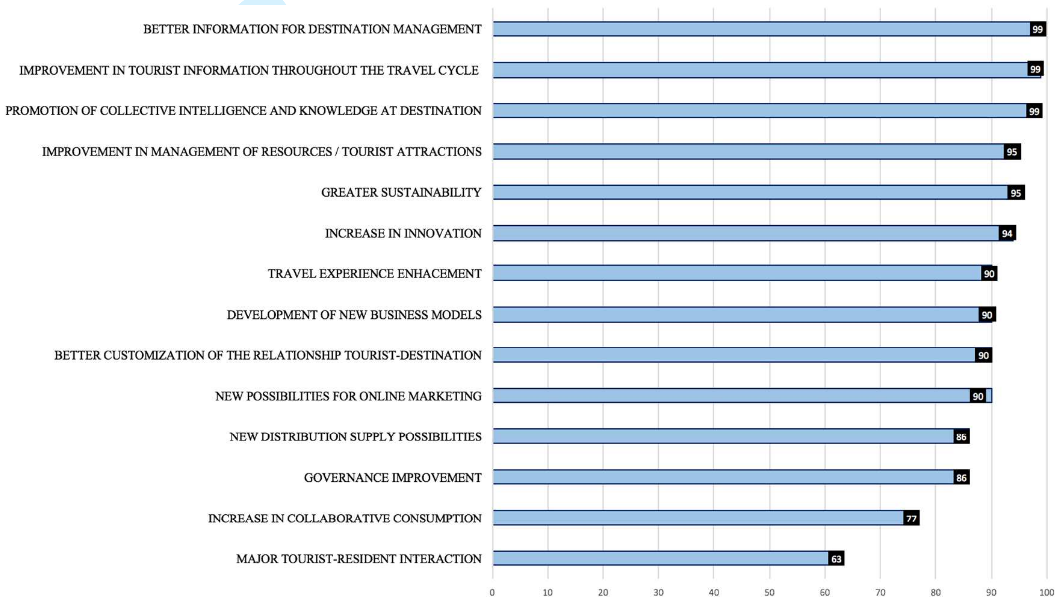
The advantages of the STD approach are based on an increase in the competitiveness of the destination, the enhancement of the satisfaction of the demand and the development of new products. Further advantages are an increase in tourist spending and public-private collaboration. Finally, less relevant advantages include the increase in demand and the emergence of new sources of finance in the destinations. Therefore, it is assumed that the STD approach improves the efficiency of tourism management and increases the competitiveness of the destination but does not necessarily lead to an increase in the number of tourists.

Graph 1. Benefits of applying the STD approach.

Note: The data express the aggregate percentage of agreement (I agree and I strongly agree)

In keeping with the advantages identified, the most relevant solutions focus on key aspects of tourism destination management with very high percentages of agreement. Only the new possibilities of distribution supply and governance are below 90%. On the other hand, the impact of the STD on collaborative consumption and the interaction between tourists and residents is perceived as being less relevant.

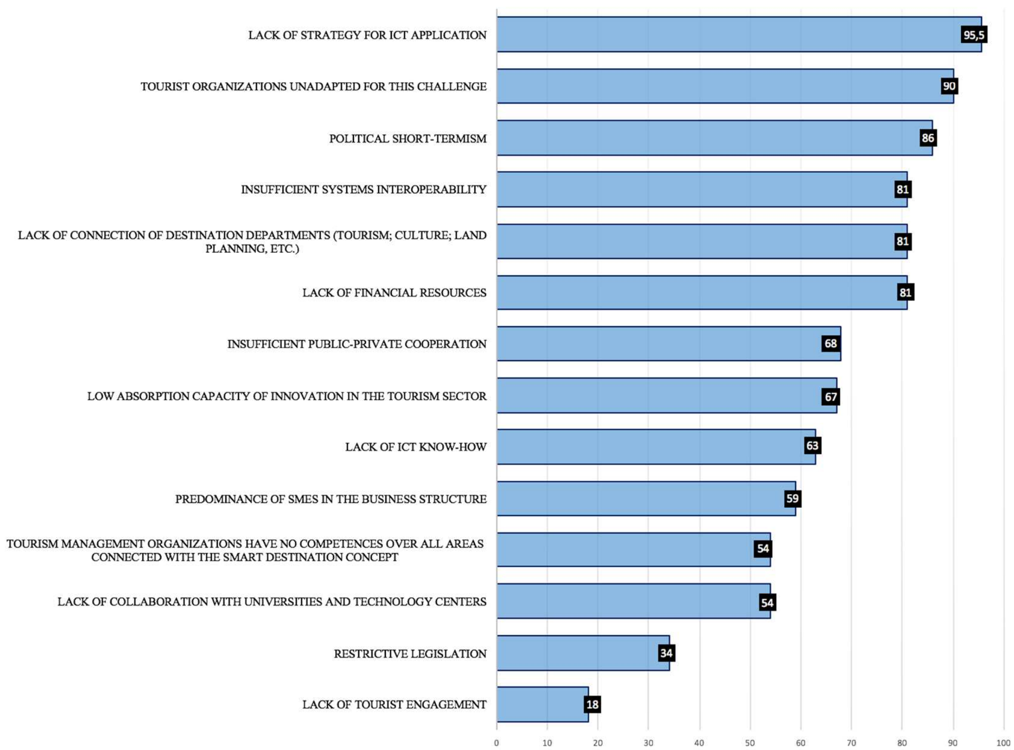
Graph 2. Degree of relevance of the smart solutions.



Note: The data express the aggregate percentage of relevance (relevant and very relevant)

With respect to the barriers that hinder the application of the STD approach, the opinion of the experts reveals the need to rethink tourist destination management so as to redress the lack of a strategy and the failure to adapt to change, the political short-termism, the lack of coordination between different departments and the deficit of economic resources. From the technological point of view, the insufficient interoperability of the systems is considered to be a fundamental barrier. A second group of barriers, with a medium level of importance, are related to the insufficient public-private cooperation and the structural characteristics of the tourism sector: low capacity to absorb innovation, lack of ICT know-how, predominance of small and medium-sized firms, limitations of competences to act with respect to all of the elements that define the STD or the insufficient collaboration between companies and research centres. However, legislation is not seen as a barrier and it is clear that tourist engagement, far from being a barrier, constitutes one of the basic drivers of the development of STDs.

Graph 3. Degree of importance of barriers in applying ICTs to tourism destinations.



Note: The data express the aggregate percentage of relevance (important and very important).

From a qualitative point of view, the contributions of the experts revolve around the need to avoid a technological bias to incorporate the principles of governance mentioned above and the need for a global focus that goes beyond the marketing of destinations to incorporate sustainability and the quality of life of the local population. In particular, it is considered that technology can help to establish a better balance between the satisfaction of tourists and the quality of life of the residents.

From a more critical perspective, reference is made to the need to analyse who controls the technology, its objective, and who benefits from the smart destination projects. Furthermore, despite an acknowledgement that certain organisations in a tourism destination are interested in smart solutions, their integrated application, which benefits the many stakeholders of the destination, is considered impractical. Therefore, difficulties arise from the lack of involvement of the stakeholders and there are doubts with respect to how secure the digital information shared between the agents of the destination is.

Prospective of ICTs: implications for smart destination development

In view of the avalanche of technologies related to STDs, it is advisable to identify those that have the greatest impact on destination management and, wherever possible, to estimate when their highest level of impact will occur. For this objective, the Delphi technique is suitable, despite its limitations. The experts have given their opinion about technologies aimed at the management and marketing of tourism destinations, which is their field of work or research. Other areas of the STD approach, such as sustainability, have not been included in the analysis due to the difficulty in addressing a greater number of complex technologies for which a different kind of expert is required (energy efficiency, smart metering, urban mobility, waste treatment, etc.). Even so, the difficulties involved in this prospective exercise are clear. Tourism constitutes an activity which Geels (2002) describes as functioning through the interplay of multiple technologies, which are parallel and even equally important. According to Kelly (2016) technologies are co-dependent within a process of technological, socio-economic and institutional co-evolution. Furthermore, nearly every field of science and technology contains some foundations for the future of tourism and much of the innovative power in this industry does not originate from tourism itself (Hjalager, 2015). Innovation in tourism is fostered by external driving forces including the external suppliers of technology (Jolly & Dimanche, 2009), which, in the case of the smart cities and STDs, exhibit a large capacity to influence urban and tourism management (Komninos, 2015).

From a theoretical point of view, Benckendorff et al. (2014) identify three theories that explain the social adoption of new technological innovations in an economy: the diffusion of innovations theory (Rogers, 1962), the technological innovation theory (Perez, 2002) and the Gartner Hype Cycle. The cycle proposed by Gartner presents the challenge of choosing the right innovation, in this case the right technology, at the right time (Fenn & Raskino, 2008). Five stages are considered: the innovation trigger; the peak of inflated expectations; the trough of disillusionment; the slope of enlightenment; and the plateau of productivity. This cycle appears to be particularly appropriate for an analysis of the evolution towards smart destinations to the extent that the current concept of smart destination can be considered as an innovation at the peak of inflated expectations that has yet to be more widely implemented (plateau of productivity), while many technologies, with a considerable media impact, are not yet really applicable to the management of destinations. This explains the interest in the opinion of experts with which to generate a roadmap that will serve as a reference for the management of destinations in the present and the immediate future.

The maximum level of impact and use in tourism is more complex to estimate. This is clear in a lower consensus in the answers given by the experts. It is evident that the origin of the generalisation of their use, which would equate to the "plateau of productivity" of Gartner Inc. (Fenn & Raskino, 2008), is multicausal and difficult to assess. In this respect, the experts have made interesting qualitative comments in which they highlight that the life cycle of the technology is not linear, as proposed for innovation in tourism: "Why do some innovations affect tourism rapidly and substantially, while others stagger for a long time before they are exploited in a tourism context?" (Hjalager, 2015:19). Furthermore, the technologies may be available but the managers of the destinations may not apply them owing to lack of knowledge, lack of technical ability or insufficient investment capacity, among other factors, not forgetting the possibility of radical changes in the technology that may alter the initial forecasts.

The technologies analysed have been divided into six groups: connectivity; wearables; identity, payments and security; sensorial experiences; other technologies; and data management. The experts were asked to give their opinion regarding first, the degree of the impact of the selected technologies on tourism (low, medium, high) and, second, their forecast regarding the period of maximum impact/use in the tourism sector (today; short, medium and long term; and uncertain). The results can be seen in Figure 2. The technologies with a degree and period of impact that exceed 51% of the answers are shown in bold. The rest of the technologies are located in the matrix in the position derived from the majority opinion; furthermore, in parentheses it is indicated whether the responses have not reached 51% of the total with respect to impact (I), to the time period of this impact (T) or in both cases, a circumstance which reflects a lesser degree of consensus (I-T). Tables with the responses expressed as percentages can be found in the Annex.

Figure 2. Impact/Time ICTs Forecast Matrix.

PERIOD OF MAXIMUM IMPACT/USE	IMPACT ON TOURISM: LOW	MEDIUM	HIGH
UNCERTAIN	Cryptocurrencies (I-T)		
LONG TERM (+10 years)			**Autonomous Vehicles**
MEDIUM TERM (5-10 years)		**Ambient Intelligence** Fi-Ware (I-T) Wearable G. Glass & the like (T) Other wearables (T) Volumetric and Holografic displays (I-T) Gesture Control (I) Complex Events Processing (I-T) 3D Printing (T)	**Robots** **Enterprise Service Bus** Open Data(T) Deep Learning (I-T)
SHORT TERM (2-5 years)		**Wearable smartwatch** Fingerprint Biometrics (I-T) Digital Security (I-T) Mashups (T) Question answering (T) Graph database (I-T) Document Oriented Database (T)	**Real-time Databases** **Local Connectivity (Wi-Fi,…)** **Mobile Connection** **Payments** **5G** **Bluetooh low energy (4.0)** **NFC Payments** **Wearables (cards, etc.)** **Augmented reality** **UAVs** IoT (T) Big Data (T) Tourism Intelligence Platform (T) Semantic Web (T) Virtual reality (I-T) Internet IPv6z (T) Portable Wi-Fi(T) Text mining (T)
TODAY	QR Codes (I)		**Opinion mining** Web mining (T) Recommendations system (T)

The results reveal that the maximum impact of the emerging technologies will take place in the short term (2-5 years). This circumstance enables us to infer that the true development of smart tourism destinations will occur in this period. It is probable that the effects of the rapid technological evolution in tourism will intensify over the next two to five years, or that, at least, technologies with a low level of application, even experimental, may become widespread in tourism in the next five years. Currently there are three technologies related to data management (opinion and web mining and recommendations system) which are considered to already have a high impact on tourism management while the effect of the QR codes is considered to be lower. The technologies with a high impact and reach a higher level of consensus among the experts (over 70%), are, in this order, the Internet of things, big data, real-time databases, local connectivity, mobile connection payments, autonomous vehicles, tourism intelligence platform, semantic web and open data. All of these technologies will reach their highest level of impact in 2-5 years, except open data (5-10 years) and autonomous vehicles (over 10 years).

These technologies concur with those identified as being essential for the development of smart cities and smart tourism destinations (Buhalis & Amaranggana, 2014; Komninos, 2015; Wang et al. 2013) with a clear orientation towards the collection of data in real time and their exploitation through big data techniques for a data-driven management approach, thanks to a deployment of technologies based on mainly IoT and user-generated data which connect the physical with the digital, and, according to Gretzel et al. (2015b), enable smart tourism to be differentiated from e-tourism.

From the point of view of the tourist experience, the impact of local connectivity and the Internet, usually through Wi-Fi and mobile payments are particularly prominent. In technologies related to sensorial experiences, it is forecast that augmented reality will be more relevant than virtual reality, although the degree of consensus is lower for the latter. Holographic displays, ambient intelligence and gesture control are perceived as having a medium level of importance with a maximum level of impact in 5-10 years. In spite of its high media coverage, the wearables group has been valued with a medium level of importance and a maximum level of impact in 2-5 years (smartwaches) or 5-10 years (smart glasses). On the other hand, the level of consensus with respect to digital security is not high. It is considered to have a medium level of importance as is the case of fingerprint biometrics, despite the expectations that this technology has generated for facilitating travel and tourism.

The impact of data technologies such as the enterprise service bus, deep learning or open data will peak in around 5-10 years. The analysis of the assessment of technologies related to data management provides two remarkable conclusions, namely that (i) there is a clear perception of smart destinations as massive data generators, and (ii) it is believed that those technologies that help to process and understand these data, generating knowledge and better supporting decision making processes in the destination, will have a high impact. Therefore, it is not only a case of the destination generating data (big data) which are made public (open data) but the destination must be able to process these data in real time and fully exploit them. Therefore both the semantic web and applications that generate knowledge, such as opinion mining, are important. However, the low impact of technologies related to open data, such as Web Mashups, suggest that the changes envisioned in tourism destination management are based on new approaches to the management of information and knowledge, favouring the internal use of the data by the destination for decision making over an approach where entrepreneurs propose innovative business models based on the development of services and applications that make intensive use of data. This approach is in line with the forecasts of the economic impact that the reuse of open data will generate. For example, according to the World Bank (2014), the estimated economic benefit to be gained from the reuse of open data in 2020 is 200 billion euros, that is, 1.7% of the European Union's GDP.

On the other hand, the database technology expected to have the highest impact is real time databases, while others, such as graph or document databases have not been considered to be as relevant, which highlights the importance of the smart destination as a data generator in real time through different sensors and the need for their appropriate processing.

Finally, other technologies, such as robots and UAVs will have a high to medium impact, and, in the long term, so will autonomous vehicles. 3D printing technology, which is currently in full hype, will have a medium level of impact in 5 to 10 years, and the cryptocurrencies will have a low impact and an uncertain evolution, although there is a low level of consensus.

Discussion and Conclusions

The analysis carried out enables us to conclude that the evolution of ICTs is contributing to shaping a new scenario for tourism destination management, which requires different management approaches, the most notable being the STD approach. However, this is a very ambitious approach which still suffers from a certain degree of conceptual imprecision and which is carried out easily from an institutional point of view or from the perspective of the technological companies' interests. In the same way as ICTs, the STD is experiencing its own hype cycle and has generated high expectations in countries such as Spain or China. Therefore it is advisable to determine the extent to which this approach is appropriate for adapting destinations to the digitalisation of the tourism activity in all phases of the travel cycle.

The scientific literature and the opinion of the experts ratify the relevance of the STD approach for transforming destination management, giving rise to undeniable advantages, through, among other factors, the incorporation of ICTs. Everything seems to indicate that destination management is evolving towards a technology and data driven scenario that will reach its peak in the medium term. However, the main barriers hindering the evolution towards the STD approach are found at the strategic-relational level and give governance a fundamental role in reinforcing the knowledge and innovative capacity of destinations as a preliminary step in the efficient development of an STD strategy.

Using ICT implementation as an evolutionary process (Yuan, Gretzel & Fesenmaier, 2006), DMOs should approach their adaptation to technological evolution in line with their needs, resources and capacities. The global nature of the STD models (which encompass everything from innovation to sustainability, including accessibility and a state-of-the-art technological infrastructure) make them unachievable for many destinations and can only be used as a management reference when based on indicators adapted to each territorial and tourism context, or as a national and international standard; an aspect that is relatively highly valued by the experts.

The possibilities for technological evolution widely surpass the management capacities of the DMOs. This gap requires changes in the structure and organisation of the DMOs or more imaginative work formulas through the externalisation of services at more affordable prices (for example, software as a service) or agreements with tourist and technological operators. This imbalance is also manifested in terms of the capacity to invest and to control the information that the destinations aspire to transform into knowledge. The large volumes of information associated to big data are usually owned by the large technological or tourism operators and it is not easy to access or exploit the data to benefit the destinations. On another level, the data derived from tourist demand are conditioned by privacy laws and there is a reticence to share the data of tourist service users.

From a systemic point of view, the integration of destinations in the global digital tourism ecosystem, dominated by large technological and tourism operators, is at stake, where the capacity to adapt constitutes a source of competitive advantage. In this respect, the STD strategy makes sense as a process which favours innovation and the consolidation of true learning destinations, which have to adopt a systemic approach such as that proposed in Figure 1, where smart solutions do not constitute isolated initiatives and act as catalysts for improving innovation and cooperation between stakeholders.

However, the structural problems that characterise tourism destinations hinder the evolution towards the STD approach. These problems include the predominance of small and medium-sized companies, the lack of leadership, the lack of a culture of collaboration, the difficulties for innovation and the presence of proprietary software which make interoperability difficult from the point of view of the destination. On the other hand, an appropriate STD strategy can contribute to overcoming these problems as smart solutions help to promote more ambitious collaboration processes, beginning with the breaking down of the structure of the information into departmental silos, like government bodies. Obviously, destination managers should not adopt all of the available technologies, although deciding which technologies to incorporate into the management model is not an easy task as it is not simple to define a technological roadmap on a destination level. Nevertheless, it is intelligent to steer the technological implementation in line with the priority needs of the destination and not according to an imitative strategy or the persuasive power of the technology providers. Furthermore, creativity and the capacity to innovate can make up for the deficit in factors such as investment. By way of example, there are many cases of digital marketing and social media.

Consequently, the new scenario will broaden the differences between the management of the destinations, favouring those with more agile organisational structures, more prone to public-private collaboration and better equipped in terms of economic and human resources. The connectivity infrastructures and the deployment of sensors will be preferred in medium to large urban environments while those destinations with a smaller population and tourism activity will have a competitive disadvantage. However, the smartness of destinations will not be conditioned exclusively by technological availability because a strategy that is shared by all of the actors in the destination will be essential in order to take full advantage of the opportunities generated by the technological evolution, with solutions adapted to each territorial and tourism context.

Finally, it is important to point out the limitations of this research. First, the approach is ambitious because it addresses a highly complex issue such as the evolution of a large number of technologies, the majority of which are important enough to be studied exclusively. This means that an in-depth analysis of each technology cannot be made but an overall view can be given in order to provide a better understanding of the new scenario for tourism destination management that is fundamentally, although not exclusively, derived from technological evolution. Consequently, the results of the Delphi technique have a qualitative, general and illustrative value derived from a prospective exercise which does not provide specific answers for all of the technologies analysed. The complexity of the issue also gives rise to doubts about the representativeness of the experts, who cannot easily be specialists in all of the technologies considered. However, the inclusion of the glossary in the questionnaire has facilitated the responses for many of the items. Nevertheless, from the point of view of assessing the STD approach, the panel is able to provide an expert view of an issue which is difficult to separate from its media and institutional character. Therefore we can conclude that the STD approach is feasible and constitutes an interesting research topic. This article has not studied the processes of adopting the technology and the role played by the different stakeholders in depth: this aspect has renewed importance for the DMOs in the light of the possibilities that the ICTs offer to transform tourism destination management.

References

Angeloni, S. (2016). A tourist kit “made in Italy”: An “intelligent” system for implementing new generation destination cards. *Tourism Management*, *52*, 187–209. https://doi.org/10.1016/j.tourman.2015.06.011

Berger, S., Lehmann, H., & Lehner, F. (2003). Location-based services in the tourist industry. *Information Technology & Tourism*, 5(4), 243–256

Baggio, R., & Scaglione, M. (2017). Strategic Visitor Flows (SVF) Analysis Using Mobile Data. In R. Schegg & B. Stangl (Eds.), *Information and Communication Technologies in Tourism 2017* (pp. 145–157). Cham: Springer International Publishing. Retrieved from http://link.springer.com/10.1007/978-3-319-51168-9_11

Benckendorff, P., Sheldon, P. J., & Fesenmaier, D. R. (2014). *Tourism information technology* (2nd Edition). Wallingford, UK: CABI.

Berger, S., Lehmann, H., & Lehner, F. (2003). LOCATION-BASED SERVICES IN THE TOURIST INDUSTRY. *Information Technology & Tourism*, *5*(4), 243–256. https://doi.org/10.3727/109830503108751171

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 International Publishing. Retrieved from http://link.springer.com/10.1007/978-3-319-14343-9_29

Buhalis, D. (2003). *eTourism: information technology for strategic tourism management*. Harlow, England: Financial Times Prentice Hall.

Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet-The state of eTourism research. Tourism Management, 29(4), 609–623. https://doi.org/10.1016/j.tourman.2008.01.005

Buhalis, D. y Matloka, J. (2013). «Technology-enabled Tourism Destination Management and Marketing». En: Costa, C.; Panyik, E. y Buhalis, D. (eds.). *Trends in European tourism planning and organisation*. Buffalo, NY: Channel View Publications, 339-350.

Buhalis, D., & Amaranggana, A. (2013). Smart Tourism Destinations. In Z. Xiang & I. Tussyadiah (Eds.), *Information and Communication Technologies in Tourism 2014* (pp. 553–564). Cham: Springer International Publishing. Retrieved from http://link.springer.com/10.1007/978-3-319-03973-2_40

Buhalis, D., & Foerste, M. (2015). SoCoMo marketing for travel and tourism: Empowering co-creation of value. *Journal of Destination Marketing & Management*, *4*(3), 151–161. https://doi.org/10.1016/j.jdmm.2015.04.001

Caragliu, A., & Del Bo, C. (2012). Smartness and European urban performance: assessing the local impacts of smart urban attributes. *Innovation: The European Journal of Social Science Research*, *25*(2), 97–113. https://doi.org/10.1080/13511610.2012.660323

Chung, N., & Koo, C. (2015). The use of social media in travel information search. *Telematics and Informatics*, *32*(2), 215–229. https://doi.org/10.1016/j.tele.2014.08.005

Cole, Z. D., Donohoe, H. M., & Stellefson, M. L. (2013). Internet-Based Delphi Research: Case Based Discussion. *Environmental Management*, *51*(3), 511–523. https://doi.org/10.1007/s00267-012-0005-5

Cooper, C. & Sheldon, P. (2010): Knowledge management in tourism: from databases to learning destinations, in Pearce, D. G., & Butler, R. (Eds.). *Tourism research: a 20-20 vision*. Oxford: Goodfellow Publ., 215-227

Del Chiappa, G., & Baggio, R. (2015). Knowledge transfer in smart tourism destinations: Analyzing the effects of a network structure. *Journal of Destination Marketing & Management*, *4*(3), 145–150. https://doi.org/10.1016/j.jdmm.2015.02.001

Donohoe, H. M., & Needham, R. D. (2009). Moving best practice forward: Delphi characteristics, advantages, potential problems, and solutions. *International Journal of Tourism Research*, *11*(5), 415–437. https://doi.org/10.1002/jtr.709

Fenn, J., & Raskino, M. (2008). *Mastering the hype cycle: how to choose the right innovation at the right time*. Boston, Mass: Harvard Business Press.

Fuchs, M., Höpken, W., & Lexhagen, M. (2014). Big data analytics for knowledge generation in tourism destinations – A case from Sweden. *Journal of Destination Marketing & Management*, *3*(4), 198–209. https://doi.org/10.1016/j.jdmm.2014.08.002

Garrod, B., & Fyall, A. (2000). Managing heritage tourism. *Annals of Tourism Research*, *27*(3), 682–708. https://doi.org/10.1016/S0160-7383(99)00094-8

Garrod, B. y Fyall, A. (2004): Revisiting Delphi: the Delphi Technique in Tourism Researh. En Ritchie, B.W., Burns, P. y Palmer, C. (eds.). *Tourism Research Methods. Integrating theory with practice (85-98)*. CABI Publishing, UK.

Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *NELSON + WINTER + 20*, *31*(8–9), 1257–1274. https://doi.org/10.1016/S0048-7333(02)00062-8

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E. (2007). Smart cities: Ranking of European medium-sized cities. https://doi.org/10.1016/S0264-2751(98)00050-X

Graciano, T. (2014): Boosting innovation and development? The italian smart tourism: a critical perspective, European Journal of Geography, Volume 5, Number 4:6 -18

Greenfield, A. (2013). Against the smart city. New York (USA): Do Projects.

Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: foundations and developments. *Electronic Markets*, *25*(3), 179–188. https://doi.org/10.1007/s12525-015-0196-8

Gretzel, U., Werthner, H., Koo, C., & Lamsfus, C. (2015). Conceptual foundations for understanding smart tourism ecosystems. *Computers in Human Behavior*, *50*, 558–563. https://doi.org/10.1016/j.chb.2015.03.043

Gretzel, U., Yuan, Y.-L., & Fesenmaier, D. R. (2000). Preparing for the New Economy: Advertising Strategies and Change in Destination Marketing Organizations. *Journal of Travel Research*, *39*(2), 146–156. https://doi.org/10.1177/004728750003900204

Guo, Y, Liu, H. and Chai, Y. (2014): The embedding convergence of smart cities and tourism internet of things in China: an advance perspective, Advances in Hospitality and Tourism.

Hall, C. M., & Williams, A. M. (2008). *Tourism and innovation*. London ; New York: Routledge.

Hjalager, A.-M. (2015). 100 Innovations That Transformed Tourism. *Journal of Travel Research*, *54*(1), 3–21. https://doi.org/10.1177/0047287513516390

Ivars, J. A., Solsona, F. J., & Giner, D. (2016). Gestión turística y tecnologías de la información y la comunicación (TIC): El nuevo enfoque de los destinos inteligentes. [Tourism managament and Information and Communication Technologies (ICTs): The smart destinations new approach] Documents d'Anàlisi Geogràfica, 62(2), 327–346. https://doi.org/10.5565/rev/dag.285

Jolly, D., & Dimanche, F. (2009). Investing in technology for tourism activities: Perspectives and challenges. *Technovation*, *29*(9), 576–579. https://doi.org/10.1016/j.technovation.2009.05.004

Jovicic, D. Z. (2016). Key issues in the conceptualization of tourism destinations. *Tourism Geographies*, *18*(4), 445–457. https://doi.org/10.1080/14616688.2016.1183144

Kanama, D., Kondo, A., & Yokoo, Y. (2008). Development of technology foresight: integration of technology roadmapping and the Delphi method. *International Journal of Technology Intelligence and Planning*, *4*(2), 184. https://doi.org/10.1504/IJTIP.2008.018316

Kelly, K. (2016). *The inevitable: understanding the 12 technological forces that will shape our future*. New York, New York: Viking.

Kitchin, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society*, *8*(1), 131–136. https://doi.org/10.1093/cjres/rsu027

Komninos, N. (2002). *Intelligent cities: innovation, knowledge systems, and digital spaces*. London ; New York: Spon Press.

Komninos, N. (2015). *The age of intelligent cities: smart environments and innovation-for-all strategies* (First Edition). New York: Routledge, Taylor & Francis Group.

Koo, Chulmo, Shin, Seunghun, Gretzel, Ulrike, Canon, William, & Chung, Namho. (2016). Conceptualization of smart tourism destination competitiveness. *Asia Pacific Journal of Information Systems*, *26*(4), 367–384.

Landeta, J. (1999). El método Delphi: Una técnica de previsión del futuro [The Delphi method: a technique for forecasting the future]. Barcelona, Ariel

Landeta, J., Barrutia, J., & Lertxundi, A. (2011). Hybrid Delphi: A methodology to facilitate contribution from experts in professional contexts. *The Delphi Technique: Past, Present, and Future Prospects*, *78*(9), 1629–1641. https://doi.org/10.1016/j.techfore.2011.03.009

Law, R., Buhalis, D., & Cobanoglu, C. (2014). Progress on information and communication technologies in hospitality and tourism. *International Journal of Contemporary Hospitality Management*, *26*(5), 727–750. https://doi.org/10.1108/IJCHM-08-2013-0367

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. https://doi.org/10.1016/j.tourman.2016.03.014

March, H., & Ribera-Fumaz, R. (2016). Smart contradictions: The politics of making Barcelona a Self-sufficient city. *European Urban and Regional Studies*, *23*(4), 816–830. https://doi.org/10.1177/0969776414554488

Marine-Roig, E., & Anton Clavé, S. (2015). Tourism analytics with massive user-generated content: A case study of Barcelona. *Journal of Destination Marketing & Management*, *4*(3), 162–172. https://doi.org/10.1016/j.jdmm.2015.06.004

Munar, A. M., & Jacobsen, J. K. S. (2014). Motivations for sharing tourism experiences through social media. *Tourism Management*, *43*, 46–54. https://doi.org/10.1016/j.tourman.2014.01.012

Neuhofer, B., Buhalis, D., & Ladkin, A. (2012). Conceptualising technology enhanced destination experiences. *Journal of Destination Marketing & Management*, *1*(1-2), 36–46. https://doi.org/10.1016/j.jdmm.2012.08.001

Niininen, O., March, R., & Buhalis, D. (2006). Consumer centric tourism marketing. In D. Buhalis, & C. Costa (Eds.), Tourism management dynamics: Trends, management and tools (p. xxiii). Amsterdam, London: Buttterworth Heinemann, 175-186

Okoli, C., & Pawlowski, S. D. (2004). The Delphi method as a research tool: an example, design considerations and applications. *Information & Management*, *42*(1), 15–29. https://doi.org/10.1016/j.im.2003.11.002

Pearce, D. G. (2014). Toward an Integrative Conceptual Framework of Destinations. *Journal of Travel Research*, *53*(2), 141–153. https://doi.org/10.1177/0047287513491334

Perez, C. (2002) Technological revolutions and financial capital: the dynamics of bubbles and Golden Ages, Elgar, Cheltenham, UK

Pesonen, J. & Lampi, M. (2016). Utilizing open data in tourism. e-Review of Tourism Research, Enter 2016, Vol. 7, Research Notes. Retrieved from http://ertr.tamu.edu/enter-2016-volume-7-research-notes/

Rogers, E.M. (1962) Diffusion of innovations, Free Press of Glencoe, New York

Saraniemi, S., & Kylanen, M. (2011). Problematizing the Concept of Tourism Destination: An Analysis of Different Theoretical Approaches. *Journal of Travel Research*, *50*(2), 133–143. https://doi.org/10.1177/0047287510362775

Schianetz, K., Kavanagh, L., & Lockington, D. (2007). The Learning Tourism Destination: The potential of a learning organisation approach for improving the sustainability of tourism destinations. *Tourism Management*, *28*(6), 1485–1496. https://doi.org/10.1016/j.tourman.2007.01.012

SEGITTUR. (2015). Informe destinos turísticos inteligentes: construyendo el futuro [Report on smart tourism destinations: building the future]. Retrieved from http://www.segittur.es/opencms/export/sites/segitur/.content/galerias/descargas/proyectos/Libro-Blanco-Destinos-Tursticos-Inteligentes-construyendo-el-futuro.pdf

Sheldon, P. J. (1997). *Tourism information technology*. Oxford, UK ; New York: CAB International.

Sigala, M., Christou, E., & Gretzel, U. (2012). *Social media in travel, tourism and hospitality: theory, practice and cases*. Farnham, Surrey, Burlington, VT: Ashgate Pub.

Townsend, A. M. (2013). *Smart cities: big data, civic hackers, and the quest for a new utopia*.

Tussyadiah, I. P., Wang, D., & Jia, C. (2017). Virtual Reality and Attitudes Toward Tourism Destinations. In R. Schegg & B. Stangl (Eds.), *Information and Communication Technologies in Tourism 2017* (pp. 229–239). Cham: Springer International Publishing. Retrieved from http://link.springer.com/10.1007/978-3-319-51168-9_17

Vanolo, A. (2014). Smartmentality: The Smart City as Disciplinary Strategy. *Urban Studies*, *51*(5), 883–898. https://doi.org/10.1177/0042098013494427

Wang, D., Li, X. (Robert), & Li, Y. (2013). China's "smart tourism destination" initiative: A taste of the service-dominant logic. *Researching Destination Experiences*, *2*(2), 59–61. https://doi.org/10.1016/j.jdmm.2013.05.004

Wang, X., Li, X. (Robert), 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. https://doi.org/10.1016/j.tourman.2015.12.003

World Bank (2014). Open data for economic growth. Retrieved from http://www.worldbank.org/content/dam/Worldbank/document/Open-Data-for-Economic-Growth.pdf

Xiang, Z., Tussyadiah, I., & Buhalis, D. (2015). Smart destinations: Foundations, analytics, and applications. *Journal of Destination Marketing & Management*, *4*(3), 143–144. https://doi.org/10.1016/j.jdmm.2015.07.001

Yoo, C. W., Goo, J., Huang, C. D., Nam, K., & Woo, M. (n.d.). Improving travel decision support satisfaction with smart tourism technologies: A framework of tourist elaboration likelihood and self-efficacy. *Technological Forecasting and Social Change*. https://doi.org/10.1016/j.techfore.2016.10.071

Yuan, Y.-L., Gretzel, U., & Fesenmaier, D. R. (2006). The role of information technology use in American convention and visitors bureaus. *Tourism Management*, *27*(2), 326–341. https://doi.org/10.1016/j.tourman.2004.12.001

ANNEX

Table 1. Forecast of impact of technologies on tourism.

	Impact	L %	M %	H %		Impact	L %	M %	H %
Connectivity	Internet IPv6z (Internet Protocol Version 6)	27.27	18.18	54.55	Identity, Payments, Security	Fingerprint Biometrics	27.27	45.45	27.27
	Internet of Things (IoT)	0.00	4.55	95.45		Cryptocurrencies (Bitcoin, Litecoin,…)	40.91	36.36	22.73
	Fi-Ware (Future Internet-ware)	13.64	36.36	50.00		Near Field Communications (NFC) Payments	0.00	36.36	63.64
	Portable Wi-Fi (Mi-Fi,...)	9.09	22.73	68.18		Mobile Connection Payments	4.55	13.64	81.82
	Mobile Connectivity 5G	4.55	31.82	63.64		Wearables/Cards NFC/RFID	0.00	36.36	63.64
	Local Connectivity (Wi-Fi, Li-Fi,...)	0.00	18.18	81.82		Digital Security	9.09	45.45	45.45
	Bluetooth Low Energy (4.0)	4.55	40.91	54.55	Sensorial experiences	Augmented Reality	0.00	36.36	63.64
Wearables	Wearable Google Glass & the like	22.73	59.09	18.18		Virtual Reality	4.55	45.45	50.00
	Wearable Smartwatch	22.73	59.09	18.18		Volumetric and Holographic Displays	18.18	45.45	36.36
	Other Wearables	31.82	40.91	27.27		Ambient Intelligence	0.00	61.90	38.10
						Gesture control	22.73	50.00	27.27

Low (L), Medium (M) and High (H). *Maximum values shaded in grey.

Table 1. Forecast of impact of technologies on tourism (continue).

	Impact	L %	M %	H %		Impact	L %	M %	H %
Data Management	Open Data	4.55	22.73	72.73	Data Management (continue)	Recommendations System	4.55	31.82	63.64
	Mashups	14.29	52.38	33.33		Deep Learning	9.09	40.91	50.00
	Big Data	0.00	13.64	86.36		Graph Database	28.57	42.86	28.57
	Text Mining	0.00	36.36	63.64		Document-Oriented Database	19.05	66.67	14.29
	Web Mining	0.00	40.91	59.09		ESB (Enterprise Service Bus)	9.52	28.57	61.90
	Opinion Mining	4.55	27.27	68.18	Other technologies	QR Codes	45.45	40.91	13.64
	Question Answering	4.76	52.38	42.86		3D Printing	18.18	68.18	13.64
	Tourism Intelligence Platform	4.55	18.18	77.27		Commercial UAVs (Drones)	18.18	22.73	59.09
	Complex Events Processing	10.00	45.00	45.00		Robots	13.64	18.18	68.18
	Real-Time Databases	0.00	15.00	85.00		Autonomous Vehicles	0.00	18.18	81.82
	Semantic Web (WEB 3.0)	4.55	22.73	72.73					

Low (L), Medium (M) and High (H). * Maximum values shaded in grey.

Table 2. Forecast of maximum impact/use of technologies in tourism.

	Forecasting	T %	St %	Mt %	Lt %	U %
Connectivity	Internet IPv6z (Internet Protocol Version 6)	13.6	**40.9**	31.8	9.0	4.5
	Internet of Things (IoT)	9.09	**40.91**	31.82	18.18	0.00
	Fi-Ware (Future Internet-ware)	0.00	9.09	**45.45**	31.82	13.6
	Portable Wi-Fi (Mi-Fi,...)	45.45	**50.00**	4.55	0.00	0.00
	Mobile Connectivity 5G	0.00	**68.18**	31.82	0.00	0.00
	Local Connectivity (Wi-Fi, Li-Fi,...)	40.91	**54.55**	4.55	0.00	0.00
	Bluetooth Low Energy (4.0)	27.27	**54.55**	18.18	0.00	0.00
Wearables	Wearable Google Glass & the like	9.52	14.29	**33.33**	28.57	14.29
	Wearable Smartwatch	18.18	**54.55**	22.73	4.55	0.00
	Other Wearables	22.73	27.27	**40.91**	4.55	4.55

	Forecasting	T %	St %	Mt %	Lt %	U %
Identity, Payments, Security	Fingerprint Biometrics	18.1	**50.0**	22.7	9.09	0.00
	Cryptocurrencies (Bitcoin, Litecoin,…)	9.09	4.55	22.73	**36.36**	27.27
	Near Field Communications (NFC) Payments	9.09	**59.09**	27.27	4.55	0.00
	Mobile Connection Payments	31.82	**54.55**	13.64	0.00	0.00
	Wearables/Cards NFC/RFID	9.09	**63.64**	18.18	9.09	0.00
	Digital Security	40.91	**45.45**	4.55	4.55	4.55
Sensorial experiences	Augmented Reality	22.73	**54.55**	18.18	4.55	0.00
	Virtual Reality	18.18	**45.45**	27.27	9.09	0.00
	Volumetric and Holographic Displays	4.55	22.73	**36.36**	27.27	9.09
	Ambient Intelligence	0.00	4.76	**57.14**	38.10	0.00
	Gesture control	4.55	4.55	**59.09**	27.27	4.55

Today (T), Short Term (St), Medium Term (Mt), Long Term (Lt), Uncertain (U)

* Maximum values shaded in grey. The highest values appear in bold.

Table 2. Forecast of maximum impact/use of technologies in tourism (continue).

	Forecasting	T %	St %	Mt %	Lt %	U %
Data Management	Open Data	13.64	27.27	**50.00**	4.55	4.55
Data Management	Mashups	**42.86**	33.33	19.05	4.76	0.00
Data Management	Big Data	36.36	**45.45**	18.18	0.00	0.00
Data Management	Text Mining	36.36	**50.00**	13.64	0.00	0.00
Data Management	Web Mining	**50.00**	31.82	13.64	0.00	4.55
Data Management	Opinion Mining	**59.09**	18.18	22.73	0.00	0.00
Data Management	Question Answering	13.64	**45.45**	22.73	4.55	13.64
Data Management	Tourism Intelligence Platform	13.64	**40.91**	36.36	9.09	0.00
Data Management	Complex Events Processing	14.29	28.57	**42.86**	4.76	9.52
Data Management	Real-Time Databases	14.29	**57.14**	23.81	0.00	4.76
Data Management	Semantic Web (WEB 3.0)	18.18	**45.45**	27.27	9.09	0.00
Data Management (continue)	Recommendations System	**45.45**	31.82	22.73	0.00	0.00
Data Management (continue)	Deep Learning	0.00	36.36	**50.00**	4.55	9.09
Data Management (continue)	Graph Database	23.81	**42.86**	23.81	4.76	4.76
Data Management (continue)	Document-Oriented Database	18.18	**45.45**	27.27	4.55	4.55
Data Management (continue)	ESB (Enterprise Service Bus)	4.55	9.09	**77.27**	4.55	4.55
Other technologies	QR Codes	**81.82**	13.64	0.00	0.00	4.55
Other technologies	3D Printing	9.09	36.36	**45.45**	9.09	0.00
Other technologies	Commercial UAVs (Drones)	13.64	**68.18**	13.64	4.55	0.00
Other technologies	Robots	0.00	9.09	**63.64**	18.18	9.09
Other technologies	Autonomous Vehicles	0.00	0.00	40.91	**59.09**	0.00

Today (T), Short Term (St), Medium Term (Mt), Long Term (Lt), Uncertain (U)

* Maximum values shaded in grey. The highest values appear in bold.