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BARRIERS AND OPPORTUNITIES OF DATA SPACES IN SMART TOURISM DESTINATIONS: INSIGHTS FROM BENIDORM (SPAIN)

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ABSTRACT

Smart tourism destinations aim to manage data coming from deployment of ICT solutions for the sake of an actionable decision-making process. However, data management in the tourism domain have some challenges, such as (i) the need of tourism sector for including external, non-tourism data to make the data more meaningful; (ii) the very heterogeneous nature of tourism data by subject matter; as well as (iii) data coming from many levels of granularity (e.g., city, region, or nation). In order to propose how to properly address these challenges, contribution of this paper is twofold. First, opportunities and barriers that held

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data-driven smart tourism destinations are analyzed by considering the case study of Visit Benidorm, the Destination Management Organization (DMO) of Benidorm, which is the first city certified as smart tourism destination according to the Spanish standards. Secondly, insights are provided that allow to state that data spaces in the tourism sector are required for DMOs to unleashing the potential of data in a smart tourism destination.

Keywords: smart tourism destination; data-driven organizations; destination management organizations; data spaces.

Barreras y oportunidades de los espacios de datos en destinos turísticos inteligentes: aprendizajes desde Benidorm (España)

RESUMEN

Los destinos turísticos inteligentes buscan gestionar los datos provenientes del despliegue de soluciones TIC con el fin de facilitar un proceso de toma de decisiones accionable. Sin embargo, la gestión de datos en el ámbito turístico presenta algunos desafíos, tales como: (i) la necesidad del sector turístico de incluir datos externos, no turísticos, para hacer que los datos sean más significativos; (ii) la naturaleza muy heterogénea de los datos turísticos por temática; así como (iii) datos que provienen de muchos niveles de granularidad (por ejemplo, ciudad, región o nación).Con el objetivo de proponer cómo abordar adecuadamente estos desafíos, la contribución de este artículo es doble. En primer lugar, se analizan las oportunidades y barreras que condicionan a los destinos turísticos inteligentes basados en datos, considerando el estudio de caso de Visit Benidorm, la Organización de Gestión del Destino (DMO) de Benidorm, que es la primera ciudad certificada como destino turístico inteligente según los estándares españoles. En segundo lugar, se ofrecen perspectivas que permiten afirmar que los espacios de datos en el sector turístico son necesarios para que las DMOs puedan liberar el potencial de los datos en un destino turístico inteligente.

Palabras clave: destinos turísticos inteligentes; organizaciones basadas en datos; organizaciones de gestión de destinos; espacios de datos.

1. INTRODUCCIÓN

A tourism destination becomes smart when it makes intensive use of technological infrastructure in order not only to enhance the tourist experience, but also to improve the decision-making process through data management (Ivars-Baidal *et al*., 2019). Smartness in a destination, therefore, is determined by the ability to gather and analyze data using Information and Communications Technology (ICT, hereafter) to implement changes in the destination based on the insights derived from data (Ivars-Baidal *et al*., 2019). The concept of a Smart Tourism Destination (STD, hereafter),) has emerged in recent years as an evolution of the traditional destination management model, in response to the challenges posed by sustainable tourism, digital transformation, and citizen participation. According to the definition proposed by SEGITTUR (Spanish State Company for Innovation and Tourism Technology Management), a smart tourism destination is "an innovative tourism

destination, built on a state-of-the-art technological infrastructure, which ensures the sustainable development of the tourist area, accessible to all, that facilitates interaction and integration of visitors with the environment, enhances their experience, and improves the quality of life of residents" (SEGITTUR, 2015).

This definition is structured around five key pillars that form the foundation of the STD model: innovation, technology, accessibility, sustainability, and governance. Each of these dimensions must be integrated transversally into destination planning and management to be genuinely considered a smart destination (Boes, Buhalis and Inversini, 2016).Innovation is expressed through new management models and tourism products; technology enables real-time data collection, analysis, and usage; sustainability involves balanced management of tourism's social, economic, and environmental impacts; accessibility promotes the inclusion of all tourist profiles; and governance encourages the participation of public and private stakeholders in decision-making processes (Del Vecchio *et al*., 2018). Smart destinations also rely on technologies such as Big Data, the Internet of Things (IoT), Artificial Intelligence, and digital platforms to offer personalized services, improve visitor flow management, and optimize the use of resources. This not only enhances the destination's competitiveness but also promotes more responsible and resilient tourism (Gretzel *et al*., 2015).

To facilitate the transition to Smart Tourism Destinations Celdrán-Bernabeu *et al*. (2018) argue that the Destination Management rganizations (DMO, hereafter) are the entities which can understand the correlation between complex metrics and parameters in the tourism sector and playing the role of intermediaries between the different components of the destination management. Specifically, according to United Nations World Tourism Organization (UNWTO), a DMO is "the leading organizational entity which may encompass the various authorities, stakeholders and professionals and facilitates partnerships towards a collective destination vision" (WTO, 2019). By fostering market intelligence through data management and analysis for decision-making, as well as engagement in public-private partnership for an efficient government, DMOs can take on the role of data management in the destinations and thus, lead to or facilitate public-private partnership (WTO, 2019).

Therefore, it is imperative for DMOs to give careful consideration to the development of a data ecosystem in order to facilitate the efficient consumption and utilization of data assets through formal processes. Unfortunately, according to the study of mastering data for tourism by EU destinations, published by European Commision (EC, 2022), DMOs face some challenges to face with when data is used for tourism, namely: (i) the need of tourism sector for including external, non-tourism data to make the data more meaningful; (ii) the very heterogeneous nature of tourism data by subject matter; as well as (iii) the different levels of granularity of tourism data (e.g., city, region, or nation). Importantly, these challenges stem from the fact that there are many stakeholders in STDs (public institutions or private companies) that generate data.

The current data ecosystems of DMOs need to be studied in depth to understand the scope of these challenges and to propose solutions to address them. A starting point for meeting these challenges is encouraging DMOs to adopt a data-centric perspective for implementing systematic data management processes in tourism destinations (WTO, 2019; EC, 2022). DMOs may turn towards the development of data ecosystems to facilitate the consumption of data assets through formal processes that create synergies and minimize con-

flicts between data-related stakeholders, promoting a data-sharing perspective in designing value-added services for tourism, for example by promoting data spaces initiatives.

To this aim, this paper focus on analyzing Visit Benidorm, the DMO of Benidorm (a mature touristic city in southeastern Spain), which is the first city certified as smart tourism destination according to the Spanish standards. Insights from Visit Benidorm are gathered to determine the opportunities and barriers in data consumption and production related to aforementioned challenges, and a discussion is provided to assess if data spaces Boris (2022) are useful to address those challenges.

The remainder of this paper is as follows. Next section describes related work. Section 3 introduces our case study on Visit Benidorm. Section 4 explains our results (barriers and opportunities) on how Visit Benidorm is addressing data management challenges, and how data spaces would support DMOs. Finally, section 5 sketches out conclusions and future work.

2. RELATED WORK

The multidimensional challenges of modern cities require them to constantly develop innovative measures and tools to address them. Data is one of these assets, offering much potential as an informed decision-making enabler and thus, can become an indispensable management tool (Osman and Elragal, 2021). Similarly, Bibri and Krogstie (2020) describes a data–driven smart sustainable city as a city that relies increasingly on ICT solutions and therefore, has the ability to generate, store, process, analyze, and harness urban data for improved decision-making and deep insights about sustainability, efficiency, resilience and quality of life. A STD as an extension of this smart city concept, being defined as "a destination facilitating access to tourism and hospitality products, services, spaces and experiences through ICT-based innovative solutions, making tourism sustainable and accessible, and fully leveraging their cultural heritage and creativity" (EC, 2022) and similar to any other smart ecosystem, relies heavily on data. Therefore, a destination can become smart if only data exploitation through the application of ICT shapes the core of its strategic and operational decision-making processes, as the exploitation of data is a key enabler for the smart growth of tourism (EC, 2022). Accordingly, some approaches have been presented in the related literature, e.g., to provide an ecosystem of ICT infrastructures, systems and devices to enable the smart solutions (EC, 2022). Authors in Bibri and Krogstie (2020) argue that data-driven sustainable smart cities demand a number of data-oriented competencies such as urban operating systems, urban operations centers, urban dashboards, innovation labs, research centers, training centers and educational institutes. Another focus for addressing the data challenges in smart environments turns toward creating synergies, minimizing conflicts between data-related stakeholders and employing a data-oriented perspective in designing services (Lim, Kim and Maglio, 2018). Consequently, concepts such as open data and data sharing are presented as suitable responses for data management challenges, as they can produce significant positive impacts on economy, governance, education, environment, tourism, transport and mobility in cities (Ojo, Curry and Zeletí, 2015) and improve the availability and effective use of data in SDs.

Within this scenario, data spaces are gaining momentum (Boris, 2022) and several initiatives have been launched, such as Gaia-X[1] or International Data Spaces Association[2]. A data space is a federated data infrastructure that supports trustworthy data sharing among data providers and data consumers, while ensuring data interoperability and data provider sovereignty. However, there are a lack of studios on the feasibility of developing a data space initiative to solve the DMO challenges in a STD. To this aim, this paper focus on a real DMO in order to detect barriers and opportunities faced with regard to data management and get insights on feasibility of data spaces for addressing STD challenges.

3. CASE STUDY: VISIT BENIDORM

Conducting a case study contributes to an in-depth exploration of intricate phenomena within a specific context (Rashid *et al*., 2019), such as the analysis of data-driven DMOs required for this research. Our case study focuses on Visit Benidorm, the organization responsible for destination management in Benidorm—an important tourist city in south-eastern Spain. Benidorm is a benchmark tourist destination and the first smart destination to achieve the Q Mark from the Institute for Spanish Tourism Quality, having passed the audit carried out by AENOR in accordance with the UNE 178501 standard for Smart Tourism Destination (STD) management systems. It also serves as a Smart Destination Living Lab to monitor and measure the impact of STD axes and the Sustainable Development Goals (SDGs) across various areas of the city.

Several characteristics of the Visit Benidorm data ecosystem have been extracted through document review and a semi-structured interviews conducted as part of this research. A total of five semi-structured interviews were conducted between July and September 2021, each lasting approximately 60 to 90 minutes. These interviews enabled a deeper exploration of various aspects of the organization's data ecosystem, providing multiple perspectives and valuable nuances regarding its management. In addition, access was granted to internal documents, reports, and platforms used by Visit Benidorm, which facilitated data triangulation and enriched the qualitative analysis of the case. The interviews were held with the Managing Director of the Visit Benidorm Foundation, the main actor responsible for the strategic and operational management of the destination. The information gathered was analyzed and synthesized using a SWOT matrix, which served as the analytical framework for identifying and organizing internal and external factors. Thus, the reflections and implications presented in this article are grounded in this structured methodology.

Our case study also reveals the policies and procedures employed by Visit Benidorm to manage data. It is worth noting that the organization began integrating big data analytics into its marketing strategies as early as 2017, marking the beginning of its digital transformation and adoption of data-driven decision-making.

The data used by Visit Benidorm can be divided into two main categories: internal and external sources. Internal data is generated through Visit Benidorm's social media platforms, internal blog, trip reports, and influencer activities. External sources include

1 https://www.data-infrastructure.eu/
2 https://internationaldataspaces.org/

data from public Wi-Fi, airlines, search consoles, social media, the Hoteliers Association of Benidorm and Costa Blanca (HOSBEC), Google, Airbnb, and platforms providing reservation, cancellation, and vacation rental occupancy and pricing data (e.g., Booking.com). In addition, Visit Benidorm utilizes datasets produced by the Spanish National Statistics Institute (INE) and processed by HOSBEC, which are not publicly displayed on their platforms but are used internally to support decision-making. The characteristics of the different datasets acquired by Visit Benidorm are summarized in Tables 1 and 2.

Table 1
DATA REQUIRED FOR VISIT BENIDORM

Type	Raw	Source	Provider	Access	Priority
Tourist location	No	Public Wifi	Wiongo	Platform	7
Flight capacity	No	Airlines	Different airlines	Platform	10
Flight and hotel search price	No	Search engines	Google	Online	10
Tourist behavior	No	Social networks	Twitter Instagram Tripadvisor	Platform	10
Hotel capacity	No	Hotels	HOSBEC	Online	10
Vacation rental occupancy and price	No	OTA	Airbnb, Vrbo, Tripadvisor, Booking	Platform	10
Search trends	No	Search engines	Google	Online	9
Reservations and cancelations	No	Travel Market Companies	Travelgate Mirai	Platform	9
Social media and influencers	No	Social media	Optimiza Data	Platform	9
Statistics	Yes	INE	HOSBEC	Online	10

Table 2
DATA REQUIRED FOR VISIT BENIDORM

Type	Analytical platform	Metadata	License	Shared
Tourist location	Cisco DNA Spaces	No	Proprietary	External
Flight capacity	Mabrian	No	Proprietary	External
Flight and hotel search price	Mabrian	No	Proprietary	External

Type	Analytical platform	Metadata	License	Shared
Tourist behavior	Mabrian	No	Proprietary	External
Hotel capacity	HOSBEC	No	Open	External
Vacation rental occupancy and price	Mabrian	No	Proprietary	External
Search trends	Google Trends	No	Proprietary	External
Reservations and cancelations	Travelgate Free Covid Space and Mirai	No	Proprietary	External
Social media and influencers	Internal Platform	No	Proprietary	Internal
Statistics	HOSBEC	Yes	Open	External

4. DATA-DRIVEN DMOS: BARRIERS AND OPPORTUNITIES FOR DATA SPACES IN STDS

Once data consumed by Visit Benidorm is determined, a set of interviews has been conducted in order to perform a SWOT analysis that allows us to determine barriers and opportunities as a data-driven DMO regarding the consumption of data, as well as data sharing mechanisms in order to discuss the feasibility of data space initiatives for DMOs. This section describes this process inspired by methodology in (Janssen, Charalabidis and Zuiderwijk, 2012).

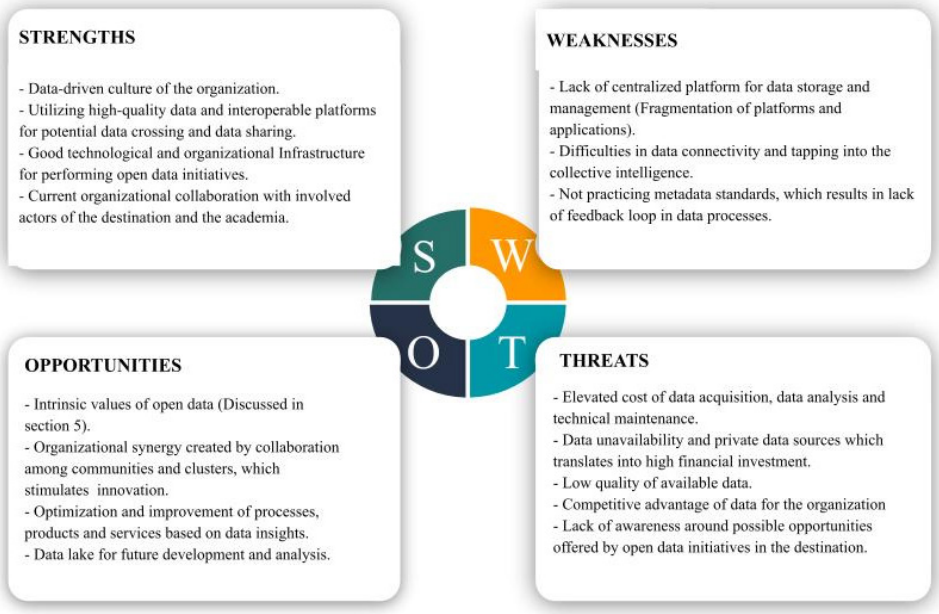
4.1. SWOT analysis

A SWOT analysis has been conducted to identify weaknesses, threats, strengths and opportunities for Visit Benidorm concerning data-driven initiatives (as shown in Figure 2). Current decision-making process in Visit Benidorm is based data from different sources. The DMO invests in acquiring high-quality structured data. Furthermore, Visit Benidorm knows which datasets are required and which platforms to use for getting insights. Platforms are interoperable and thus, provide a suitable infrastructure for future digital developments. Ultimately, it is also important to note that publishing reports to inform destination collaborators and cultivating close relationships with academics also assists in disseminating and sharing data with actual and potential entities who might be interested in the destination's data.

However, due to the current scale of the DMO, establishing an independent data management department is still not feasible. In addition, the lack of a centralized platform for storing and managing data impedes the organization from performing cross-domain data management, thus making data policies more difficult to implement. Additionally, it hampers the integration of heterogeneous data sources. Also, the DMO does not follow a particular metadata standard which limits data traceability and usage. Data sharing is performed only partially among internal departments and the organization's distribution list and without a feedback loop to assess the impacts of data in each department or organization. On the other hand, companies are unwilling to reveal which data is using.

Regarding external aspects influencing the data process in Visit Benidorm, some opportunities have been identified. First and foremost opportunity for the organization lies in open data, as well as in the synergies created by the collaboration among clusters in the Valencian region and Costa Blanca through data sharing, which can act as a counterbalance for the high cost or the availability of data. Each entity acquires a certain type of data and shares it with other collaborators to encourage value creation and generate a more holistic view of the destination on a regional, national or international level. Some organizations such as travel agencies share interesting data about the actual situation of the destination (e.g., British market sale or its evolution) in an informal, unstructured manner, which also provides valuable insights for Visit Benidorm. Such data is essential for implementing services which are exactly in accordance with the actual needs of the destination.

Figure 1
SWOT ANALYSIS OF DATA IN VISIT BENIDORM



On the other hand, some concerns have also been identified while analyzing the external factors affecting open data in Visit Benidorm, among which the issues related to elevated cost of data acquisition and data availability are noteworthy. Data in Visit Benidorm enters the data flow mainly from private sources, as normally the open datasets facilitated by public authorities do not equip Visit Benidorm fully with decision-making capacity. This is due to the fact that often these open datasets are not immediately usable, rather they need a quality assessment process. Moreover, there is plenty of data about the city such as bank

transactions data or mobile network operators data, which is of interest for the DMO, but is not provided. In addition, the ability to deliver innovative tourism products and services cannot be optimized if certain data is unavailable. Another important concern is related to the competitive advantage offered by data, resulting in open data being viewed more as a threat to the organization than a fruitful approach. In other words, making data public would not align with the organization's strategy since data can be used and interpreted by competitors.

4.2. Opportunities

Many of the opportunities for Visit Benidorm (see Table 3) come from the availability of open datasets to be consumed as external data. Before the 2020 pandemic, data was mostly being used for segmentation and client profiling in Visit Benidorm. During the pandemic, however, data accessibility became a crucial element in the decision-making process and helped the DMO in adjusting the policies in response to new circumstances and regulations. Visit Benidorm also benefits from some already processed open datasets through reinterpreting them with new indicators and metrics. For instance, data about water consumption in the city is used for calculating the occupancy rate. Other opportunities recognized by the DMO include the improvement of coordination and interaction between different actors in the destination, which also leads to the generation of a holistic, 360° view of the STD. In other words, not only open data but data-sharing among actors can explain the actual situation of the destination by connecting and integrating data from different sectors. Such an opportunity is essential to the DMO since it responds to the challenges caused by the complex nature of tourism data. Moreover, it provides Visit Benidorm with the opportunity to manage its strategic plans based on data-driven facts and develop new tourism products and services in the destination. However, there are plenty of data beyond municipality, and thus, unavailable to the DMO. Finally, DMO believes that open data providers should also consider the sustainability of data along time to be useful for extracting patterns and trends in the destination.

Table 3
VISIT BENIDORM OPPORTUNITIES ON DATA CONSUMING AND SHARING

Category	Opportunities
Political and social	More transparency
	Equal access to data
	Strategic planning and decision-making
Economic	Better management of public resources
	Improvement in segmentation and personalization of services
	Development of new products and services
Operational and technical	Sustainability of data (no data loss)
	Data integration and 360° view of city
	Improvement of coordination and interaction between different actors

4.3. Barriers

Barriers detected by Visit Benidorm for open data consumption and data sharing are shown in Table 4. First, the public-private nature of Visit Benidorm significantly impacts policies of the organization toward open data and data-sharing. As an entity collaborating with the private sector to promote the destination, sharing data among stakeholders can prove challenging, and in some cases even legally impossible. This also brings to light some legal, ethical and governance barriers of consuming data. Moreover, the revenue system in the organization is heavily dependent on income generation and since there are no clear mechanisms to measure the effectiveness of open data and data sharing in the destination. Also, the DMO is resistant to institutional changes which are necessary for dealing with open data and data-sharing. Also, according to Visit Benidorm, there are certain datasets that could be helpful in the managerial processes, but their accessibility to tourists or citizens might be irrelevant, as they can create negative impacts by being misinterpreted. For instance, data about PCR tests realized in the different regions' wastewater for detecting the number of infected people can aid significantly in the improvement of management and healthcare of the city, but simultaneously is a very sensible data and its public access could create fear in residents and visitors. In other words, the organization believes that the access level to data should differ depending on data users, as data interpretation varies widely based on the objectives they follow. Visit Benidorm also faces some technical barriers as a data reuser, which stem from the lack of sufficient human resources for providing technical assistance. In other cases, only processed data, and not the raw data is available, and the current interpretation can appear vague or biased to the organization. Other factors limiting data usage in Visit Benidorm include the absence of a systematic structure for public-private data integration and inadequate guidance for identifying suitable datasets for consuming. Also, the DMO states that combining external data makes the most sense if only all internal data are already integrated in a ready-to-use platform. Reusing open data within an organization is also challenged by the availability of essential data. Transaction data or mobility data, for instance, are of high importance because they can be used to measure the effectiveness of the organization's strategies. However, such data are often inaccessible to the DMO or are extremely expensive. Furthermore, the DMO is not aware of the value of all available and potential useful data (even worse, DMO may not be aware of the existence of some useful data).

Table 4
VISIT BENIDORM BARRIERS ON CONSUMING AND SHARING DATA

Category	Barriers
Institutional	Private nature of organization
	Competitive risk
	Emphasis of barriers from data producer perspective
	Revenue system based on creating income from data

Category	Barriers
Task complexity	Large amount of data
	No technical support from data providers
	Data is already processed and therefore hides other potentialities
	Lack of technical infrastructure for updating and integrating all the necessary data
Use and participation	Probability of data misinterpretation by inadequate user
	Registration required before being able to download original datasets
	Lack of time and personnel to update open data portal
Legislation	Numerous licenses used by different data providers
	Risk of privacy violation
	Security
Information quality	Published data is too generic
	Data is not updated
	Unclear value of data

4.4. Data spaces in smart tourism destinations

The European Data Governance Act[3] is a European Union initiative to promote the use and re-use of data. This directive establishes nine data spaces that relate to different thematic areas and economic sectors where data availability and re-use is expected to increase. A common feature of all these data spaces is that they are constructed in a sectoral way and following a top-down approach. In other words, the problems of the sector are posed and the data space is developed for that specific context. However, according to the opportunities and barriers stated above, this paper proposes to create data spaces for the tourism destination itself including the DMO as a relevant actor. Institutional and legislation barriers detected would be automatically overcome. Also, this kind of data space allows the analysis and exploitation of data (considering reusable formats as well as metadata), in collaboration with the tourism companies in the destination at the same time that data sovereignty is kept. Therefore, a data space in a STD allows DMOs to build trust among all actors (public and private) and to maintain a commitment to data quality. In this way, actors in a STD data space would make intensive and formal use of data of different nature: own data and external data (i.e., public data through the reuse of open data, as well as private data through data sharing between private sector companies). A data space initiative also provides technological support for the development of data-based services within a federated database system that allows DMO to have an easy-to-use platform with the right services to improve decision making process in the STD.

A data space initiative is thus relevant for promoting an adequate data consumption of internal and external data among actors in a STD, allowing DMOs to avoid the barriers detected and taking advantage of the opportunities for addressing STD data challenges through data sharing.

3 https://digital-strategy.ec.europa.eu/en/policies/data-governance-act

5. CONCLUSIONS AND FUTURE WORK

This paper describes data challenges in STDs and states opportunities and barriers of data ecosystems for DMOs. It discusses the feasibility of data spaces initiatives for DMOs as a best practice for sharing data in STDs and addresses these challenges. Specifically, the focus is on Visit Benidorm to analyze the extent to which the implementation of such concepts has been influential in the efficiency of data management for the STD. This paper also intends to contextualize the opportunities and barriers associated with open data and data sharing for a data-driven DMO in a real-world setting. Therefore, this paper examines the practices and challenges faced by DMOs in this regard, in order to gain a comprehensive understanding of the complex data management processes involved in developing and operating data-driven STD. As for future work, a more detailed analysis on the STD data ecosystems in which a DMO operates together with more stakeholders will be considered. Also, an implementation of a pilot data space initiative for a DMO will be developed together with a set of experiments that allow us to prove that a data space ecosystem would contribute to a smarter tourism destination.

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