Journal of **Tourism** & Development | n.º **39** | 2022 | [**65** - 82]
DOI: 10.34624/rtd.v39i0.27694
e-ISSN 2182-1453

Smart and 4.0 paradigms fostering **innovation dynamics** within tourism destinations

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Abstract | The smart and 4.0 paradigms are increasingly dominating the narratives of tourism decision-makers and planners, although being argued that both concepts still lack theoretical background capable of supporting their adoption in development and planning strategies. People travel because they want to get involved in a particular destination through remarkable experiences. Thus, through innovative approaches, tourism destinations can create outstanding offers to engage visitors within the territory, enhancing their attractiveness and competitiveness. Innovation and technology walk side by side, and their impact within a particular context might contribute to the remodelling of the established panorama. Aiming to discuss the role of both smart and 4.0 paradigms in a tourism innovation context, this study applies a case study analysis to the smart cities of Ljubljana and Málaga. The results indicate an increased awareness of digital potentialities by the decision-makers, turning tourism destinations into innovative territories, where the continuous innovation processes are supported by the adoption of technological tools and synergies among the stakeholders, with positive implications on destinations' attractiveness and competitiveness.

Keywords | Smart tourism destination, tourism 4.0, innovation, territorial innovation, case study

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1. Introduction

On the path of the former three industrial revolutions and enhanced by the rapid and continuous technological innovation process, the fourth industrial revolution erupted, giving space to the emergence of a new paradigm, the industry 4.0 (I4.0) (Lu, 2017; Zhou, Liu & Zhou, 2015). The industrial framework shifted towards a more digital production process where the Information and Communication Technologies (ICTs) (e.g., Big Data, Artificial Intelligence (AI), Internet of Things (IoT), blockchain) constitute the vital centre of the operation, creating an intelligent value chain in which data are continuously processed autonomously and independently (Posada et al., 2015; Xu et al., 2018).

Simultaneously, and due to its intrinsic and historical relationship with technological developments, tourism is nowadays facing a new challenge related to the digital transition and transformation of the sector. Boosted by the fourth industrial revolution and the associated disruptive technological innovations, Tourism 4.0 (T4.0) has emerged. Several potentialities have been addressed to T4.0, namely the ability to enrich visitors' experiences and create new business opportunities (Jeong & Shin, 2020). When properly implemented, technologies in services (and tourism inherently) are highly linked to successful interactions between the service provider and customers. Therefore, they are useful for co-creating value, enabling potential tourists to be familiar with a destination in a pre-trip stage, and/or enhancing a destination and a business's competitiveness (Buhalis et al., 2019; Jeong & Shin, 2020). Moreover, it has been argued that paradigm 4.0 is a massive opportunity for developing regions, particularly those located in remote and less developed areas, by attracting new investments and retaining or attracting new residents (Barzotto et al., 2020; Dredge et al., 2018). However, these developments raised severe concerns about the risk of digital divides that could lead to significant disparities between developed and less developed regions (Bailey & De Propris, 2019). Simultaneously, minimal effort has been made to deeply understand the concept of T4.0 (e.g., Pencarelli, 2019; Stankov & Gretzel, 2020; Yildiz & Davutoglu, 2018) and the associated implications for a destination and its stakeholders.

Within this context, innovation is commonly regarded as the solution to solve crises (e.g., economic, social) experienced by both developed and developing countries (Divisekera & Nguyen, 2018). Apart from assisting these challenges, innovations, particularly technological, can contribute to economic and sustainability objectives (Costa & Matias, 2020). The quest for innovative approaches is seen as a precondition to creating more productive, flexible, and stable economic structures (Divisekera & Nguyen, 2018; OECD, 2020). Innovation is thus fundamental to ensure survival, improve sustainability, and guarantee future growth of territories and companies that take part in a highly competitive and global market (Divisekera & Nguyen, 2018). Innovation is also crucial to promote new technologies that facilitate and improve tourism experiences (OECD, 2020). Even so, if innovation is the solution, more efforts should be done to boost and encourage the adoption of digital tools, promote digital literacy, and stimulate new business dynamics across sectors (OECD, 2019).

Schumpeter (1939, p. 87) defines innovation as "the setting up of a new production function" in the form of a new product, a new way of organisation, or the opening of new markets. In other words, innovation can be understood as the combination of a set of factors in a new way. Nonetheless, innovation continues to be an ambiguous term, used, most of the time, as a sort of slogan representing something that constitutes a certain novelty but lacks critical debate (Hjalager, 1997). In a broader sense, innovation concerns the implementation of something adding uniqueness to a product, service, process or method (e.g., marketing, managerial, institutional) (OECD, 2005).

This approach implies that the added element, tangible or not, must be new or significantly improved. More than that, innovation is related to the function of the entrepreneur as the creator of new resources that add value; or to the capacity that they demonstrate to endow the existing resources with added value, contributing to the creation of wealth (Drucker, 2014). Innovation is a consequence of a never-ending process of continuously searching for the best practices and transformations to improve and materialise an organisation's potential. In other words, it is a process based on multidisciplinary interactions, collaboration, knowledge sharing, and information exchange that result in competitive advantages for all the actors engaged (Edquist, 1997). Accordingly, innovation should be perceived as a social phenomenon, resultant of learning and interactivity practices, which are the main principles underlying tourism 4.0 and smart tourism concepts, as will be discussed in the following sections.

Speaking of innovation does not imply radical changes constantly taking place. Innovations are creations of economic worth, but they are more frequently new combinations of existing elements than brand-new ones (Edquist, 1997). If innovations were constantly disruptive, a system of chaos would arise where the innovation would not have a sufficient life cycle to demonstrate its full potential. On the other hand, society would not be able to keep up with this rapid evolution. Innovation can imply improvements that occur in a particular context, without changing it completely (Hjalager, 2010). Looking at the concept in the tourism context, some authors (e.g., Divisekera & Nguyen, 2018; Trunfio & Campana, 2019) claim there is a certain fragmentation of the existing studies, which entails poor empirical evidence on innovation in tourism and hampers the adoption of appropriate innovation policies. In any case, thanks to the technological innovation processes operated in the industrial sector and their repercussions on tourism, we may be moving towards a true paradigm shift that rests upon T4.0.

With this in mind, the present paper aims to demonstrate how implementing technological solutions triggers and promotes innovative dynamics in tourism destinations. Thus, through a case study approach, using the smart cities of Ljubljana (Slovenia) and Málaga (Spain), this paper reviews the best technological practices with direct implications for the innovation process in each city. To do so, it promotes a discussion concerning the topics T4.0 and smart tourism, the analysis of technological innovation in a smart tourism context, and ends up with the characterisation and discussion of the smart city examples. Conclusions, limitations, and implications are then presented in the last section.

2. Literature review

2.1. Understanding 4.0 and smart paradigms in the tourism sector

Following a simplistic logic, T4.0 can be understood as an extension of I4.0 and, therefore, concerns implementing or integrating new technologies in the tourism context. However, the principles of I4.0 cannot simply be transferred to the tourism context, since they were first conceived for an industrial-based production process, while services essentially characterise tourism. At the same time, the simple integration of technologies in the tourism context does not guarantee an added value. At this level, it is essential to recognise the complexity of this new smart standard by the destinations' managing entities to contribute to the competitiveness of all the involved stakeholders (Boes et al., 2016). In other words, the changes brought about through digitalisation must be seen in a joint logic, involving the agents of tourism supply, local and regional managers, visitors, and the local community (Smirnova et al., 2020).

The term 'smart' has been applied in a vari-

ety of contexts (e.g., smart cities, smart factories, smart economies, smart technologies) and has become a buzzword to describe developments driven by the integration of new communication and information technologies through specific processes (Gajdošík & Orelová, 2020; Gretzel et al., 2015a). Simultaneously, the term is used in the tourism context to describe, among others, the concepts of smart tourism, smart tourism destination and/or smart tourism technology. More than a definition of each of the said concepts, the term is often adopted as a way of creating 'a hype' around a political strategy or a technological product (Gretzel et al., 2015a) that is meant to be 'marketable'. In many other cases, the term is used as a representative prefix to 'connectivity' or 'intelligence' (Gretzel et al., 2015b). However, as reiterated by Gretzel et al. (2015a), there remains an unclear definition, leading to a decontextualised use and transformation of everything around us into something 'smart'. Then, what are its basic principles? According to Buhalis (2020), the concept is materialised through the characteristics of technologies, particularly the interconnectivity and interoperability, aiming to redesign processes and data to create innovative products and procedures and in a way that maximises the contribution of all stakeholders. As opposed to the concept of 'intelligence', the term 'smart' is centred on the technological potential for the consumer and not on the technologies *per se*, i.e., as tangible elements (Li et al., 2017). In other words, for something to be called 'smart', it must go beyond anticipating consumers' needs. There is a certain transcendence of the intelligent process that implies the consumer is a facilitator in creating and obtaining information through technological means (Li et al., 2017). The concept is not exclusively related to technological evolution, but rather to the potential of networking between different actors, with the view to maximising the creation of value for all stakeholders, facilitated by the integration of different technologies. In any case, the concept is extremely ambiguous and requires further developments, even acknowledging that its use is currently a common practice in the most diverse areas.

Baggio et al. (2020) recognise certain ease in using the concept, namely in the tourism field, a simple implementation of technology being enough for a destination to be considered smart. However, as previously discussed, this is not sufficiently demonstrative of its extensiveness (Gretzel et al., 2015a). Smart tourism involves innovative forms of collaboration and value creation based on the collection and processing of data from all involved actors and combined with the use of new technologies centred on the efficiency and sustainability of processes (Gretzel et al., 2015b). At the same time, the ability to converge short-term economic goals with the long-term ones associated with sustainable development is fundamental (Encalada et al., 2017). In this regard, Sachs et al. (2019) even state an intimate relationship between technologies and the sustainable development goals (SDGs) defined by the United Nations. As a result of smart tourism, two other concepts emerge: smart tourism destination and smart tourism technologies. The latter can simply be understood as the technologies that are adopted by the tourism sector (e.g., blogs, social networks, IoT, augmented reality, virtual reality, smartphones, among others) with practical implications for value creation and, consequently, for tourist experience (Huang et al., 2016). Subsequently, a smart destination can be understood simply as "a knowledge-oriented destination, where ICTs constitute a technological platform where information and knowledge related to tourism activity are constantly exchanged" (Jovicic, 2019, p. 278).

A smart destination is a complex and dynamic ecosystem where multiple actors (e.g., service providers, intermediaries, public sector, and visitors) and technologies converge, whose interactions make up this ecosystem's physical and virtual elements (Boes et al., 2016; Buhalis, 2020). From this connection, the co-creation of value results,

aiming to maximise the competitiveness of a destination and optimise the tourist experience (Baggio et al., 2020). Furthermore, the human component is fundamental for this ecosystem's success, whereas technological potential depends on the inputs created by the interactions between people and the digital world (Baggio et al., 2020; Boes et al., 2016). At the same time, the concept of smartness has implicit the principle of improving the destination's communities' quality of life (Buhalis et al., 2019; Encalada et al., 2017), which must be an integral part of the referred ecosystem. Thus, following all these requirements, a destination can only be considered smart if it guarantees sustainable development across all its economic, sociocultural, and environmental aspects.

This discourse brings the concept of smart tourism destination closer to that of I4.0. However, from the perspective of Pencarelli (2019), T4.0 can be understood as a new ecosystem based on cutting-edge technologies and closely related to the basic principles of I4.0, such as interoperability, virtualisation, decentralisation and/or the ability to collect and analyse data in real-time. As in the framework of I4.0, the technologies implemented in the tourism context converge and integrate the virtual and physical worlds, providing the basis for developing a new tourism ecosystem. But is this the smart ecosystem identified earlier? In the author's view, this does not seem to be the case. It is based on the statement that the distinction between the concepts lies in the fact that T4.0 is essentially based on the adoption of ICTs without considering the dimension of sustainability. On the other hand, smart tourism can be defined as the tourism system in which technology is, in fact, the central and facilitating element that provides the means for the constant production and sharing of information and co-creation of value. Yet, it is inseparable from the human and social contexts in which it operates, as well as from the principles of sustainability (Gretzel et al., 2015b; Pencarelli, 2019). In view of these statements, one of the ideas worthy of further and more detailed analysis is to understand to what extent T4.0 differs from smart tourism.

2.2. Technological innovation in smart tourism destinations

Innovation potential is an inherent facet of each region (Asheim et al., 2011). However, this differs from region to region, according to territorial specificities and institutional structures established in the past, which shape the type of innovation, integration in innovation networks, knowledge creation and sharing (Asheim et al., 2011; Brandão & Costa, 2012). In this sense, Brandão and Costa (2012) highlight the role of regional innovation systems towards innovation at the destination level, mainly because within this system, innovation is understood as a creative process encompassing collaborative and interactive learning relationships between different actors toward problem-solving (Moulaert & Sekia, 2003). Thus, this array of regional innovation potentials should be considered to comprehend that companies within these different knowledge bases will innovate in distinct directions. Therefore, it would be incorrect to believe in or adopt a 'one-size-fits-all' policy (Asheim et al., 2011).

Therefore, a tourism destination can be understood as a local innovation system (Trunfio & Campana, 2019). Within this setting, the innovation process leads to new experiential offers, frequently through the integration of new actors, both from the private, although not exclusively belonging to the tourism industry, and public sectors (Bellini et al., 2017). In this sense, some authors (e.g., Bečić & Švarc, 2015; Romão, 2020; Romão & Nijkamp, 2018) claim that innovation in tourism benefits from knowledge externalities and spillovers resulting from a creative regional economy framework in which actors from different fields of action contribute to diversifying regional economic structu-

res. Hence, innovation is vital for the competitiveness of tourism destinations as it makes tourism businesses more dynamic, efficient, and productive (Brandão et al., 2019; Hjalager, 2010). Additionally, ICTs have been the backbone of many innovations in recent years (Buhalis & Law, 2008). Due to the ability to transform and organise data and produce knowledge, beyond geographical and user boundaries, ICTs emerged as a nuclear instrument to enhance innovative processes (Hjalager, 2010; Pencarelli, 2019).

Technological advancements are promoting deep changes in people's lifestyles. They are also starting to shape the future of tourism (OECD, 2020), particularly by positioning it as one of the most relevant determinants of innovation in tourism (e.g., Divisekera & Nguyen, 2018). In particular, digital transformation opened the way for the arising of new opportunities for tourism businesses and their competitive ability in the global market (OECD, 2020), also contributing to improving organisations' efficiency, and their capacity to adapt and to anticipate customers' changing needs (Bellini et al., 2017; Jeong & Shin, 2020). Therefore, dynamic innovation systems evolve from converging these digital technologies and interaction between different actors within a specific territory (OECD, 2020).

Boes et al. (2016) claim that innovation is simultaneously the input and outcome of integrating smartness within territories. Smart tourism covers the activities that are endorsed by smart technologies (Gretzel et al., 2015a), which, in turn, are the heart of this knowledge-driven economy. They provide opportunities for reducing distance and time constraints by facilitating information exchange and knowledge sharing. They also promote the development of networks, hence fostering social, economic, and territorial cohesion (Santinha & Castro, 2010). This creates the basis for establishing a dynamic network within an ecosystem where all the stakeholders, from the public sector to visitors, and local communities, are interconnected through the efficient use of technologies (Boes et al., 2016; Buhalis, 2020). Consequently, emerges the concept of a smart tourism ecosystem, a system characterised by intensive information sharing and value co-creation that takes advantage of technological solutions to collect, analyse, and exchange data concerning the destination, activities, and visitors' performance (Buonincontri & Micera, 2016). Through it all the stakeholders get involved and act properly in the process of creation, management, and share of intelligent touristic services and experiences (Gretzel et al., 2015b).

There is a reasonable list of recent studies analysing the impact of technologies in different sub-sectors of tourism, namely hospitality, tourist attractions, restaurants, and the destination itself (e.g., Buhalis et al., 2019; Encalada et al., 2017; Ivanov & Webster, 2017; Jeong & Shin, 2020; Jung et al., 2020; Mohanty et al., 2020; Samara et al., 2020; Seyitoğlu & Ivanov, 2020; Stankov & Gretzel, 2020; Zubiaga et al., 2019). However, there seems to exist an apparent fragmentation in the way that the overall scope of T4.0 is not addressed in these studies, and the focus is predominantly on specific technologies sometimes associated with earlier stages of the industrial revolutions, like the third industrial revolution (Osei et al., 2020). Nevertheless, some examples can illustrate how technological solutions contribute to territorial dynamics and innovative approaches.

For instance, the study of Jeong and Shin (2020) analysed how tourists use technologies in a destination context, measuring the effects on the travel experience and revisit intention. Accordingly, these technologies (e.g., google maps, city apps, mobile payment, virtual reality) positively influence the overall tourism experience and the intention to return. Still, the research was conducted on smart environments totally equipped with several smart technologies enabling a total immersive technological experience, meaning that these kinds of results were, somehow, expected. Another practical example is brought by Jung et

al. (2020), highlighting the role of virtual and augmented reality as promotional tools of cultural heritage in South Korea. The aim was to measure the technology acceptance among potential visitors. Unfortunately, the participants disregarded both usefulness and intention to use these technologies, meaning that the purpose was not totally perceived nor the added value for the potential tourist. This somehow is related to a previous observation of Buhalis (2020) indicating the failure of technological innovations in specific contexts (e.g., hospitality robots), forcing managers to take a step back and reinforcing the necessity to deeply comprehend visitors' technological hesitancy level, as the added value of these tools within a destination framework.

The overtourism phenomenon can be a tangible issue for a tourism destination if managed improperly. Furthermore, the massive attendance of visitors to specific sites or attractions can be destructive to a destination's overall environment (e.g., business life cycle, local communities' well-being, ecological equilibrium), with negative consequences for the visitor experience as well (Zubiaga et al., 2019). Thus, effective management practices are required to ensure the most effective performance of tourism destinations. Additionally, big data analytics arises as a smart tool with considerable usefulness in tourism management, particularly to ensure truly sustainable development. For instance, in Encalada et al.'s (2017) study, the spatial distribution of tourists visiting Lisbon is analysed through geotagged photos published on social networks. By implementing these practices, the authors claim decision-makers can identify the main tourist hotspots of the destination. More than that, the approach also provides the opportunity to discover marginalised sites valued by visitors and show great potential for tourism purposes but are disregarded by tourism managers. These insights prove that by using datasets, such as big and open data, tourism managers can properly cope with sites that are under pressure, particularly by reallocating visitors to undeveloped points of interest. This will revitalise specific areas, create new business opportunities, and optimise the visitor experience. Similarly, Del Vecchio et al. (2018) claim that through this type of analysis, managers can identify specific patterns regarding the destination (e.g., critical points, areas needing intervention, opportunities for development) and the demand (e.g., satisfaction, expectations, needs). Accordingly, there is a great potential associated with the analysis of visitors' content on social media, particularly the creation of knowledge, allowing the destination to improve its performance in critical issues (e.g., accessibility, price, waste management) and to identify market segments (assessing visitors' personal information). Moreover, social networks are also an important marketing channel. Through Big Data analytics, tourism managers can directly involve visitors in this process, thus contributing to a more customised offer.

The relevance of other technological solutions, such as IoT and Geographic Information Systems (GIS) to monitor and manage visitor flows and mobility patterns (e.g., occupation level, most-visited sites), was demonstrated in the study of Zubiaga et al. (2019). As in Encalada et al. (2017) and Del Vecchio et al. (2018), the design and implementation of a monitoring system to collect and share data among the stakeholders allow decision-makers to develop strategies to avoid overcrowding situations and reduce the pressure on specific attractions or sites. It also provides the opportunity to design new attractions, improve less-visited places, and define new visitor routes, particularly in the surrounding areas of the destination. The added value of this solution is in the alarm method that notifies managers in overcrowded situations, allowing them to put into practice measures to control visitor flows (e.g., activating barriers) and to notify visitors through a mobile app, suggesting alternative activities or attractions to visit.

Thus, it can be deduced that effective territorial networks involving cooperation, collaboration,

and coordination among different regional and local actors trigger territorial innovation (Brandão et al., 2019; Pires et al., 2020). As innovation is mostly linked to the emergence and adoption of technological solutions, tourism innovation dynamics within a territory can be achieved through the implementation of technologies coming from the I4.0, as demonstrated by the above-mentioned examples, thus resulting in reinvented tourist products and experiences (Bellini et al., 2017) and territorial development (Dredge et al., 2018). The integration of these new technologies has promoted virtual and multisensorial experiences of tourism destinations, even without visitors' physical presence (Mohanty et al., 2020). In this context, Morgan (2004) highlights the 'geography is dead' thesis, based on the hypothesis that ICTs allowed greater interchangeability of information which, to a certain extent, transformed both organisational and travel experiences processes. The services sector is gradually becoming more oriented toward new technologies, which, in turn, facilitate the separation between the production and consumption processes. In this sense, is it feasible to think of a new paradigm of tourism experiences? In other words, when many sectors of activity are no longer dependent on a geographic area where consumption takes place, what kind of implications does this entail for the destination's stakeholders? In fact, it seems that the inherent capacity to generate, manage, and share information, combined with the ability to remove physical and communication barriers, allowed the ICTs to introduce new ways of creating and consuming tourism experiences (Hjalager, 2010; Trunfio & Campana, 2019).

3. Methodology

The role of smartness and ICTs within a tourism destination competitiveness context is a growing topic that needs further development, particularly through the analysis of best practices (Boes et al., 2016; Pierdicca et al., 2019). In order to do so, this paper adopted a case study approach. The case study is a method widely applied in the tourism field (Beeton, 2005), allowing researchers to obtain a holistic and meaningful overview of specific real-life cases or events (Botterill & Platenkamp, 2012; Yin, 2009). Tourism is increasingly embedded in a smart setting, and technological solutions are starting to dominate the discussion concerning the future of the tourism sector (Buhalis et al., 2019; Pierdicca et al., 2019). However, several challenges to this paradigm shift are still to be perceived. Thus, this approach might provide several opportunities to analyse how smartness and digital transformation are being addressed in tourism destinations by analysing strategic plans and other relevant documentation. Lastly, the integration of description, theory and analysis, and the explicit recognition of ideology, perceptions, values, and choices straighten the explanatory powers of the theory, i.e., the topic in focus (Hall & Jenkins, 1995).

3.1. Case selection and analysis

The analysed cases were selected based on the European Commission competition for the European Capital of Smart Tourism. This initiative aims to improve tourism-generated innovative development in European cities, enhance their attractiveness, and promote economic growth. Additionally, it intends to establish a framework for promoting and exchanging best practices, defining a new pathway for cooperation and partnerships between European cities (EC, 2021a). Within the competition context, a smart tourism destination is perceived as a "destination facilitating access to tourism and hospitality products, services, spaces and experiences through ICT-based tools" through innovative and intelligent practices (EC, 2021a, p.3). Specifically, the initiative identifies remar-

kable achievements in smart tourism through the evaluation of tourism destinations in four specific categories, particularly: (i) accessibility, (ii) sustainability, (iii) digitalisation, and (iv) cultural heritage and creativity (EC, 2021b). The 'digitalisation' category refers to the effective implementation and use of technological and digital tools to share information among all the destination stakeholders, enhance the development of innovative tourism offers, and improve visitors' experience (EC, 2021a). When designing the application, the cities must describe best practices conducted under the mentioned categories that are later analysed accordingly to specific criteria, namely the level of smartness of the initiative, sustainability and resilience, the level of inclusiveness, and impacts on the local business environment and community (EC, 2021a).

The case studies analysed in this paper are the smart tourism destinations of Málaga (Spain) and Ljubljana (Slovenia). Both cities were selected from a final list of 35 applicants. The reason behind these choices lies in the fact that Málaga was the winner of the 2020 edition of the said competition, with a special insight in innovation and digitalisation practices, namely through the incorporation of several technologies (e.g., AI, mobile apps). The choice of Ljubljana, similarly, is justified by the fact that it was the city distinguished by its unique performance in the digitalisation category.

A qualitative approach has been implemented to collect and analyse data. This work relies essentially on secondary data retrieved from (i) the European Commission, specifically the official reports regarding the competition, such as the "Guide for applicants" that explains the fundamentals and provides guidelines for the initiative, and the "Compendium of best practices", offering the compilation of the most inspiring initiatives and projects implemented across cities; (ii) the European Commission's competition-related website (smart-tourism-capital.ec.europa.eu/); and (iii) destination management organizations (DMOs), particularly national strategic plans for tourism development, such as the "Strategy for the sustainable growth of Slovenian tourism for 2017-2021", *"Plan estratégico de innovación tecnológica 2018-2022"*, and "Enhancing the digital promotion of Ljubljana and the Ljubljana region as one of the leading tourist destinations in Slovenia", in addition to official websites of both cities (https://www.visitljubljana.com/ and www.malagaturismo.com/en/site/smarttourism/pages/smart-tourism-destination). A content analysis was then conducted, aiming to describe and detail the innovations and initiatives implemented by each city. Further, the discussion was conducted by crossing these insights with the literature reviewed.

3.2. Case studies characterisation

Ljubljana is Slovenia's capital and its administrative, cultural, political, and economic centre. The city offers a diversified set of resources, with a particular insight into its cultural and historical heritage, natural setting with pristine woods and hills, shopping opportunities and other valuable attributes that enrich and promotes authentic tourism experiences (Grah et al., 2020: MEDT, 2017). The city has been embedded in the smart context since 2016, when it was awarded the European Green Capital 2016 (EC, 2016; Johnson et al., 2021). In 2017, the Slovenian government launched a new tourism strategy for 2017-2021, identifying a set of measures in which smartness is incorporated. Particularly, the smart paradigm is related to 'smart mobility', focused on the efficiency of public transportation, the development of smart mobility cards, and the design of projects for effective traffic management (MEDT, 2017). Within the digital transformation process, Ljubljana is further striving to become gradually digital. For instance, in 2018 and 2019 it was laun-

ched the initiative "Enhancing the digital promotion of Ljubljana and the Ljubljana region as one of the leading tourist destinations in Slovenia" a funding project aiming to support the development of tourism offering. In the case of Ljubljana, the initiative was centred on the enhancement of digital platforms such as the official website and online promotional campaigns (Visit Ljubljana, 2021), that will be further analysed. In line with these efforts, the city won the digitalisation category in the 2020 European Capital of Smart Tourism Competition, rewarding the city for its continued efforts towards the implementation of technological solutions aiming to increase its smartness, such as mobile apps, chatbot facilities, virtual and augmented solutions (EC, 2021b; Intelligent Cities, 2021), that will be further analysed in the following section.

Málaga is part of the Smart Tourism Destination Network, a project promoted by the Ministry of Tourism aimed at improving the position of Spain as a global tourism destination, seeking new mechanisms to promote innovation in tourism destinations and to create differentiated and highly competitive services with the deployment and development of ICTs. The Smart Tourism Destinations project is one of the measures included in the National and Integral Tourism Plan (PNIT) for the 2012-2015 period, promoted by the Ministry of Tourism and managed by the State-owned Enterprise for the Management of Tourism Innovation and Technology (SEGITTUR) (Malaga Turismo, 2021). Becoming a Smart Tourism Destination encompasses the design of a strategy that revalues Málaga as a tourism destination, increasing its competitiveness through a solid use of the existing resources and the design of innovative offers. The process is also achieved through the improvement of efficiency of production and distribution processes, which ultimately promotes sustainable development and facilitates the interaction of visitors with the city (Malaga Turismo, 2021). More recently, the city has developed a strategic plan for technological innovation for the 2018-2022 period, the "Málaga Smart", aiming to promote sustainability and safety, smart mobility, innovative economy, ICT infrastructures and facilities, digital transformation, and services for the citizens (Ayuntamiento de Málaga, 2018).

Málaga has been awarded the title of European Capital of Smart Tourism in 2020 for its outstanding achievements in smart tourism planning and incorporation of sustainability, innovation, and culture into its strategic plans. As a result, there is a constant exchange between visitors and the government's tourism services focused on meeting the visitors' needs. In terms of sustainability, Málaga has invested in various spheres: energy and water-saving solutions, eco-friendly mobility, and pollution management. In addition, the city has also upgraded and adapted infrastructural management, such as street cleaning equipment and waste separation in the city centre, public and private transportation services network, and pedestrian spaces (Cleverciti, 2021).

4. Discussion

In line with the initiative described earlier, aiming to promote digital transformation in Ljubljana, one of the first projects was redesigning the official tourism website and app – Visit Ljubljana (https://www.visitljubljana.com/). Both tools are available in seven languages and are regularly updated with information and tourism offers (EC, 2021b). Additionally, visitors can explore the city through the 'Ljubljana 360-degree sightseeing', 'remoted guided tour of Ljubljana', and 'virtual guided tours of Ljubljana' offers without leaving home. The first consists of virtual walks with multisensorial elements (e.g., visuals and sounds of the surrounding environment) in specific sites or attractions, such as the Ljubljana castle, city parks or museums (Visit Ljubljana, 2021). The re-

moted guided tours are videos of local guides that allow people to experience city tours remotely, learning about specific facts or stories of some of the most notorious sights of the destination. Lastly, and contrary to the remote tours, the virtual guided tours are paid thematic packages in the format of a live Zoom webinar where local guides explore specific touristic points of the city, ensuring a more intimate experience in a virtual setting (Visit Ljubljana, 2021). Besides the inherent digital component, these projects also encompass sustainability principles, particularly by ensuring the involvement of local communities in the co-creation process and creating alternative products to revitalise economic activities and foster economic growth. This managerial capacity to anticipate and deal with constraints, such as the coronavirus pandemic, is fundamental to the success of a smart tourism destination and regional innovation systems, particularly by developing the conditions to support future development based on sustainable visions (Brandão et al., 2019; Divisekera & Nguyen, 2018).

The *URBANA smart card* is a mobility pass aiming to foster visitors' use of public and eco-friendly transportation and transportation facilities (e.g., bus journeys, bicycle sharing, parking lots). Through contactless technology, the card makes it easier to use and switch between the available modes of transportation. Furthermore, it also functions as a payment card and is key to activating the bike-sharing system dispersed throughout the city (EC, 2020; Intelligent Cities, 2021). Still, in the smart mobility trend, the city disposes of electric-powered vehicles – 'Kavalirs' – in a joint collaboration between the city municipality and the bus company LPP, aiming to improve the experience in the historical centre and boost environmentally friendly practices by diminishing air pollution constraints (EC, 2020; Visit Ljubljana, 2021).

Then, a set of mobile apps were designed with different purposes that deserve to be emphasised. *The Tap Water Ljubljana app* is an innovative solution that provides visitors with information concerning the locations of the 16 public water fountains operating during the summer with drinkable water (Intelligent Cities, 2021; Visit Ljubljana, 2021). The app displays a map with the best route according to the visitor's location, comparable to several other travel assistants (e.g., google maps). The *Ljubljana by Wheelchair* app is oriented to tourists with disabilities to promote sustainability through tourism for all platforms. Besides its user-friendly layout, the app indicates the most appropriate and suitable locations for wheelchair users. Moreover, the cycling paths and the adaptation of the transportation facilities to wheelchairs make the city accessible to all. The app also allows visitors to rent an electric trailer to attach to the wheelchair, enabling people with disabilities to improve their experience by moving easily and faster within the destination (Visit Ljubljana, 2021). Once again, the collaboration among the destination's stakeholders reveals its positive impact on the destination, more precisely through the cooperation between the local DMO and local citizens with disabilities that jointly designed the app. Similarities can be found in the study of Huang and Lau (2020), namely by demonstrating that simple technological tools, such as a smartphone app, are able to provide a considerable level of autonomy to visitors with physical impairments, guaranteeing that tourism for all can be a reality.

Additionally, the *Nexto app* is a storytelling app that combines the benefits of audio guides solution with a gamification approach, aiming to enrich visitors' experience through puzzles, enigmas, and the collection of items around the city, through scanning objects with a smartphone, like the Pokémon Go app. More precisely, the app creates cultural learning experiences through augmented and virtual reality technologies, providing an autonomous interaction between the destination and the visitors, as it uses location-aware technology (e.g., sensors or methods that calculate the geographical position of a person and automatically activate the audio guide each time the visitor is nearby a point

of interest) (EC, 2020; Intelligent Cities, 2021; Nexto, 2021). This gamification approach is similar to that of Huang and Lau (2020), which improved visitors' engagement with the destination and overall satisfaction. Besides, it is an alternative tourism solution that might increase the destination's competitiveness. The development of these apps encompassed the collaboration between public tourism entities, residents, technological companies, and the municipality of Ljubljana. This demonstrates that working on dynamic networks might result in significant gains ranging from the improvement of the visitor experience to targeting new market segments or the development of new offers that will enhance the destination attractiveness and competitiveness (Brandão & Costa, 2012; Brandão et al., 2019; Hjalager, 2010).

Málaga was mainly known as a sun and sea destination until a strategic shift that put the city on the track toward the smart paradigm. The city successfully combines sustainability, accessibility, innovation, and culture into its holistic smart tourism system (EC, 2021b). Both industrial and technological parks mentioned earlier boosted the digital transformation of Málaga, positioning technologies at the core of the tourism experience and as a catalyst for the innovative capacity of local companies (EC, 2021b; Malaga Turismo, 2021). Embedded in this smart and digitalisation process, the city was gradually implementing technological innovations that led it to be awarded the European Capital of Smart Tourism in 2020. Some of the most relevant solutions are e presented in the following paragraphs.

One of the most recent technological innovations was the beach monitoring app, developed in a joint initiative between the University of Málaga and Costa del Sol Tourism (EC, 2021b). This smartphone app uses remote sensors and the IoT to provide information about beach conditions. It also uses artificial intelligence to predict crowd size, which was of particular importance during the pandemic period in 2020, when uncertainty was prevailing, and social distancing was required. Besides, the application was also designed to provide real-time information concerning sea and beach conditions (e.g., temperature, waves, wind speed), as well as warnings about specific events like seaweed issues or the presence of jellyfish (EC, 2021b). As Ljubljana, Málaga also launched its chatbot, called Victoria la Malaguena, in 2018. Through AI, the chatbot uses conversational interfaces through Facebook, Messenger, or Google Assistant to provide information about the city. Specifically, by activating geolocation, the chatbot can identify the users' location and provide information about (i) equipment and facilities (e.g. markets, libraries, cinemas, monuments, museums), (ii) public transportation, particularly by indicating the waiting times, (iii) parking lots, providing real-time information about the occupancy rate, (iv) restaurants according to visitors' preferences, (v) routes, providing direction on how to get to a specific location, (vi) additional information (e.g. curiosities, weather, traffic cameras, local words and expressions, cultural agenda) (Malaga Turismo, 2021).

Another example of Málaga's digital transformation is the beacon project. Through low-energy Bluetooth technology sensors dispersed across municipal markets, museums, and tourist spots throughout the city, this initiative aims to provide visitors with valuable content available in five languages and related to the offers available in specific places and to promote cultural heritage through technological innovations. Additionally, this solution allows destination managers to collect anonymous data on monument visits, tour times, and other information that can be used to increase management effectiveness as a way of contributing to the development of technological capacities and the overall competitiveness of all the destinations' stakeholders (Boes et al., 2016).

In line with Ljubljana's practices, the city of Málaga implemented technological solutions within the smart mobility context. For instance, near-field communication technology sensors were

employed in public transport to provide passengers with an easier method of validation and purchase of tickets, as well as to inform them about schedules, transportation lines, and waiting times at stop points. Another example was the implementation of an augmented reality app aiming to allow visitors to know the exact location of each bus stop according to their location, also providing information about the arrival time of buses. Revitalising the use of QR codes, an alternative solution was developed by implementing this technology in each stop terminal to get direct access to bus schedules (Ayuntamiento de Málaga, 2018). All these projects were implemented in a collaborative logic between *Empresa Malagueña de Transporte*, the regional DMO, and the city council of Málaga, proving the relevance of these joint initiatives towards the success of innovation dynamics, as argued by Moulaert and Sekia (2003) and Bellini et al. (2017). Development of these initiatives in a multidisciplinary context that combines actors from different spheres is beneficial for all, as it creates positive externalities that strengthen the economic structure (Bečić & Švarc, 2015; Romão, 2020; Romão & Nijkamp, 2018).

More oriented to the development of destination management capacities, the Strategic Plan for Innovation also included the employment of Big Data methods to collect, store, and analyse data concerning visitors' behaviours and flows in specific areas of interest, in order to develop future strategies and actions in line with the UN's SDGs (socio-economic, environmental and cultural). It particularly focuses on the quality of life of local communities and that of visitors, as well as on the efficient management of the city's resources (Ayuntamiento de Málaga, 2018). The plan seems to be focused on converging short-term economic goals with long-term ones, centred around sustainable development, in line with Encalada et al.'s (2017) and Sachs et al.'s (2019) statements previously discussed in the literature. The usage of big and open data can also assist tourism managers in identifying specific patterns in demand and coping with sites that are potentially or realistically under pressure, particularly by reallocating visitors to undeveloped points of interest, as argued by Encalada et al. (2017) and Del Vecchio et al. (2018).

The city's projects and the Strategic Plan, overall, appoint to a strong focus on interconnectivity and interoperability, the creation of innovative products and procedures of data collection and processing, and the maximisation of inclusion and collaboration of the involved stakeholders, which is in accordance with Buhalis (2020) and Gretzel et al.'s (2015b) materialisation of the concept of smart tourism. Málaga and Ljubljana can, therefore, truly call themselves 'smart destinations', being knowledge-oriented and focused on the constant exchange of information between stakeholders (Jovicic, 2019; Encalada et al. (2017); Del Vecchio et al. (2018) in the context of innovative digital transformation.

5. Conclusions

Implementing new ICTs in the tourism industry encompasses several advantages for visitors and destinations. On the one hand, they provide simplified processes of information exchange and knowledge sharing, promoting regional and/or local networks, which are expected to contribute to economic growth and territorial cohesion. Moreover, it has been suggested that they decrease the associated travel risks, encourage behavioural intentions of visiting a specific destination, and improve the destination's image (Buhalis et al., 2019).

The present study uses a case study method to investigate the influence of smart and 4.0 paradigms on innovation in tourism in terms of territory. The rationale supporting this study lies in the increasing relevance of industry 4.0 and 'smartness' in tourism. The smart destinations of Ljubljana and Málaga were chosen to address this dis-

cussion. The results suggest that tourism managers are increasingly aware of the potentialities of digitalisation for both the destination and the visitors. Supported by virtual and augmented reality, Artificial Intelligence, Internet of Things, and/or mobile apps, several technological solutions were designed and implemented in these destinations, aiming to increase their attractiveness and competitiveness. Although there is a predominance of former technological innovations, such as mobile apps, it is also true that destinations are struggling to incorporate the latest technologies arising from the fourth industrial revolution. As demonstrated in the study, this path is being made through collaborative strategies, involving tourism suppliers from both public and private sectors, local communities, companies, and businesses specialised in different fields, and through the inputs of visitors, retrieved with the aid of Big Data analytics. In this sense, tourism destinations arise as truly innovative territories, where synergies are established among all stakeholders to accomplish their objectives and contribute to sustainable growth.

As for the study's limitations, one concerns the fact that only an analysis of secondary, online data was conducted. Future studies should consider analysing additional secondary material, such as conference presentations, promotional material, and other types of communications on the topic and the case studies in question (Johnson et al., 2021). Moreover, they should collect and analyse primary data as well. Despite the application of a simple content analysis of the selected documents in the present study, a more in-depth one should be conducted in the future, using different qualitative and quantitative methods and software for data collection and analysis. An additional limitation is that only two cases were analysed, and only Ljubljana was exclusively focused on the digitalisation dimension. Future studies should consider comparing further cases, encompassing both best practices and unsuccessful cases, aiming to deeply understand how technological innovations operate in distinct territorial contexts.

Further studies are needed (e.g., comparative research) to be conducted in less developed destinations, in order to understand the way visitors react and interact with technologies in a non-pre-staged scenario, i.e. one that is not prepared to address this kind of experience, as suggested by Jeong and Shin (2020). Moreover, technological aspects of travel motivations should be considered in future studies. Technology-oriented visitors have different expectations from those who want to engage in experiences outside the digital context. These dimensions need to be deeply investigated within the smart and 4.0 frameworks, in order to further understand the implications of digital and technological innovation and their application in tourism territories.

Acknowledgements

This work was financially supported by the research unit on Governance, Competitiveness and Public Policy (UIDB/04058/2020)+(UIDP/04058/2020), funded by national funds through FCT – *Fundação para a Ciência e a Tecnologia,* under the PhD Grant UI/BD/152274/2021.

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