



## Deliverable D4.4

# MARKET ANALYSIS, EMERGING BUSINESS MODELS AND IMPACT ASSESSMENT



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## DATES: European Data Space for Tourism

Deliverable D4.4 Market analysis, emerging business models and impact assessment

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| Task Leader<br>(Name and Short Org. Name)   | Nuria de Lama, IDC   |
| Main Author<br>(Name and Short Org. Name)   | Nuria de Lama, IDC   |
| Other Authors<br>(Name and Short Org. Name) | Masarra Mohamed (IDC), Massimiliano Claps (IDC), Beatrice Dorenti (Intellera), Enrique Areizaga (Tecnalia), Dolores Ordóñez (ANYSOL), Ludek Kühr (DIHT)  |
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| 6                | AMADEUS SAS  | AMAD       | FR      |
| 7                | INTERNATIONAL DATA SPACES EV   | IDSA       | DE      |
| 8                | ARCTUR RACUNALNISKI INZENIRING DOO                                       | ARCTUR     | SI      |
| 9                | NETWORK OF EUROPEAN REGIONS FOR COMPETITIVE AND SUSTAINABLE TOURISM ASBL | NECS       | BE      |
| 10               | OUTDOORACTIVE AG   | OUTD       | DE      |
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| <b>List of Abbreviations and Acronyms</b> |   |
|---|---|
| <b>AI</b>                                 | Artificial Intelligence                       |
| <b>API</b>                                | Application Programming Interface             |
| <b>B2B</b>                                | Business to Business                          |
| <b>CAPEX</b>                              | Capital Expenditure                           |
| <b>CO2</b>                                | Carbon Dioxide                                |
| <b>CSAT</b>                               | Customer Satisfaction Score                   |
| <b>DMO</b>                                | Destination Management Organization           |
| <b>DSSC</b>                               | Data Space Support Centre                     |
| <b>ESG</b>                                | Environmental, Social and Governance          |
| <b>ETDS</b>                               | European Tourism Data Space                   |
| <b>EU</b>                                 | European Union                                |
| <b>FAIR</b>                               | Findable, Accessible, Interoperable, Reusable |
| <b>GDP</b>                                | Gross domestic product                        |
| <b>GDS</b>                                | Global Distribution System                    |
| <b>HoReCa</b>                             | Hospitality, Restaurant and Catering          |
| <b>HR</b>                                 | Human Resources                               |
| <b>IaaS</b>                               | Infrastructure as a Service                   |
| <b>IFRS</b>                               | International Financial Reporting Standards   |
| <b>IoT</b>                                | Internet of Things                            |
| <b>IPCC</b>                               | Intergovernmental Panel on Climate Change     |
| <b>IT</b>                                 | Information Technologies                      |
| <b>KPI</b>                                | Key Performance Indicator                     |
| <b>ML</b>                                 | Machine Learning                              |
| <b>MS</b>                                 | Microsoft                                     |
| <b>MST</b>                                | Measuring Sustainability of Tourism           |
| <b>NFT</b>                                | Non Fungible Token                            |
| <b>OPEX</b>                               | Operational expenditures                      |
| <b>OTA</b>                                | Online Travel Agency                          |
| <b>PaaS</b>                               | Platform as a Service                         |
| <b>RoI</b>                                | Return on Investment                          |
| <b>SaaS</b>                               | Software as a Service                         |
| <b>SME</b>                                | Small and medium Size Enterprise              |
| <b>UN</b>                                 | United Nations                                |
| <b>UNWTO</b>                              | United Nations World Tourism Organization     |
| <b>WP</b>                                 | Work package                                  |

# 1. EXECUTIVE SUMMARY

The main goals of the report you are about to read (D4.4 Market analysis, emerging business models and impact assessment) are: i) To provide a **market analysis** that help us to **understand the trends in tourism** not only in general terms but accompanied by quantifications based on market intelligence capabilities of IDC and market literature (including the projections of the sector) so that we give a basis for **prioritizing data sets, potential applications, services or products, or actions** to be undertaken in order to benefit from data spaces, ii) To provide guidance with respect to **emerging business models, understanding how to capture value out of the data space as data provider, data consumer or intermediary** in the context of the tourism industry. This includes preliminary reflections on the **sustainability of the data space** as such and iii) To understand potential elements, indicators and framework to be used for **impact assessment**.

In order to achieve those goals, we have structured the document around 5 major chapters: **Tourism market insights and projections, Value proposition of data spaces, Analysis of use cases from a business perspective, business models and impact assessment**.

Our market analysis elaborates on the drivers for the tourism industry, which include: a focus on resiliency and sovereignty of the sector as a result of the consequences of the pandemic, labour shortages combined with an increased demand for personnel, and digital transformation, accelerated by the previous factors. We see that **data is needed to implement most of the strategies, but there is not enough maturity about understanding the transition path towards a data-driven transformation** (this is especially obvious in the case of SMEs). Thus, companies need to understand their own transformation towards data-driven solutions and processes before they can benefit from the use of data spaces. This document provides data on investments on IT undertaken by companies in the tourism sector to contribute to a better understanding of where organizations are in terms of technological readiness and maturity to adopt or migrate to data spaces. The analysis of the sector is followed by a complete approach to the definition of benefits that could be achieved by organizations (as data providers, data consumers, data intermediaries) and a set of **business models, some of them already established in the market but applicable in this context and a number of them emerging as a result of new opportunities derived from the characteristics of data spaces**. Some examples are offered along the text to contextualize opportunities in the tourism ecosystem. One key aspect is that these **business models must provide benefits not only in the short term but in the medium and long term**. The main current problem is that large data holders, on the one hand, are reluctant to share their data or commercialize it since they consider that it has great internal potential (see the comment above), and those who decide to commercialize it do so at a very high price for potential buyers. On the other hand, many potential data consumers, especially SMEs, cannot afford to purchase such data. What's more, in many cases, even if they could afford it, they would not have the capacity to exploit



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them, so they have no incentive to buy them. The result is that this data's buyer is often public administrations or DMOs, who can afford the purchase and have resources for its exploitation. To break this vicious circle, business models must be designed so that they satisfy the requirements and needs of a multiplicity of stakeholders, they ensure fair distribution of value, and they work in the short, medium, and long term. Only under those conditions the ETDS will create critical mass and benefit from network effects that will contribute to create value and thus, ensure its sustainability.

## 2. INTRODUCTION

The Data Space initiative serves as a pivotal instrument for facilitating the tourism ecosystem's shift towards sustainability and digitalization. This imperative is particularly pronounced now, given the substantial setbacks the hospitality industry endured amid the COVID-19 pandemic. Encouragingly, recent data from the European Travel Commission, as of the second quarter of 2023, indicates a significant recovery. Europe has rebounded to approximately 95% of its 2019 international tourist arrival levels, recording 528.9 million arrivals in 2023 compared to 577.0 million in 2019. Moreover, the upward trend is projected to continue, with Intra-European visitors anticipated to surge, reaching a peak of 680.2 million by 2026<sup>1</sup>. This underscores the resilience of the tourism sector and emphasizes the timeliness of initiatives like the Data Space in fortifying its digital and sustainable future.

By integrating legislative, policy, and funding measures across Europe establishing a single data market, the common European data space for tourism seeks to boost data **sharing and reuse** in the sector through the establishment of a fair data governance model. It adheres to existing EU and national data legislation, ensuring that all stakeholders benefit from the increased value generated by expanded data sharing and usage.<sup>2</sup>

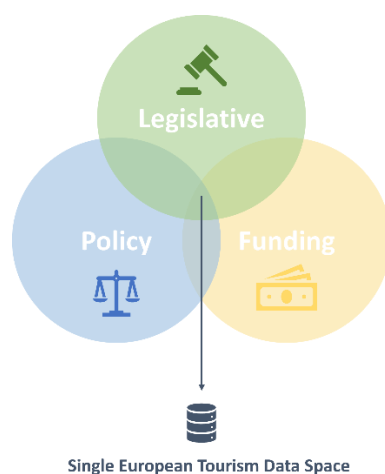


Figure 1 Integration of major elements of the tourism data space

The tourism sector, being dependent on diverse and evolving user experiences, stands to benefit from a data space that fosters innovation. However, challenges, such as reluctance to share data without reciprocity guarantees, administrative burdens, and varying levels of data readiness among stakeholders, exist. It's worth noting that small and medium-sized enterprises (SMEs) play a dominant role in the tourism industry, constituting approximately 99.9% of all enterprises. Among these SMEs, a substantial 91% fall into the category of micro-enterprises. These micro enterprises lack the capability to store, share or analyse data.<sup>3</sup> Hence the business models should be adaptable to the different sizes of stakeholders. This document builds precisely on the market and business elements that should be considered when deploying and operating the European Tourism Data Space or any of the emerging data spaces in the tourism sector.

## 2.1 Objectives and target audience

Main goals of D4.4 Market analysis, emerging business models and impact assessment include:

- To provide a **market analysis** that help us to **understand the trends in tourism** not only in general terms but accompanied by quantifications based on market intelligence capabilities of IDC and market literature (including the projections of the sector) so that we give a basis for **prioritizing data sets, potential applications, services or products, or actions** to be undertaken in order to benefit from data spaces.
- To provide guidance with respect to **emerging business models, understanding how to capture value out of the data space as data provider, data consumer or intermediary** in the context of the tourism industry. This includes preliminary reflections on the **sustainability of the data space** as such.
- To understand potential elements, indicators and framework to be used for **impact assessment**.

As such, it provides a very complementary angle of the data space that is seldom tackled, that of business and sustainability. Most discussions so far have focused on the technical aspects of the data space such as interoperability within and with other data spaces, data sovereignty, data privacy, but value should exist and also be clearly perceived by the different stakeholders involved in the data space for them to be engaged.

The **target audience** for this document encompasses data providers, data consumers and intermediaries (service providers) independently on their relationship to data spaces; while those contributing to the design of the concept and already engaged in the data spaces community may understand all these contents better and would be able to complement and enrich our reflections and statements, those that are less savvy on this topic may find the document very interesting to compare the concept of data spaces vis-à-vis other data sharing mechanisms such as data platforms or data marketplaces. The document provides many examples and instantiation for the tourism industry but could be of interest to players working in other domains and still wanting to understand the way data spaces could drive value for European organizations and hence, contribute to the development of the data economy.

## 2.2 Structure and contents of the document

This document is structured around 5 major content pillars:

- **Tourism market insights and projections:** this chapter provides insights and trends of the tourism industry. While some trends and challenges were pointed out in the D4.1 Roles and Dynamics of the Tourism industry in the EU, here we dive deeper into market projections, providing quantifications on different market indicators, including investments in technologies for digital transformation. Readers will find a i) market analysis, ii) an example of how collaboration between

- stakeholders in the ecosystem is driving many investments and will probably be a critical element for the adoption of data spaces, and iii) insights on how companies are embracing technologies like cloud computing, migration to the edge and Artificial Intelligence.
- **Value proposition of data spaces:** even though we do not customize this section for the tourism industry, we provide a very advanced analysis of the value proposition for data providers, data consumers and data intermediaries, which are major roles in a data space (the same organization could play more than one role depending on the use case). We start by exposing some of the agreed benefits of data spaces, as discussed with the data spaces community (work undertaken by DSSC with sectorial data spaces and other initiatives); then, we jump into a more detailed assessment that will probably please readers even though some statements could be argued. This includes the careful consideration of i) the quantification and metrics of the Data Space Value Proposition, ii) benefits of moving to a Data Space from a Data Lake, iii) OPEX Reduction for a Data Provider as member of a Data Space, iv) OPEX Reduction for a Data Consumer as member of a Data Space, v) Data Provider Revenue Growth from participating in a Data Space, vi) Data Consumer Revenue Growth from participating in a Data Space, and vii) Key factors to move to a Data Space Ecosystem.
- **Analysis of use cases businesswise:** insights from the market research and the analytical work on benefits and value proposition of data spaces *in general* come together in this chapter that exemplifies the value that could be enabled by a data space in the tourism sector, building on top of major challenges and opportunities for tourism stakeholders. The basis for this work is the analysis of a myriad of use cases carried out in D2.3 Identification of data typology and priority list of datasets, potential use cases and common building blocks with other data spaces. Here we focus on the analysis of value and business aspects in 8 use cases.
- **Business models**, including well established and emerging ones for the different roles that organizations could play in data spaces. Inspired by the success story of a well known and successful data ecosystem in the tourism domain, we go through a sample of business models -including those for data monetization-, from the perspectives of data providers and intermediaries and reflecting on some revenue models for the sustainability of the data spaces as such (beyond the data space participants). A range of examples have been added for better understanding.
- **Impact assessment:** while we are not yet able to run a quantitative assessment of the European Tourism Data Space or any of the data spaces emerging in the tourism sector due to the lack of sound data, we anticipate a potential framework for such endeavour, containing indicators and attributes that could inspire an assessment model as soon as some data spaces become operational.

## 2.3 Relationship to other parts of DATES

D4.4 addresses the analysis of the tourism market, business models and impact. As such, it continues the analysis anticipated in D4.1 but goes deeper into the characterization of the value that data spaces could provide for the tourism industry in general and the different roles tourism stakeholders could adopt with respect to the provision and consumption of data and data-related services in particular. This is feasible thanks to the evolution of work around data spaces in the last year through many workshops, surveys, discussions, and interactions with the data space community. Since WP4 envisages non-technical elements of the tourism data space, D4.4 is complemented by D4.2 Governance Framework of the Tourism Data Space, which revolves around regulation, legal and governance aspects of the data space, proposing a model for collaboration, rule setting and compliance, as well as D4.3 Roadmap for the Governance Framework that -opposite to its title- provides a path towards deployment of the tourism data space with accompanying recommendations not only for the deployment of the governance model, but in general for the overall deployment of the data space, since the different angles should not be tackled in isolation.

Readers of this document will find unavoidable connections with other parts of the project. For example, the business approach for the analysis of use cases relies on the 8 selected use cases of D2.3, while many of the concepts associated with the value of data spaces will be familiar to those that have gone through our technical work driven by WP3.

We hope that the combination of the knowledge brought by the different parts and documents of the project provides a more comprehensive picture of the rationale behind the investment in a European Tourism Data Space than we had one year ago and gives hints on how to continue this endeavour.

### **Attention!**

This consortium is glad to receive feedback from readers that help to increase the collective knowledge on data sharing and data spaces for tourism. Enjoy the reading and get in touch with DATES through the different communication channels set up by the project!



## 3. TOURISM MARKET INSIGHTS AND PROJECTIONS

### 3.1 Market analysis

In D4.1 we depicted major trends for the tourism sector that are conveniently extended and revised here to contextualize the extraction of value out of data and thus, data spaces. For this analysis, we build mainly upon market intelligence provided by IDC<sup>1</sup>.

Some of the **drivers of change** nowadays come from: i) the **consequences of COVID-19**: the pandemic disrupted the sector because most companies had to stop their activities as a result of travel bans and confinement. Disruptions in value chains due to political conflicts or natural disasters have added bottlenecks. All this has put the focus on the **resiliency and sovereignty** of tourism companies; ii) **increasing labour shortages coupled with augmented demand**, which has led to **automation** of many processes; iii) while digitization was an ongoing process, some of the elements mentioned above have served as catalyser for an even **more rapid digital transformation** (a good example of this is the deployment of new payment methods to avoid physical money); finally iv) while organizations in this field are into such digital transformation cycle and recognize the relevance of such investments, many companies claim that **infrastructure costs, access to skills and other building blocks are rather expensive** (let's remember that 99% of companies in the tourism sector are SMEs), which creates financial pressure; as a result of this, companies have to **prioritize their investments**, and here is where quantitative indicators play a key role to guide technological projects (limited budgets should show a positive RoI be it on increasing revenue, driving customer lifetime value, reducing labour requirements, etc). **Models that lead to collaboration and cost sharing, as proposed by data spaces, could receive attention in this context.**

In general, digital transformation strategies in the tourism sector -specially in what customers are concerned-are driven by what we call **the “3 C’s”: customization, convenience and conscience.**

- **Customization:** Hyper-personalization of products and services will involve a **constant cycle of data in and insights out.**
- **Convenience:** Removing friction from all guest experiences will require premiere brand interactions that will drive customer lifetime value.
- **Conscience:** both consumers and employees care about organizations that commit to ESG goals and thus, showing real **compliance and progress on sustainability indicators has become a retention mechanism** on both sides.

<sup>1</sup> IDC FutureScape: Worldwide Hospitality, Dining, and Travel 2023 Predictions

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 IDC highlights the **10 major predictions for the tourism sector** (including hospitality, dining and travel, as the title of the following figure suggests), identifying their realization complexity but also their timeframe. Numbers do not indicate prioritization or any other meaning but help us to label the predictions and link them to their descriptions. While all the predictions are described at high level for general awareness, for the purpose of this report **we analyse more in depth those ones that provide interesting insights to understand how data-driven applications could be prioritized or what the impact of data spaces could be** looking at investments that companies are willing to make. It is indeed a tool to align digital transformation paths of organizations in the tourism industry with the deployment and go-to-market strategies of data ecosystems in tourism and more in particular, to understand the potential adoption that such data-sharing solutions could have.

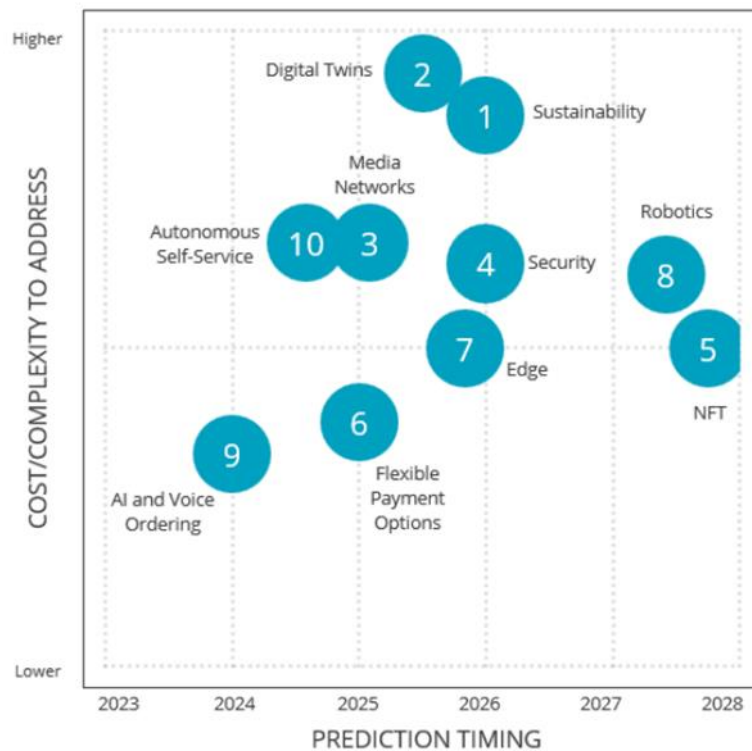


Figure 2 IDC FutureScope: Worldwide Hospitality, Dining and Travel 2023. Top 10 Predictions (IDC 2022)

|   |  |   |  |
|---|--|---|--|
| 1 | By 2026, 40% of enterprise hospitality and travel organizations will apply more than 25% of IT budgets to <b>achieve sustainability-focused goals and KPIs</b> .                               | 6 | In response to guest demand, by 2025, 75% of hospitality and travel organizations will offer multiple <b>payment options including contactless, QR code, or alternative payment</b> , improving CSAT by 15%. |
| 2 | Driven by labour shortages, by 2025, 50% of hospitality and travel organizations will leverage <b>digital twins to increase efficiency and forecast accuracy</b> , increasing bookings by 25%. | 7 | Driven by the need for <b>low-latency and real-time personalization</b> , by 2025, 60% of enterprise hospitality and travel organizations will <b>increase spending in edge computing by 20%</b> .           |
| 3 | By 2025, 75% of enterprise hospitality and travel organizations will <b>launch media networks</b> ,  | 8 | By 2027, 50% of hospitality and travel enterprises will invest in <b>robotics to fulfil orders</b> , reducing  |



|   |  |    |  |
|---|--|----|--|
|   | improving customized offers during browse, book/buy, and rebooking opportunities, increasing revenue by 15%.   |    | errors by 80% and improving service speeds by 30%.   |
| 4 | By 2026, 45% of hospitality and travel organizations will hire or <b>reskill employees for cloud IT security</b> , reducing negative impact of breaches from a cost and time perspective by 25%. | 9  | By 2024, 50% of interactions with hospitality and travel brands will be <b>AI enabled for recognition and automation</b> , lifting profits by 15% and improving customer satisfaction by 30%.  |
| 5 | By 2028, 75% of hospitality and travel organizations will invest 30% of marketing budgets to <b>NFT-backed loyalty programs</b> , leading to a 20% increase in loyalty membership                | 10 | By 2025, 45% of in-person hospitality and travel <b>orders/bookings will be initiated through self-service channels like kiosks or personal mobile devices</b> , reducing labour costs by 10%. |

*Table 1 Details of Top 10 Predictions (IDC 2022)*

These predictions are very insightful because they do not only allow us to recognize which data sets will be more important and in which areas data spaces may have a higher potential impact, but they are also accompanied by the size of the market (in % of companies willing to move forward in that direction) and the quantitative impact of the action. From those ones, we consider particularly interesting the fact that **ESG has become mainstream** (prediction 1), the use of **digital twins to run simulations and be able to formulate more accurate predictions and take better decisions** (prediction 2), the increased **investments on the edge** looking at data processing closer to the user so that **real-time and hyper personalized applications** are feasible (prediction 7) and the **use of AI for process automation**, among other functions (prediction 9). Of course, many others involve great amounts of data and some of them could be particularly important looking at actions that may be developed to ensure the right adoption of data spaces, such as a well-thought capacity program that contributes to the development of the right skills. As anticipated, a deeper look at some of the selected predictions is included below as a reference for the understanding of how important data spaces could be looking at current priorities and thus, how data spaces could fit in the market.

### 3.1.1 Sustainability Goals and KPIs

Environmental, social, and governance (ESG) is a globally adopted framework to achieve a better and more sustainable future for all. The United Nations has adopted 17 Sustainable Development Goals, which address global challenges such as poverty, inequality, climate change, environmental degradation, peace, and justice. **Regulation will soon require disclosure of sustainability-related risks and opportunities as part of new International Financial Reporting Standards (IFRS)**. Some of the relevant aspects of environmental sustainability (on the agenda of tourism stakeholders) include **reduction of carbon footprint, management of energy sources** (and increased use of renewables) and **driving efficiency**. As said before, many customers (especially if they belong to Gen Z) make dining and travel decisions based on sustainability metrics and often are willing to pay more creating new needs and business opportunities; for example, Google Flights shows carbon emission estimates next to each flight to help potential travellers choose flights with less environmental impact. We see reactions on these requirements in the use of cloud capabilities with machine learning/artificial intelligence (ML/AI) models to optimize routes



for deliveries or flights, reducing carbon footprint, and creating more efficient supply chains. In a different segment of the tourism sector, IHG hotels and resorts provide examples on how to use AI and IoT to reduce food waste; in this case, their technology solution based on machine learning allows them to recognize different foods that are being discarded and over time can calculate the financial and environmental cost of waste on a cumulative basis. All in all, most companies declare that their investments in digital solutions are providing good results to achieve sustainability metrics. However, these steps require some considerations that include the **automation of processes (to capture and report data reducing errors, measure progress and identify patterns)** and especially a **higher degree of transparency so that data is shared with appropriate parties in real time, contributing to faster and better decisions**. Definition of metrics and targets is also key to ensure progress. New **requirements on data include accuracy, trust and integrity**, but this is not a straightforward matter and, in many cases, required data is difficult to identify, gather, and validate.

### A deeper look at data challenges for sustainability...the case of CO2 emissions

While 65% of hospitality and travel organizations have sustainability plans in place and have identified necessary data to measure and track sustainability goals, of that number, 39% admit that the data accuracy has not been verified through internal or external audits<sup>2</sup>. In addition, the career towards a more sustainable brand is reflected in numerous announcements of net-zero commitments, but in order to reach net zero, enterprises must look at both direct and indirect sources of pollution-causing emissions. In fact, there is a difference between “net zero” and “carbon neutral”. While carbon neutral looks at scope 1 and 2 emissions (all of them emissions that are owned or controlled by a company) even if scope 3 emissions are encouraged, net zero targets scope 1, 2 and 3 emissions (all of them mandatory), being scope 3 emissions those generated as a consequence of the company activities but occur from sources not owned or controlled by it.



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<sup>2</sup> IDC's Future Enterprise Resiliency and Spending Survey, Wave 12, January 2022; hospitality and travel n = 76

### Identifying the Scopes of Emissions

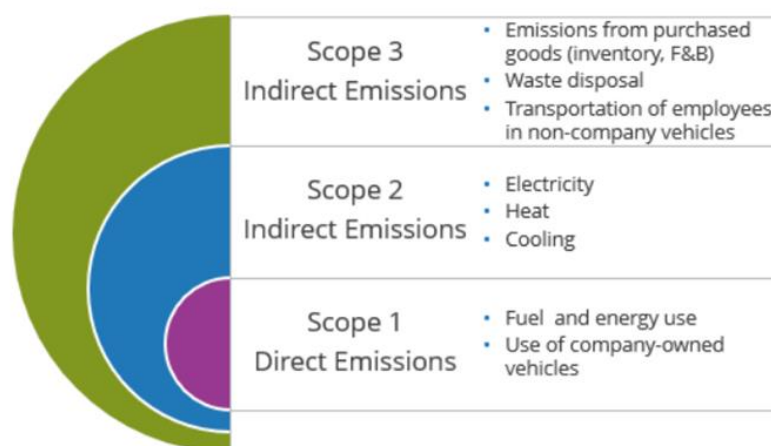


Figure 3 Detail of scope of emissions; IDC, 2023

Let's have a look at some figures that reflect **the situation as of today**. Regarding **collection and reporting of data on CO2 emissions**:

**42% of organizations** (hospitality and travel) say they **are not doing anything** yet, **43% collect scope 1 data** (internal sources of CO2 emission), but **only 28% are regularly reporting that data**; **only 7% collect scope 2 data** (internal and energy supplier sources of emissions), with 7% that collect and report on all scope 1 and 2 emissions data. Why do we get these low numbers? 73% of those organizations that do not collect and report CO2 emissions claim that they do not have **access to enough quality data to assess and report on emissions in an accurate way**. For 18% the problem is not data access but unreliability of data. The result of all this is that we are rather **far from having carbon neutrality but extremely far from the realization of such net zero commitments**.



How important is this? According to the Sustainable Hospitality Alliance, **hotels contribute 1% to global carbon emissions approx**. That means roughly 363 million tonnes (based on the 36.3 billion tonnes of carbon dioxide emitted worldwide in 2021). **The hotel industry would need to reduce its carbon emissions by 66% per room by 2030 and by 90% per room by 2050 to ensure that the growth forecast for the industry does not lead to a corresponding increase in carbon emissions**. This adds to additional measures to help limit warming to 1.5oC and avoid even worst impacts on climate change. Efforts and changes are possible though. We saw a big impact of the pandemic, where global restrictions on travel resulted in a drastic reduction of emissions in 2020, but according to a Global Energy Review 2021 by the International Energy Agency, global CO2 emissions rebounded by nearly 5% in 2021, nearing the peak of 2018/2019. In addition, **the aviation industry produces approximately 2% of human-caused CO2 emissions**, based on the Intergovernmental Panel on Climate Change (IPCC).

**While the focus should be on making high quality and reliable data accessible for emission tracking, other key data points like carbon pricing, cost performance, and the financial impact of sustainability would be of extreme importance for corporates.**

### 3.1.2 Digital Twins to increase accuracy and automation

A digital twin is a virtual model designed to accurately reflect a physical object. For organizations in the tourism industry, digital twins can help hotels, restaurants, airlines, cruise lines, or event venues to collect and analyse vast amounts of data to improve operations and offer better experiences to guests or clients. **Around a third of hotels and restaurants (34%) claim that they are already using digital twin technology for digital/physical convergence, while 45% plan to apply digital twin applications by 2024 for customer experience investments.**

Digital twins are used by event sales to showcase possibilities in venues. Lindner Hotels & Resorts has utilized digital twin technology to add 3D tours to their Google My Business entry (with an impact of 25% more clicks), and airports are using them to predict scenarios based on weather or flight cancellations/rerouting. Other areas of opportunity for digital twins in hospitality and travel include performance of the supply chain, through modelling and simulation of a mix of suppliers and leveraging past performance data and information, or traffic intelligence and queue crowd management, of interest for venues/events and even restaurants and hotels (with 49% of them planning to use computer vision and AI enabled solutions to aid in overall operations but also to enhance guest safety and satisfaction).

Challenges for the deployment of such digital twins do not only include the connectivity aspects associated to the connection of physical assets to the IoT, or the use of AI, augmented reality and computer vision, but also the **access to the necessary internal and external sources of data and the integration of the corresponding APIs**. For an airline environment, to give an example, sources will include terminals, airlines, or ground handlers, to name a few. **Preventing data siloes and promoting standard-based approaches to facilitate integration are key.**

### 3.1.3 Real-time personalization enabled by edge computing

The **need for personalization and the real-time context** are leading companies to **move customer experience applications to the edge**. This requires access to customer data so that interactions can be customized automatically. For example, Taco Bell has implemented a totally digital location in Times Square and American Airlines has established a partnership with MS Azure to provide real-time information to travellers and employees and uses machine learning to help in the process of refunds. Since companies seek for end-to-end experiences for the customer, main applications that are being moved to the edge include augmented self-service including AI-enabled solutions and biometrics (64.6%) and personalized offers with recommendations with the use of AI/machine learning and IoT platforms (58.3%). In this context that is “close to the user”, **edge AI and edge analytics will become of paramount importance**. In addition, with edge investments being driven by data use and access, a **holistic approach to security will be essential**. Many applications will benefit from analytics on the cloud, but many applications will require companies to have undergone a digital transformation path that entails the computing continuum and if they do not have tools or skills not only to collect and manage data, but also to do the

analytics, they will have to partner with IT companies for that purpose. This opens up a range of **potential opportunities for intermediaries in data spaces** that could contribute to the evolution of the tourism industry to scenarios as those depicted by the examples above.

### 3.1.4 Use of AI for recognition and automation

Around half of hotel and restaurant operators (47%) say that they plan to **layer AI into customer experience applications for personalization** by 2024<sup>3</sup>. The top growing area for restaurants and hotels to invest seems to be that of **virtual assistants/chat bots, with 60% of organizations planning to invest in this area by 2024**. Voice AI is not only becoming more affordable, but also more sophisticated and is improving in accuracy and efficiency. Current solutions take orders across different channels, send orders to the kitchen, initiate payments without requiring a server to take any manual steps. Voice AI is also being applied to customer service applications, especially in those cases where customers are not able to contact the business. Some interesting examples come with companies like McDonald's or Wendy's. McDonald's, for example, has invested in voice ordering at drive throughs. Overall, AI tools can recognize guests, interpret a spectrum of accents, recognize frustration, and never miss an upsell opportunity. **Main challenge nowadays is that AI algorithms require access to data which are usually in departmental silos and will require APIs to integrate systems**. When the context becomes more complex, **data from different providers and sources will be needed for which data spaces could play a vital role**.

## 3.2 Collaboration as key driver for data sharing

In the previous section we had a look at the forecasts for the tourism industry with respect to those elements that could be perceived of value in the context of data sharing, realizing that some scenarios require the collaboration between different stakeholders (e.g. measurement and reporting of CO2 emissions at different levels, as illustrated above). This is common practice in most sectors, with supply chains involving myriads of partners. Nevertheless, the exchange of data has become a critical aspect for companies to react to events and drive the efficiency of their processes simply because of the increased dependencies among organizations. While we could think on many different examples of this, we have selected the ecosystem of Air Travel to illustrate how collaboration is shaping the evolution of digital and business transformation.

### 3.2.1 Data in the Air Travel Ecosystem

While partnerships have been common in aviation for a long time (for example, global distribution systems collect data about seat availability, pricing, and other aspects from airlines to provide B2B information and booking intermediation for travel agents; airlines work with their peers to share loyalty programs -in fact, if you are an Iberia customer you do not only get points to travel with Iberia and the airlines that are part of the OneWorld

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<sup>3</sup> IDC's August 2022 Global Retail Operating Models Survey

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Alliance, but you also get access to an ecosystem of vendors and brands that include clothes, car rental companies, communication services, wine suppliers, etc, looking at cross-selling opportunities-; airlines work together for baggage handling, catering, and other operational services and of course, an extended ecosystem of airlines, airports, and transportation security authorities is needed to ensure safe travel), business, policy, and technology factors are coming together for the aviation **ecosystem collaboration to be scaled** across three axes:

- The objects of collaboration (the “what”). Ecosystem collaboration usually includes one or more of the following: **data sharing, applications/services sharing, and operations/expertise sharing.**
- The subjects involved in the collaboration (the “who”). **Ecosystem collaboration extends horizontally among co-opetitors and vertically along the value chain.**
- The strategic outcome of collaboration (the “how”). Ecosystem collaboration is applied to **customer experience and revenue innovation use cases, as well as to operational efficiency, sustainability and safety use cases.**

Technology innovation is one of the drivers of the evolution of the ecosystem. For instance, OTAs have cannibalized part of the GDS business by aggregating data directly from airlines and the hospitality industry; they have taken an even larger part of travel agents' business by empowering consumers to plan and book their own travel through portals and apps. New ground transportation services, such as ride sharing and ride hailing, are offering airlines additional partnership options beyond traditional car rental services. **The increased availability of granular data and insights about customers, the power of machine learning algorithms to support product innovation and operational efficiency, and the emergence of immersive reality capabilities to personalize travel experiences are now driving airlines to rethink their partnerships with GDSs and OTAs.**

By combining data across airports, airlines, and transportation security authorities, they are imagining how some of security checks could happen virtually so that passengers can enjoy shopping and dining at the airport, while a digital queueing application will ping them just in time for boarding. Additional possibilities include segmenting users based on their willingness to pay premium prices, offering personalized discounts and pricing for ancillary services, making predictions on the risk of aircraft failure, and optimizing ground operations for cost saving and fuel efficiency all require **ubiquitous data aggregation from across the air travel ecosystem.** The three examples of collaboration mentioned above are depicted for the areas of customer experience/product innovation and operational efficiency, sustainability and safety in the following table.



|                              | Customer Experience and Product Innovation   | Operational Efficiency, Sustainability, and Safety   |
|------------------------------|--|--|
| Data sharing                 | The aviation industry is promoting open standards such as New Distribution Capability (NDC) and ONE Order, which are XML-based standards coordinated by IATA. These standards aim to increase convenience and transparency for passengers, travel agencies, and intermediaries to complete booking processes and create products without having to interface with multiple technology systems.<br><br>GDSs are scaling data aggregation to be able to match connections across full-service and low-cost carriers regardless of their partnership status, enrich search functionalities with map views, offer end-to-end search that includes hospitality services, and provide insights about sustainable travel. | Biometrics data is being used to combine convenient experiences with security. For instance, airlines, airports, and airport authorities in the Middle East and Asia are extending the use of biometrics beyond security controls to make payments, health checks, lounge access, and priority boarding seamless.  |
| Application/services sharing | Airlines are investing in mobility-as-a-service offerings beyond the airport-to-airport experience. These have become a critical differentiator for customer loyalty services. For instance: <ul style="list-style-type: none"> <li>• KLM set up booking and ticketing agreements with Thalys to make traveling to the airport more convenient and replace short flight routes with train trips.</li> <li>• Alaska Airlines announced a partnership with Lyft, enabling Mileage Plan members to earn miles from journeys taken with the ride-sharing service.</li> </ul>   | Partner airlines are co-developing predictive maintenance machine learning applications that require access to massive amounts of data to train algorithms, based on aircraft failure events and preferably on all global flight conditions, from arctic to desert conditions. By bringing together anonymous data sets about modeled airplane events, the algorithm training can be faster and more accurate. |
| Operations/expertise sharing | To enable dynamic capacity planning, airlines increasingly rely on exchanging data and expertise with airports, air traffic control agencies, weather services, and other entities. Data enables them to predict and respond to potential disruptions in schedules; reduce layovers; make decisions on delaying, re-routing, or cancelling flights; adjust staffing; and monitor flight crew scheduling and hours "in air."  | Examples of integrated traffic control systems include Single European Sky. This EU initiative is expected to cut airlines' carbon emissions by around 10% per year and optimize every aspect, such as identifying more fuel-efficient flight routes and saving millions of gallons of fuel while taxiing on the ground.   |

Table 2 Aviation ecosystem collaboration scenarios (IDC 2023)

### 3.3 How do IT investments look like in the tourism industry?

Previous sections allow us to understand many examples where data in general will be needed and data sharing will become essential. Predictions, as described above, give us insights on market figures and trends, putting the accent on technologies like the edge and the computing continuum, AI, digital twins or robotics; all of them benefiting from and realizing their potential upon a data access layer. We highlighted the fact that digital transformation has been accelerated because of the pandemic, even though the trend had already started in order to answer some of the challenges faced by the sector, but we also pointed out that more detailed RoI analysis will be needed by companies to undertake additional IT investments, with increasing pressure on capitalizing the already high investments of the previous years. This will obviously put **more pressure on those companies with scarce resources, like SMEs and public institutions**. Data Spaces seem well placed in this regard, since the value proposition promises reduction of costs for data sharing and a wide umbrella of benefits. However, emerging data spaces and front runners in this sphere should share convincing examples to act as catalyst for other organizations to join, thus, realizing a critical mass of stakeholders that lead to economies of scale and platform effects.

But, **while cost sharing and “as-a-service” models will be beneficial, it can not be neglected that organizations should provide an underlying IT framework by default**, i.e., a level of **technological readiness that enables them to take advantage of the benefits of the data economy**. It seems difficult to think about data-driven applications for a company that does not collect data in digital form and has not migrated to the cloud. As a result, data spaces should be included as integral part of digital transformation strategies and IT investments (and related organizational changes) of the organization.

While we are not in a position to provide figures on the investments companies in the tourism sector may be willing to make, we can benefit from insights on how companies are investing in some of the key technologies mentioned above, which will act as drivers for the potential adoption of data spaces (e.g. digital twins could be a clear application enabled by data spaces). The figures and graphics added to this section, even if showing a very restricted or partial view of the technological state of play of the sector, give an idea of **how companies are moving to some technologies, timeframes for the investments and deployments, and priorities with respect to migration of applications.**

### 3.3.1 Cloud and edge migration strategies in Tourism

We see increasing investments in different types of cloud as part of an ongoing massive migration to cloud. While in the beginning major drivers for such migration were **customer experience** and **access to information**, priorities now are **cost reduction** and **improved IT security**. According to IDC, Cloud migrations in hospitality and travel stem from the need for rapid innovation from updating outdated systems to leveraging latest innovation and adhering to **compliance regulations**. Current legacy systems are not designed for the rapid innovation cycles needed to remain competitive; hotels are more driven by changing operating models from CapEx to OpEx. In any case, while business continuity, efficiency and innovation seem clear drivers for all the organizations, **strategies differ with respect to preferences about private and public clouds.**

- **Private cloud (colocation centre/on-premises) will be in use by 82% of hospitality and travel organizations by 2023;** 78% increasing expenditure on private cloud compared to 52% in 2021.
- **Increasing expenditure in public cloud (SaaS) with 81% scaling up investment from 76% in 2021.** Public cloud use is growing steadily with **32% of hospitality and travel organizations planning to use SaaS, 40% adding PaaS and 47% planning to implement IaaS by 2023.**

More interesting is the **trend towards industry clouds**, with more than half of hospitality and travel organizations already using this concept and forecasted growth to **91% by 2023.**

- **80% of hospitality and travel organizations participate or plan to do so in Marketplace industry clouds** (buying and selling industry-specific goods, services and data)
- **47% of hospitality and travel brands will focus on Workspace Industry Clouds**, which offer dedicated areas for collaboration with chosen partners and defined cooperation options.

We may derive from this that **initial data sharing ecosystems** (kind-of *embryonic data spaces*) **could be set up among a set of industry players that are already collaborating** (e.g. participants in the same supply chain, stakeholders in the same geographical region) and could emerge as a result of the evolution of such Industry Clouds.

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In fact, companies in the hospitality and travel industries claim that data security is the most important criterion to select a cloud provider and also to select which applications to move to the cloud. The same analogy could be made when selecting a data space based on the findings of DATES so far, since trust (including security, data privacy, and regulatory compliance) has been valued as a key element of the data space governance.

The following diagrams showcase applications that have been moved to the cloud in first place (either migrated in the last 12 months or earlier) and those expected to be moved to the cloud in the next 12 months. Applications in the first group are concerned with real-time data analytics and management; applications to be migrated relate to real-time data and enablement of digital guest experiences.

|  | On Cloud - Purchased within the last 12 months | On Cloud - Purchased more than 12 months ago |
|--|--|--|
| Mobile Key                                 | 26.0   | 20.8   |
| Mobile check-in/out                        | 21.9   | 25.0   |
| Online Ordering                            | 21.9   | 24.0   |
| Order/Driver tracking                      | 32.3   | 15.6   |
| Room/Seat selection                        | 21.9   | 22.9   |
| Location-based/proximity monitoring        | 25.0   | 17.7   |
| Online reservations                        | 26.0   | 24.0   |
| Table management                           | 32.3   | 8.3  |
| Energy management (environmental controls) | 28.1   | 12.5   |
| Television content/streaming               | 22.9   | 20.8   |
| Task management                            | 35.4   | 12.5   |
| Asset Tracking                             | 30.2   | 20.8   |
| QR Code readers                            | 26.0   | 18.8   |
| Local area guides                          | 27.1   | 11.5   |
| Property/Flight information                | 24.0   | 19.8   |
| Voice/Video call                           | 31.3   | 18.8   |
| Guest/Team messaging                       | 29.2   | 16.7   |
| Bookings/appointment management            | 33.3   | 18.8   |
| Virtual concierge                          | 37.5   | 13.5   |
| Interactive menus                          | 34.4   | 20.8   |

**Key: Higher / Lower**

Table 3 Tourism applications migrated to the cloud in the last 12 months or earlier (source: WW- Industry CloudPath Survey, IDC, April, 2022, For this question Hospitality & Travel n=96)



|  | Expect to move to cloud within 12 months |
|--|--|
| Mobile Key                                 | 21.9                                     |
| Mobile check-in/out                        | 19.8                                     |
| Online Ordering                            | 13.5                                     |
| Order/Driver tracking                      | 13.5                                     |
| Room/Seat selection                        | 16.7                                     |
| Location-based/proximity monitoring        | 16.7                                     |
| Online reservations                        | 11.5                                     |
| Table management                           | 15.6                                     |
| Energy management (environmental controls) | 18.8                                     |
| Television content/streaming               | 11.5                                     |
| Task management                            | 26.0                                     |
| Asset Tracking                             | 10.4                                     |
| QR Code readers                            | 15.6                                     |
| Local area guides                          | 19.8                                     |
| Property/Flight information                | 17.7                                     |
| Voice/Video call                           | 13.5                                     |
| Guest/Team messaging                       | 13.5                                     |
| Bookings/appointment management            | 12.5                                     |
| Virtual concierge                          | 15.6                                     |
| Interactive menus                          | 12.5                                     |

**Key: Higher / Lower**

Table 4 Tourism applications to be migrated to the cloud in the next 12 months (source: WW- Industry CloudPath Survey, IDC, April, 2022, For this question Hospitality & Travel n=96)

However, as specified in the predictions, there is an increasing investment on the edge for those cases where latency is key, as it could be the case of hyper-personalized, real-time, connected experiences for guests and travellers. A glimpse on the **strategies of companies in the sector with respect to edge migration** is depicted here:

- 80%+ of organizations are already deploying or planning to deploy at least one workload on the edge
- IoT workloads deployed on the edge doubled in hospitality and travel from 22% in 2021 to 44% in 2022 and 41% plan to deploy IoT at the edge by 2023.
- The greatest growth in edge deployments is for analytics workloads with nearly half of hospitality and travel providers planning the move by 2023.

## DATES: European Data Space for Tourism

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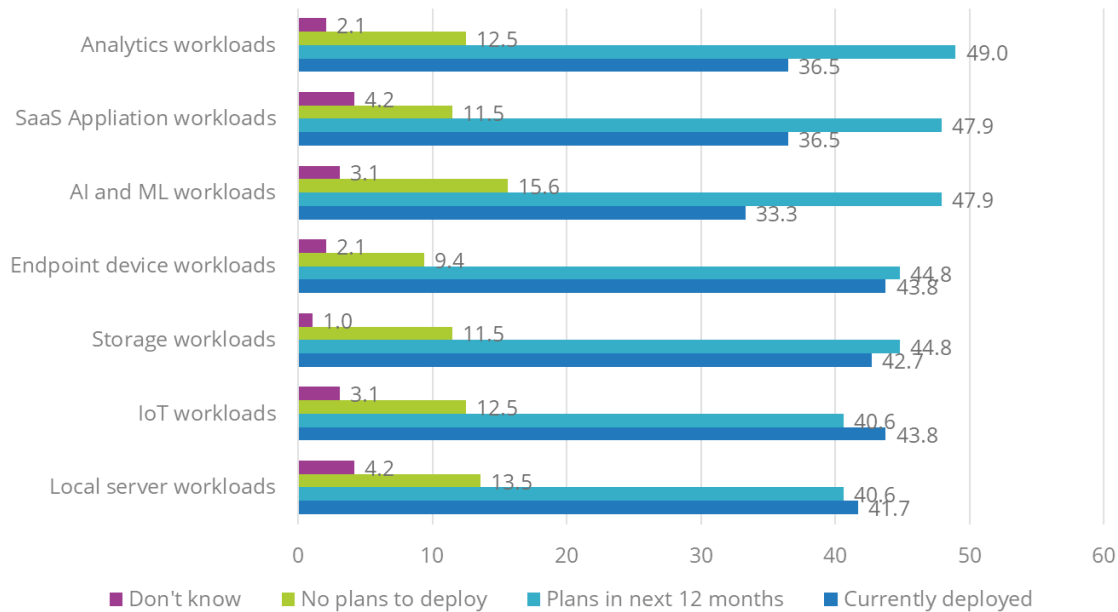


Figure 4 Which of the following workloads are deployed at an edge location? Source: WW- Industry CloudPath Survey, IDC, April, 2022, For this question Hospitality & Travel n=96

### 3.3.2 AI strategies in Tourism

Findings from the IDC Industry AI Path Study (September, 2022), show that hospitality and travel organizations (including restaurants, commercial travel, lodging, and recreation) are investing heavily on AI in order to drive business outcomes. The top drivers include **improving risk management (43%), improving employee productivity (42%), speeding new product development (38%), and improving customer experience (37%)**. The market shows that lodging companies are using AI to increase competitiveness and gain market share (80%), but generally speaking, organizations are looking to identify revenue opportunities and most-profitable sales and booking channels; for example, airlines are using AI to benefit from dynamic pricing and offers. As it was highlighted in previous sections of the document, shortage of skills and personnel is also driving the deployment of solutions to automate processes, support employees and improve customer satisfaction. Here -and we saw in some examples before when AI was introduced as one of the top predictions for Tourism- is where AI becomes truly relevant. The intelligence that augments interactions between a brand -be it self-service or employee-led - and a guest, can drive revenue with upsells, increased loyalty and increased customer lifetime value. Generative AI will be yet another lever for organizations to pull to offer personalized content quickly and without adding strain on an already taxed workforce.

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Figure 5 What are the primary business drivers for using AI for your projects/initiatives? Source: Industry AI Path Survey, IDC, September, 2022, hospitality and travel n = 100

## 4 VALUE PROPOSITION OF THE DATA SPACE

### 4.1 Value Proposition of Data Spaces

#### 4.1.1 General benefits of Data Spaces

The value and potential benefits of data spaces for different stakeholders was discussed first in D4.1 and exemplified through a high number of use cases in the corresponding documents generated by WP2. However, the work carried out in the last 12 months has been very useful to reach a level of **common understanding about data spaces at cross-sectorial level and also within the Tourism industry**. Still a lot of work will be needed to evangelize the community in the deployment phase. DATES has participated -as many other projects- in the numerous discussions led by the DSSC, some of them around the business benefits, for which consensus seems to exist. A summary of main ideas captured in the paper "*Why data spaces? A business and user's perspective*" created by the DSSC Strategic Stakeholder Forum is provided here for reference:

- Which are the **ideas that best define data spaces** with respect to other data-sharing mechanisms?
  - A data space is a distributed (vs centralised) structure.
  - There is a governance framework and participants that commit to that governance framework (vs customers or users of infrastructures like data platforms).
  - It enables data transactions implying trustworthiness of the data transaction, emphasizing qualities of the infrastructure for data sharing such as efficiency, security, control, transparency, quality, scalability, and regulatory compliance. Thus, it enables trust amongst the participants.
  - It also enables data sovereignty or in other words the capability of individuals or organisations to control the data and exercise their rights on the data they have (vs lack of control).
  - Based on the statements above, we could conclude that a data space is not a digital ecosystem; a data space is not a data platform, and a data space is not a data lake.
- **Users that can benefit from data spaces in generic terms include a wide array of organizations:** policy makers that need access to data for critical decision-making; Big Data holders that want to extract value from their data; enterprises that use data for growth and innovation, and desire to leverage data more strategically; businesses in a sector that want to use data to improve their sector-specific processes; service providers that develop services using shared data; researchers that require access to data for excellence in research but also generate data valuable for science, public or private services; research and innovation communities that need access to valuable data for innovation or to train their AI models; citizens that provide unique data to optimise public services, but that can also be curious and

- require access to data (e.g. for citizen-led research). All of them can be better defined or detailed for the case of tourism, as we have depicted in some documents.
- As diverse as the group of users is the **set of potential benefits**, which include, among others: cheaper, faster and easier access to data tools and data services (e.g. for big data holders with big amounts of unstructured data, or access to data services by individuals); cheaper, faster and easier access to data (e.g. researchers, innovators, etc); increase potential for innovation and creation of new solutions (co-created by several participants, new use cases or innovators creating new products and services based on shared data). Solve problems that could not solve before (or they were too difficult or too costly); fair data economy, transparency, fair distribution of value and distributed power; cost savings, improved processes, and faster solutions (“do better what we already do”); new business opportunities (e.g. opening existing products and services to new markets, new customers, etc) and new collaborations to be able to compete in the market with big players; valorisation and monetisation of data and a greater focus on climate and user-friendly solutions.
- An important part of those benefits, as mentioned, relies on **new business opportunities, both direct and indirect ones**. Contributions agreed as part of direct business opportunities include **market growth** (data space users are likely to experience increased market share and growth, thanks to the expanded data-sharing capabilities); **diversification** (the ability to access and share various datasets (open, closed, research, etc.) opens doors to new roles and business opportunities within the market); **new revenue streams** (users can unlock new revenue streams through the creation of innovative products and services, which can include selling valuable datasets, evolving AI services (trained with richer datasets) and developing cross-sectorial services focused on personal data management), **diversified monetization models** including subscriptions, transaction fees, member fees/donations, freemium/premium services, and one-off payments can be applied for revenue generation; **expanded customer base** (access to data spaces often means access to new customer channels and marketplaces, facilitating business growth); **innovative business models** (users can explore innovative business models, including cross-border and collaborative models tailored to specific use cases) and **cost savings** (data space technical infrastructure can lead to cost savings, enhancing overall profitability). Some of them may overlap depending on the use cases.
- **Indirect business opportunities** that add to the previous list expand (again, in some cases they overlap) to **enhanced branding and reputation** (active participation in data spaces can enhance an organisation's branding and reputation as a trusted data-sharing entity); **operational efficiency** (data sharing through data spaces can streamline operations, optimize supply chains, and lead to better decision-making and market/organizational insights, resulting in increased efficiency); **strategic partnerships** (engaging with other data space users and stakeholders can foster valuable strategic partnerships, community-building, and access to public funding and collaborative schemes), **new business avenues**

(knowledge and expertise gained within data spaces can open doors to entirely new business opportunities, as organisations tap into emerging trends and technologies).

Before jumping into a more thorough examination of the value proposition behind data spaces from different perspectives, it is worth paying attention to a reflection by the World Economic Forum<sup>4</sup> that links very well the potential benefits of data spaces with the prerequisites for companies to take advantage of such gains (this elaborates on some of the statements pointed out in our market analysis on the technology readiness of organizations). In this case, the text refers to manufacturing, but it could well be extrapolated to tourism.

**View data as an asset.** The concept of data as an asset is not new. However, advances in the internet of things, analytics and AI have elevated the importance of properly understanding, categorizing and managing data. Seeing its data as a business asset helps a company to place a value on it and take appropriate actions to protect, share or sell it.



As is true when sharing any asset, **before a company shares data, it needs to understand the value it is offering and the value it is receiving in return.** If the value a company receives in exchange for its data does not exceed the value of keeping the data in-house, it will not engage in data sharing. Unfortunately, **establishing the value of data can be especially difficult.** Today, people can trade data in, for example, data marketplaces. Theoretically, by offering a data set in a marketplace, a manufacturer could gain an objective understanding of its value. However, no manufacturer would place its sensitive product and production-related data in a marketplace solely for this purpose. Moreover, it is essential to **consider context when assessing the value of data.** A specific type of data might have value in one application but might not be valuable for another application. For example, although data on machine vibration might not have value alone, this data becomes valuable when applied to reduce breakdowns and improve machine uptime. Thus, to place a value on data, a manufacturer needs to put this data into context and consider how it can be applied. Only then can it calculate a value for each application.

To fully assess the contextual value of data, a manufacturer must **consider the risks that could arise from sharing data in a specific context.** For example, the amount of storage space a company uses in a cloud system might initially seem like irrelevant “exhaust” data that it could share. However, another party in a data-sharing relationship could use this information to gain insight into how the business is performing. So, even sharing exhaust data could be damaging to the business. To meet the challenges of valuation, manufacturers need a structured way to manage their data assets, categorize them with respect to what is and what is not shareable, and carefully assess the value and risks arising from each use. **Without this knowledge, companies will shy away from data sharing**

<sup>4</sup> Share to Gain: Unlocking Data Value in Manufacturing

**and prefer to keep their data, hampering innovation and making it difficult to generate value.**

While aspects of data privacy and compliance with regulation may seem obvious barriers for organizations to share data (especially in the case of tourism where a lot of personal data may be involved), the **dimensions associated with understanding the value of data sets, competitiveness and risks when sharing data is a crucial element to foster data sharing**, especially in the case of private actors (public sector usually promotes open data models).

#### **4.1.2 Quantification and metrics of the Data Space Value Proposition**

One of the statements repeated in the market analysis is that investments should be accompanied by sound RoI indicators and KPIs so that companies are in a position to quantify the value proposition. While no concrete figures can be shared at this stage based on the embryonic data spaces, we make an attempt to translate the value proposition for data spaces based on many of the benefits listed above into a set of key metrics that could be quantified to demonstrate the tangible benefits and advantages offered to the data space users.

##### **Cost Savings:**

- **Reduction in Data Storage Costs:** Measure the decrease in data storage expenses as Data Spaces allow for efficient organization, compression, and elimination of redundant data.
- **Lower Infrastructure Costs:** Quantify the savings from not needing to invest in as much hardware or cloud resources due to optimized data management.

##### **Efficiency:**

- **Time Savings in Data Access:** Measure the time users save in locating and accessing relevant data due to improved organization and search capabilities of data spaces.
- **Increased Productivity:** Quantify the boost in productivity as teams spend less time on data preparation and more time on analysis and decision-making.

##### **Data Quality and Accuracy:**

- **Error Reduction:** Quantify the decrease in data errors or inaccuracies due to improved data governance, validation, and maintenance within Data Spaces.
- **Enhanced Decision-Making:** Measure the impact of improved data quality on making more accurate and informed business decisions.

##### **Collaboration:**

- **Collaboration Efficiency:** Quantify the reduction in time and effort required for collaborative data projects due to streamlined sharing, version control, and commenting features.
- **Cross-Team Synergy:** Measure the increase in cross-functional collaboration as teams can easily access and utilize each other's data assets.

##### **Data Monetization:**

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- Revenue Generation: If applicable, quantify the direct revenue generated from sharing or selling high-quality data assets within Data Spaces to external parties.

### **Security and Compliance:**

- Data Breach Avoidance: Estimate the potential cost savings from preventing data breaches or unauthorized access to sensitive data through enhanced security features.
- Regulatory Compliance: Measure the reduction in compliance-related fines or legal risks by adhering to data governance and protection standards within Data Spaces.

### **Innovation and Insights:**

- Faster Insights: Quantify the speed at which insights are generated from data, leading to quicker identification of trends and opportunities.
- Innovation Rate: Measure the increase in innovative projects and solutions as teams have easier access to diverse datasets for experimentation and analysis.

### **Scalability:**

- Scalability Gains: Quantify the ease of scaling up data operations without significant increases in complexity, allowing for business growth without major setbacks.

### **Risk Mitigation:**

- Risk Reduction: Measure the decrease in business risks associated with data loss, downtime, or inadequate data governance due to the robust features of Data Spaces.

### **User Satisfaction:**

- User Feedback and Engagement: Collect feedback from users about their experience with Data Spaces and quantify improvements in user satisfaction scores.

It's important to note that the specific metrics and their quantification will depend on the nature of the data space, the industry it serves, and the goals of the users. By collecting data on these metrics before and after implementing data spaces, organizations could objectively measure the value proposition data spaces bring to their organizations.

We think this exercise is key as part of the deployment phase of the Tourism data space. Again, it is worth noticing that some of the statements included here are based on assumptions on how the data space could be designed (e.g. we make reference to services that may not be in place depending on the specific data space, while assuming that only metadata will be shared and datasets will stay within the boundaries of data holders, there may be cases where organizations would use data space infrastructure for that as IaaS...).

### **4.1.3 Benefits of moving to a Data Space from a Data Lake**

Moving from a data lake to a data space can offer several advantages, particularly if organizations are looking to improve data management, accessibility, collaboration, and overall data-driven decision-making. Here are some reasons why organizations might consider making this transition:

#### **Data Organization and Management:**



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- **Structured Data:** While data lakes are known for handling both structured and unstructured data, data spaces often provide more structured data management, making it easier to organize and categorize data for different use cases.
- **Metadata Management:** data spaces typically include robust metadata management capabilities, making it easier to understand the context, lineage, and quality of the data.

### **Data Accessibility:**

- **User-Friendly Interface:** data spaces often offer user-friendly interfaces that allow business users to easily discover and access the data they need, reducing the dependency on data specialists.
- **Simplified Querying:** data spaces might provide more intuitive querying and search functionalities, enabling users to retrieve relevant information quickly without deep technical knowledge.

### **Collaboration and Sharing:**

- **Collaborative Workflows:** Data Spaces can facilitate collaboration by allowing teams to share, comment on, and collaborate on datasets and analyses, leading to more efficient cross-functional work.
- **Controlled Access:** data spaces typically offer granular access control mechanisms, ensuring that sensitive data is only accessible to authorized individuals or groups.

### **Data Quality and Governance:**

- **Data Quality:** data spaces often incorporate data quality management features that help ensure the accuracy and consistency of data, leading to more reliable insights and decisions.
- **Data Governance:** data spaces can enforce data governance policies, ensuring compliance with regulations and internal data management standards.

### **Faster Insights and Innovation:**

- **Reduced Data Prep Time:** data spaces can reduce the time spent on data preparation, allowing data analysts and scientists to spend more time on actual analysis and deriving insights.
- **Experimentation:** data spaces can support a more agile approach to data analysis and experimentation, enabling quicker testing of hypotheses and iterative improvements.

### **Scalability and Performance:**

- **Efficient Resource Utilization:** data spaces might optimize resource utilization, allowing for better scaling and allocation of computing resources based on demand.
- **Performance Enhancement:** data spaces might provide optimizations that lead to faster query performance, improving the speed at which insights can be generated.

### **Data Monetization and Value Creation:**

- **Data Sharing:** data spaces can facilitate controlled data sharing with partners, customers, or other stakeholders, potentially creating new revenue streams or business opportunities.
- **External Collaboration:** data spaces can support collaborative projects with external parties while maintaining data security and control.

### Migration to Cloud-Native Architectures:

- Cloud Integration: data spaces might be designed with cloud-native architectures, making it easier to integrate with cloud-based services and take advantage of cloud benefits.

However, it's important to note that the decision to move from a data lake to a data space should be based on a thorough assessment of the organization's specific needs, existing infrastructure, and long-term goals. Consider factors such as implementation complexity, data migration challenges, training needs, and potential vendor lock-in when evaluating this transition.

Note: It's also important to consider that while OPEX reduction is a potential outcome, there might be upfront costs associated with transitioning to a data space, such as migration, training, and integration expenses.



#### 4.1.4 OPEX Reduction for a Data Provider as member of a Data Space

The benefits that can contribute to OPEX reductions can vary depending on the specific data space, the nature of the data being provided and the operational practices of the Data Provider. However, most will be derived from improved data management practices, streamlined processes, and optimized resource utilization.

##### Data Management Efficiency:

- Reduced Data Redundancy: In a data space, data duplication and redundancy can be minimized through standardized data sharing and storage practices. This leads to reduced storage costs and less effort spent managing multiple copies of the same data.

##### Resource Optimization:

- Infrastructure Cost Savings: Instead of maintaining extensive on-premises infrastructure, Data Providers might be able to leverage the shared infrastructure of the data space, reducing the need for heavy upfront investments in hardware and maintenance.
- Cloud Efficiency: If the data space operates in the cloud, Data Providers can benefit from scalable cloud resources, paying only for what they use, and avoiding overprovisioning.

##### Data Processing and Analysis:

- Faster Insights: Collaborative data environments often enable faster data processing and analysis due to optimized resource allocation and the ability to leverage the collective computing power of the data space.

##### Data Governance and Compliance:

- Reduced Compliance Costs: data spaces often offer built-in data governance and compliance features, helping Data Providers adhere to regulations without the need to invest heavily in separate compliance solutions.

##### Data Integration:

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- Lower Integration Costs: data spaces can provide standardized APIs, formats, and protocols for data integration, reducing the time and cost associated with data mapping and transformation.

### **Collaboration Efficiency:**

- Streamlined Communication: The collaborative nature of data spaces facilitates efficient communication among data providers, consumers, and partners, reducing the time and effort spent on coordinating data-related activities.

### **Risk Mitigation:**

- Data Security and Privacy: data spaces often offer robust security measures and data protection features, reducing the risk of data breaches, which could result in costly legal and operational consequences.

### **Data Quality Improvement:**

- Enhanced Data Quality: By participating in a data space, Data Providers can benefit from data validation and feedback from other participants, leading to improvements in data accuracy and quality.

### **Operational Agility:**

- Adaptability: data spaces enable quicker response to market changes and emerging opportunities, as participants can access and analyse data more efficiently.

## **4.1.5 OPEX Reduction for a Data Consumer as member of a Data Space**

### **Efficient Data Access:**

- Reduced Data Search Time: data spaces often offer advanced search and discovery functionalities, enabling Data Consumers to quickly find and access the data they need without spending excessive time searching through disparate sources.

### **Data Integration and Transformation:**

- Simplified Integration: data spaces can provide standardized data formats and APIs, making it easier to integrate data into existing systems and processes. This reduces the time and cost associated with data transformation efforts.

### **Data Quality Improvement:**

- Better Data Quality: data spaces might offer data validation and quality assurance mechanisms, reducing the likelihood of using inaccurate or unreliable data, which could lead to costly errors.

### **Collaboration and Insights:**

- Collaborative Analysis: data consumers can collaborate with other participants to gain insights from shared datasets, reducing the need for redundant analysis efforts and potentially leading to cost savings.

### **Faster Decision-Making:**

- Quick Insights: data spaces enable faster access to data and analytics, which can speed up the decision-making process and lead to more efficient resource allocation.

### **Resource Optimization:**

- Cloud-Based Efficiency: If the data space operates in the cloud, data consumers can benefit from scalable cloud resources, paying only for what they use and avoiding overprovisioning.

### Risk Mitigation:

- Data Security and Privacy: data spaces often implement robust security measures and data protection features, reducing the risk of data breaches or unauthorized access that could result in operational and financial challenges.

### Operational Agility:

- Adaptability: data spaces enable quick response to changing market conditions, emerging trends, or unexpected opportunities, helping Data Consumers stay agile and competitive.

### Reduced Data Redundancy:

- Minimized Duplication: Shared access to metadata data in a data space can help avoid duplications and the associated costs of storing and managing redundant datasets. While metadata may be exposed through several data spaces thanks to the interoperability between them, data sets as such would be stored once and no need to move them around different platforms.

### Cost-Effective Analysis:

- Shared Resources: Collaboration within data spaces can enable access to shared computing resources, reducing the need for data consumers to invest heavily in their own infrastructure.

### Learning and Skill Development:

- Upskilling: Interacting with diverse datasets and analytical approaches within a data space can lead to learning opportunities for data consumers, enhancing their skills and reducing the need for extensive external training.

## 4.1.6 Data Provider Revenue Growth from participating in a Data Space

### Data Monetization:

- Data Licensing: Data providers can offer access to their datasets to other participants within the data space in exchange for licensing fees. This can be a direct revenue source.
- Subscription Models: Implement subscription-based access to your data, allowing regular revenue generation from subscribers who need continuous access to your datasets. *Some additional business models are depicted in section 5 of this document.*

### New Market Opportunities:

- Access to New Customers: By making your data available in a data space, you might gain exposure to a broader customer base, including potential clients or partners you might not have reached otherwise.

### Data-as-a-Service (DaaS):

- Offer Data Services: Beyond just providing the raw data, Data Providers could work with data intermediaries (this would depend on the particular case and offering, but

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separation between data providers and data intermediaries should happen as a result of the Data Governance Act) to offer value-added data services such as analytics, insights, or customized reports for a fee.

### **Cross-Selling and Upselling:**

- Upsell Premium Data: Data providers can offer premium or specialized datasets with enhanced features or exclusivity, allowing for higher pricing and potential upselling opportunities.

### **Innovative Collaborations:**

- Joint Ventures: Collaborate with other data providers to create innovative datasets or analytics solutions that can be sold to a broader audience, creating new revenue streams.

### **Market Intelligence:**

- Market Research: Data consumers might be interested in purchasing your data for market research purposes, providing insights into trends and customer behaviours.

### **API Usage:**

- API Access Fees: If your data can be accessed programmatically through APIs, you can charge API usage fees to developers and businesses that integrate your data into their applications.

### **Data Enrichment:**

- Data Enhancement: By contributing to a data space, your data might be enriched with additional attributes from other data sources, increasing its value and potentially justifying higher pricing.

### **Partnerships and Alliances:**

- Strategic Partnerships: Forge strategic alliances with other data providers or companies within the data space to jointly offer comprehensive solutions that can attract higher-paying clients.

### **Subscription Models:**

- Recurring Revenue: Subscription-based models can provide a predictable stream of recurring revenue as customers pay for continuous access to your data.

### **Marketplaces and Ecosystems:**

- Participate in Ecosystems: data spaces often foster an ecosystem of data-related services and products. By participating, you can engage in cross-selling and upselling within this ecosystem.

## **4.1.7 Data Consumer Revenue Growth from participating in a Data Space**

Participating as a Data Consumer in a data space can lead to revenue growth by enabling you to access valuable data, insights, and resources that can drive better decision-making and business outcomes. Some of the benefits have already been introduced at the beginning of chapter 4, but here we dive into some of them from the perspective of the consumer of data.

### **Improved Decision-Making:**

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- Data-Driven Insights: Access to diverse and high-quality data within a data space can lead to more informed decision-making, helping you identify trends, opportunities, and risks that could lead to revenue growth.

### **Innovation and Product Development:**

- New Product Ideas: Data from a data space might spark innovative ideas for new products or services, leading to revenue growth through diversification and expansion.

### **Cost Savings:**

- Efficiency Improvements: Data-driven insights from a data space can lead to process optimizations, cost reductions, and resource efficiencies that contribute to higher profitability.

### **Market Intelligence:**

- Competitive Advantage: Access to real-time market data and competitor insights from a data space can help you develop strategies that give you a competitive edge, leading to revenue growth.

### **Customer Understanding:**

- Enhanced Customer Experience: Better understanding customer preferences and behaviours through data can lead to improved customer satisfaction and higher customer retention rates.

### **Strategic Partnerships:**

- Partner Collaboration: data space often encourage collaboration among participants. Partnering with other Data Consumers or Providers within the data space can lead to joint ventures, co-created solutions, and shared revenue opportunities.

### **Predictive Analytics:**

- Forecasting and Planning: By leveraging predictive analytics based on data from a data space, you can make more accurate revenue forecasts and strategic plans.

### **Data Monetization:**

- Value-Added Insights: If you offer services to clients, the insights derived from data in the data space could enhance the value you provide, potentially leading to increased customer retention and new revenue streams.

### **Risk Management:**

- Reduced Risks: Better data insights from a data space can lead to improved risk management, helping you avoid potential losses and disruptions.

### **Personalization and Marketing:**

- Targeted Marketing: Data from a data space can enable more personalized marketing campaigns that resonate with customers, leading to higher conversion rates and revenue growth.

### **Customer Acquisition:**

- New Market Entry: Access to data from a different market or industry within the data space can help you identify new customer segments for expansion.

### **Operational Efficiency:**

- Resource Optimization: Insights from a data space can lead to streamlined operations, optimized resource allocation, and cost savings that contribute to revenue growth.

#### **4.1.8 Key factors to move to a Data Space Ecosystem**

From the **data providers' point of view**, participation in the data spaces may not always be fully justified from the point of view of reducing operating costs (OPEX). Though there are important benefits like the potential optimization of resources with savings in infrastructure, paying only for the resources used, reduced costs of adhering to different regulations thanks to data governance models, lower integration costs, reduced risks and agility to adapt to market changes, it is equally important to bear in mind that the costs associated with adapting to the requirements for participation in data spaces, as well as the training of IT staff to be able to adapt to the requirements, have an impact on the decision-making process in the strategy of data providers.

However, the revenue benefits that data providers can gain through participation in the data spaces would justify their participation. In addition to traditional revenues through subscriptions and data licensing, new market opportunities are opened through access to a larger number of potential consumers, including other services, such as data services. Moreover, this initiative holds the potential to enhance the quality of data, allowing the data provider to go for premium pricing. Additionally, strategic partnerships can be established to tailor bespoke offerings that cater to highly specific demands. Consequently, the potential for consistent revenue generation lies in subscription-based income, providing a bedrock for business sustenance, while concurrently augmenting benefits through innovative value-added services. Adherence to and full compliance with regulations at different levels can be a great benefit, as well as services around data that could greatly help both data providers and consumers.

For **data consumers** specifically, the rationale behind participating in data spaces can vary significantly. From an operational expenditure (OPEX) perspective, engaging in data spaces can result in notable reductions in the time required to locate and access requisite data, as well as in the complexity of data transformation processes. This participation promises improved data quality, bolstering their agility and competitive edge. Furthermore, the shared computing resources within these spaces offer a means to enhance their skill sets through interactions with fellow participants. The resulting efficiency enhancements hold the potential for process optimization, expense mitigation, and resource efficiencies, collectively contributing to heightened profitability.

In terms of revenue growth, data consumers can also realize considerable advantages. Gaining access to high-quality data aids in the identification of novel products or services, and a deeper understanding of customer preferences can lead to enhanced customer retention rates. Collaborating with other data consumers can yield co-created offerings, while personalized marketing campaigns can drive elevated conversion rates. Additionally, the ability to acquire new customers is heightened by leveraging data-driven insights and informed strategies.

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In summary, the **approach to align with data spaces varies based on the participant's role**. Data providers are often attracted by the potential for revenue growth, whereas data consumers tend to exhibit a greater interest in the reduction of operational expenditure (OPEX) costs and the ability of creating new products and services.

The exercise we have done here to highlight major benefits and elaborate on the rationale for data providers and consumers to migrate to a data space ecosystem should be part of the strategic discussions of organizations on how to best take advantage of the data economy, starting with gathering good knowledge of their data sets (benefits and value of sharing, associated risks) in the case of data providers and understanding the path towards a data-driven transformation in the case of both data providers and data consumers.





## 5 BUSINESS APPROACH FOR USE CASE ANALYSIS

While previous sections reflect about the general value of data spaces, use cases in WP2 have undergone through a deep discussion and validation process on how data spaces could specifically facilitate operations and processes that would not be feasible without the characteristics of data spaces in the tourism domain. Therefore, section 5 allows us to represent the value of data spaces specifically for stakeholders in the tourism industry, going from the general analysis of section 4 to the specificities of the use cases evaluated and discussed with experts that assign an understandable value to the usage of data.

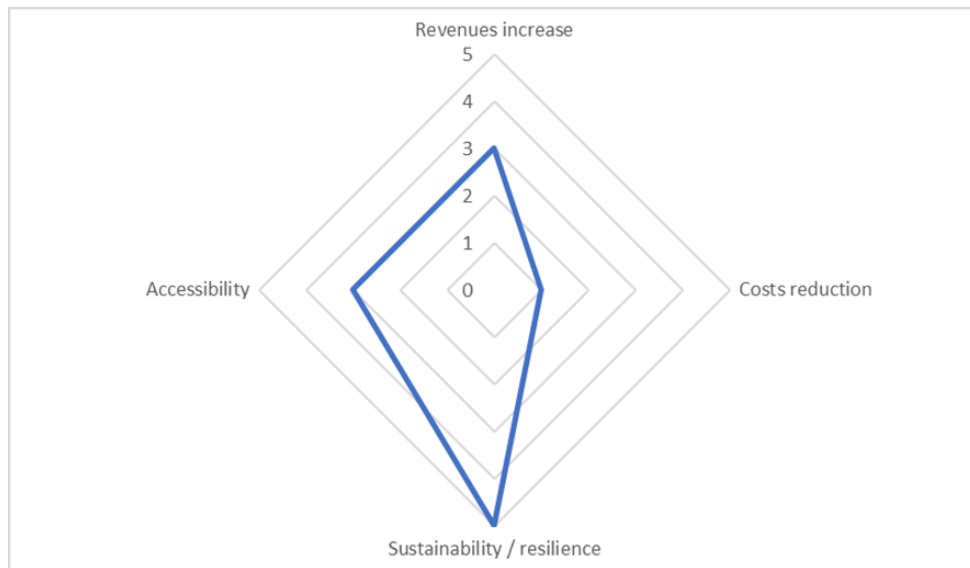
So, for the sake of this document we have considered the value generated by the data space as the benefits that it can bring to the tourism players, to the tourists, the local residents, and the environment. In particular, the study team focused on the following categories of benefits:

- Benefits for the tourism players, which are linked to their increased profitability, i.e. the increase in revenues and the decrease in costs; and
- Benefits for tourists, local residents, and the environment, which were grouped into two types, i.e. the ones linked to environmental sustainability and resilience, and the ones linked to services accessibility, in line with the EU Tourism Transition pathway objectives.

For assessing the value generated by the data space, it is important to start from its potential applications. For this reason, the analysis is based on which benefits (revenues increase, costs reduction, sustainability/resilience, and accessibility) could be generated by the 8 use cases developed in D2.3 "Identification of data typology and priority list of datasets, potential use cases and common building blocks with other data spaces". Results of this activity show that 63%<sup>5</sup> of the data space applications would contribute to sustainability and/or resilience of the tourism ecosystem. The 38% of the applications would provide benefits in terms of accessibility of the offered services. Finally, the 38% of the data space applications would bring an increase in tourism operators' profitability. An overview of the benefits brought by the use cases is presented in the radar chart below.

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<sup>5</sup> Percentages are based on the amount of use cases that prove to generate such benefit. As an example, 63% should be read as 6 use cases out of the selected ones contribute to sustainability and/or resilience



*Figure 6 Business analysis of use cases*

It is important to mind that the analysis is based only on the most direct impacts that the use cases may have. Indeed, many of them (or their extended applications) may generate several types of benefits. In the table below, the most direct benefits are marked with a “x”, while the indirect ones are marked with a “(x)”. Moreover, the table provides an explanation of why each use case generates such direct and indirect impact(s) and the main stakeholders that would experience such benefits.

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| USE CASE  | BENEFITS          |                 |                             |               | EXPLANATION  | Stakeholders                                     |
|---|-------------------|-----------------|-----------------------------|---------------|--|--|
|   | Revenues increase | Costs reduction | Sustainability / resilience | Accessibility |  |  |
| Food inclusivity  | x                 |                 |                             | x             | By clarifying the food options available in a destination, tourists will have easier access to offers catered for their needs. Moreover, by decreasing the information asymmetry regarding the food offer, the competition among the HORECA sector is likely to increase, resulting in a wider food offer for tourists and residents. A better visibility of the available offer results in a higher turnover for HORECA players already providing wide food options, and, at the same time, may push others to tap into an underserved market segment. In broader terms, when a destination is known for its accessibility (in this case regarding food options) it may increase its attractiveness, and thus the whole tourism local ecosystem would economically benefit from it. | Tourists, Residents, HORECA <sup>6</sup>         |
| Minimize tourism negative environmental and socioeconomic impacts |                   |                 | x                           |               | By effectively monitoring the negative environmental and sociocultural impacts of tourism, the use case contributes to the sustainability of the local tourism ecosystem. Indeed, thanks to the indicators system, the public authorities and DMOs may take evidence-based decisions to protect the environment and to enhance residents' wellbeing.   | DMO <sup>7</sup> , Public authority <sup>8</sup> |

<sup>6</sup> HoReCa is a short for hotel / restaurant / catering and encompasses the whole food service industry. The term HoReCa includes everything that happens at places like restaurants, cafés, clubs, pubs, hotels etc.

<sup>7</sup> DMOs are the backbone of tourism destinations. They exist to promote destinations, attract visitors, and develop a regional economy. DMOs are responsible for everything from attracting major sporting events to promoting local festivals. They work with businesses to help them understand what travelers need to have an enjoyable experience. E.G: [Visit Finland](#)

<sup>8</sup> Public Authorities such as Regions, Ministries, Local Authorities, etc. E.G.: [Spanish Ministry of Industry, Tourism and Commerce](#)

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|   |   |  |   |     |   |   |
|---|---|--|---|-----|---|---|
| <b>Smart tourism observatory</b>                    |   |  | x | (x) | By monitoring tourism flows, the use case contributes to address the issue of overcrowding. Indeed, based on the proposed dashboard, public authorities, DMOs, and tourism service providers may take action to relieve points of interest exceeding (or close to exceed) their carrying capacity (i.e. the maximum number of people that may visit a site at the same time, without causing destruction of the physical, economic, and sociocultural environment and an unacceptable decrease in the quality of visitors' satisfaction <sup>9</sup> ). At the same time, if similar information is made available to the public (for instance through a mobile app), the use case may increase sites and overall destination accessibility as tourists may need sites not to be overcrowded to properly experience them. | DMO, Tourism service provider <sup>10</sup>               |
| <b>Mitigate crisis management</b>                   |   |  | x |     | By providing a system that integrates real-time data on disasters with information of tourists flows, the use case contributes to improving destinations' ability to effectively and efficiently respond to crises, thus improving its resilience to disasters.   | DMO, Public authority                                     |
| <b>AI-based recommender for sustainable tourism</b> |   |  | x | x   | By implementing an AI-based recommendation system, the use case contributes to addressing the issue of overcrowding. Public authorities, DMOs, tourism service providers, and tourists themselves may implement the recommendations aimed at restoring sites carrying capacity by diverting tourists to other points of interest. At the same time, if recommendations are adopted, sites and overall destination accessibility would improve, as tourists may need sites not to be overcrowded to properly experience them.  | DMO, Public authority, Tourism service provider, Tourists |
| <b>Customised immersive experiences</b>             | x |  |   | x   | By targeting new market segments (such as Generation Z, and Generation Y) with personalized VR experiences, this use case can attract more tourists, resulting in increased ticket sales and revenues for cultural institutions and tourism service providers. At the same time, developing VR experiences may increase the access  | Tourism service provider                                  |

<sup>9</sup> UNWTO, Centre of Expertise Leisure, Tourism & Hospitality, NHTV Breda University of Applied Sciences, & NHL Stenden University of Applied Sciences. (2018). 'Overtourism'? Understanding and managing urban tourism growth beyond perceptions. UN-WTO. DOI: <https://doi.org/10.18111/9789284420070>

<sup>10</sup> Any company who sells and supply a tourism services (city tour, museums, parks, etc...).

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|  |     |   |     |  |  |  |
|--|-----|---|-----|--|--|--|
| using historical data  |     |   |     |  | to culture, as they may provide a way to experience places that cannot be physically accessed.   |  |
| Optimisation of tourist flows in protected areas               | (x) |   | x   |  | By forecasting the value of tourism impact based on the foreseen number of visitors, the use case contributes to enhancing destinations sustainability and resilience. Indeed, such forecasts may support public authorities, DMOs, HORECA companies, and tourism service providers to adopt preventive measures to reduce the negative environmental and sociocultural impacts. If such decisions are linked, for instance, to reducing tourism seasonality through marketing campaigns, this use case may also lead to an increase in revenues for the whole local tourism ecosystem.  | DMO, Public authority, Tourism service provider, HORECA                |
| Data intelligence-based marketing campaign optimization system | x   | x | (x) |  | By providing relevant information for marketing campaigns, this use case may increase the efficiency and effectiveness of marketing campaigns of public authorities, DMOs, hotels, travel agencies, and tour operators. Indeed, relying on data about people already interested in the tourism offer reduces the costs of developing the campaign and, at the same time, increases the chances of being effective, resulting in an increase of revenues. Moreover, if campaigns are used to face tourism seasonality, the use case also contributes to improving environmental and sociocultural sustainability, making the local economy more resilient, and, if associated with an overall increase of yearly tourists, it results in additional increase in revenues for the whole local tourism ecosystem. | DMO, HORECA, Travel agency <sup>11</sup> , Tour operator <sup>12</sup> |

Table 5 Use case analysis (business perspective), based on the 8 use cases of D2.3

<sup>11</sup> A travel agency is a private retailer that provides travel and tourism-related services to the general public on behalf of accommodation or travel suppliers to offer different kinds of travelling packages for each destination. E.G: [kiwi.com](https://www.kiwi.com)

<sup>12</sup> A company that makes arrangement for travel and places to stay, often selling these together as package holidays. A tour operator does not always sell flights, they can also be purely ground-based. Cycling holidays, yoga retreats, wellness holidays, detox retreats, skiing holidays, hiking breaks, theatre breaks, cookery escapes are all examples. E.G: [quasarex.com](https://www.quasarex.com)

## 6 BUSINESS MODELS

We start this section with a case study for inspiration. We have selected booking.com to exemplify business models and revenue channels operated by a successful company that builds on data coming from an ecosystem. Of course, we are not talking here about a data space, but a data platform where a company makes business by generating opportunities for other companies in the sector. It shows very well the relevance of reaching a critical mass of providers and users taking advantage of the so-called network effects. This example enables us to compare with the models that may be facilitated by the data spaces in the tourism industry. For this, we then present a number of business models looking at the different roles that an organization may play in the data space. We distinguish specifically between the business models for data providers and those for data service providers (intermediaries). These business models, tailored exclusively for B2B use, hold the promise of establishing robust revenue streams for both data users and providers. Savvy readers may realize that some of such business models have been anticipated in section 4 as part of the benefits that organizations may get from data spaces, generally under the typology of data monetization. At the end of the section, we reflect on potential sustainability avenues for the tourism data space as such, considering the organization that governs the data sharing ecosystem as an extended data intermediary.

### 6.1 Case Study: The Booking.com success story

Booking.com's is an online travel agency (OTA) built on connecting travellers with a diverse range of accommodations, flights, travel insurance, transportations, and tours, leveraging technology for user satisfaction and earning revenue through commissions from the mentioned service providers. The company revenue for 2022 was \$17.09 billion<sup>5</sup>. The key components of Booking.com's business model include:



1. **Commission-Based Revenue Model:** The primary source of revenue for Booking.com is the commission it charges accommodation providers for each booking made through its platform. When a traveller makes a reservation at a hotel, hostel, vacation rental, or any other accommodation listed on Booking.com, the property pays a commission to Booking.com for facilitating the booking. The commission is usually a percentage of the total reservation cost.
2. **Free to List Model:** Accommodation providers can list their properties on Booking.com for free. They only incur costs when a booking is made through the platform. This model encourages a wide range of accommodations to list on Booking.com, contributing to the platform's extensive and diverse inventory.
3. **Incremental Revenue through Add-Ons:** While the primary revenue comes from accommodation commissions, Booking.com also offers additional services such as

- airport transfers, car rentals, and flights. The platform earns additional revenue through commissions or fees associated with these supplementary services.
- 4. **Booking.com Affiliate Program:** Booking.com operates an affiliate program that allows third-party websites, such as travel blogs or niche platforms, to earn a commission by promoting and facilitating bookings through Booking.com. Affiliates receive a percentage of the commission that Booking.com earns from the bookings generated through their referral links.
- 5. **Partnerships and Collaborations:** The company forms partnerships and collaborations with various entities in the travel industry, including airlines, travel agencies, and other online platforms. These partnerships may involve revenue-sharing arrangements or commissions for bookings generated through these channels.
- 6. **Dynamic Pricing and Promotions:** Adjusting the commission rates based on factors like demand, seasonality, and the competitive landscape. The platform may also run promotional campaigns in collaboration with accommodation providers, earning revenue through increased bookings during these periods.
- 7. **Premium Partner Program:** Where certain properties pay a higher commission rate in exchange for enhanced visibility and promotional features on the platform. This program is designed to benefit both Booking.com and properties seeking increased exposure.

Overall, Booking.com's success is built on connecting travellers with a diverse range of accommodations, leveraging technology that is easy to use and earning revenue through commissions. Some of the company advantages include:

- **Global Presence:** Booking.com has a global reach, featuring accommodations in destinations worldwide. This broad coverage allows it to attract a diverse range of travellers and accommodation partners.
- **User-Friendly Interface:** The platform is designed to be user-friendly, providing travellers with a seamless experience from searching for accommodations to making reservations. The intuitive interface contributes to customer retention.
- **Customer Reviews and Ratings:** Booking.com incorporates customer reviews and ratings for each accommodation listed on the platform. This transparency helps travellers make informed decisions, and it incentivizes accommodation providers to maintain high standards.
- **Mobile Application:** Booking.com has a mobile app that enables users to make reservations conveniently from their smartphones. The app contributes to user engagement and loyalty.
- **Continuous Innovation:** Booking.com invests in technology and data analytics to enhance its platform continuously. This includes features such as personalized recommendations, dynamic pricing, and other innovations to improve the user experience and increase conversions.



## DATES: European Data Space for Tourism

Deliverable D4.4 Market analysis, emerging business models and impact assessment

While, as mentioned before, booking.com is not a data space, business models applied by the company give indications on how data could be used to augment benefits and create stable revenue sources. It also shows that network effects would be important for a platform-related business (in this case, the data space), with critical mass of data providers and consumers acting as levers (*the more data sets are available through the data space, the more interesting it will be for the data consumers; the more data consumers the data space has, the more interesting it will be for data providers to expose their data sets to a big potential customer base*; this is simplistic and other considerations could be added to the picture, but in essence, this is true).

## 6.2 Business models for Tourism data providers

Inspired by the former case study and elaborating further on the content of section 4, we expose here a sample of potential business models (and examples) whose application would be more or less convenient depending on the actors and the concrete operational environment; combination of some of them would also be possible and we are confident that many others will emerge as a result of the activities in embryonic data spaces. In blunt words, data could be provided in exchange for access to other data, by getting services like data enrichment or through direct monetization applying models like subscription or pay-per-use.

1. **Freemium Access:** Stakeholders are provided with free access to a basic version or limited volume of standardized tourism data. To access more detailed or extensive datasets, a subscription fee is applied.

*Example: A travel agency can access basic information about accommodation capacities across regions for free but may need to subscribe for detailed data, including specific breakdowns by type, such as hotels, short-term rentals, etc.*

2. **Freemium Access with Paid Data-Based Products/Services:** Stakeholders get free access to a basic version of standardized tourism data. The fee is applied when stakeholders use data to create customized products or services, such as analytics reports, insights, personalized data sets or tailored recommendations.

*Example: A tour operator can access basic data for free but pays a fee when requesting custom reports that analyse accommodation capacities, popular attractions, and travel trends for a specific region.*

3. **Participation-Based Reductions:** Stakeholders who actively contribute data or insights to the data space receive incentives such as discounts, tax cuts, or redeemable points.

*Example: A hotel sharing detailed occupancy data may receive tax benefits or discounts on premium features of the data space.*

4. **Partnership-Based Agreements:** Form partnerships with tourism-related entities (e.g., DMOs, hotels, transportation services) to encourage data sharing and collaboration. Partnerships can involve joint projects, co-branded initiatives, or shared data contributions.

## DATES: European Data Space for Tourism

Deliverable D4.4 Market analysis, emerging business models and impact assessment

Example: A data platform collaborates with a regional tourism board to create a comprehensive dataset that includes both official statistics and real-time data from local businesses.

5. **Yearly Subscription Fees:** Stakeholders pay a fixed annual subscription fee to access specific datasets throughout the year. Access may include regular updates, customer support, and additional features.

*Example: A travel agency pays an annual subscription fee to access a set of tourism data sets with continuous access to updated and reliable information.*

### 6.3 Business models for data intermediaries

Business models in this category describe payments made by consumers of services for the provision of specific data-based services. Here specific limitations of the Data Governance Act apply.

#### 1. Data aggregation service:

- Data-based service: provision of a specific service that standardizes and aggregates tourism-related data from various sources.
- Revenue Stream: Subscription fees or pay-per-use model for access to the standardized data.

#### 2. Harmonization Services:

- Data-based service: Provide services to harmonize data across regions, ensuring that diverse data sources align with standardized concepts, taxonomies, and classifications.
- Revenue Stream: Consultation fees, project-based fees for data harmonization services.

#### 3. API Integration for Travel Agents:

- Data-based service: Develop APIs (Application Programming Interfaces) that allow travel agencies and operators to seamlessly integrate standardized tourism data into their systems. This could well be the case of a data space connector provider.
- Revenue Stream: API access fees, licensing fees based on usage.

#### 4. Data Analytics and Insights:

- Data-based service: Offer analytics tools and insights derived from standardized data to help tourism stakeholders make informed decisions.
- Revenue Stream: Subscription fees for analytics services, custom analytics projects for specific needs.

#### 5. Educational Services:

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- Data-based service: Provide training and educational resources to tourism stakeholders on how to effectively use standardized data for accurate estimations.
- Revenue Stream: Training fees, workshops, certification programs.

### **6. Customization and Localization Services:**

- Data-based service: Offer customization services to adapt standardized data to the specific needs and preferences of different travel agencies or regions.
- Revenue Stream: Customization fees, ongoing support services.

### **7. Collaboration with DMOs:**

- Data-based service: Partner with DMOs to encourage the adoption of standardized data practices and provide them with tools to contribute to the data space.
- Revenue Stream: Partnership agreements, collaborative projects.

### **8. Subscription Model for Small Agencies:**

- Data-based service: Introduce a tiered subscription model specifically designed for small agencies, allowing them access to the standardized data at an affordable rate.
- Revenue Stream: Subscription fees based on agency size or usage.

### **9. Advanced Quality Assurance and Certification:**

- Data-based service: this could be the case of implementing advanced (additional) quality assurance processes and certification programs to ensure the reliability and accuracy of standardized data.
- Revenue Stream: Certification fees, quality assurance services.

## **6.4 Business models for data space sustainability**

The business model of the Tourism Data Space seeks to address the challenge of securing sustainable funding for the governance authority responsible for managing its operations and procuring services. While several models may co-exist and their practical application will depend on how the data space will be deployed and operated, we provide here some reflections and ideas that could help to define the path towards sustainability of the myriad of data spaces that could emerge in the tourism sector (operating at different geographical levels, focused on particular segments of the industry and involving particular ecosystems...) and the European Tourism Data Space as the overarching data space infrastructure for the aforementioned ones.

The focus when looking at the business models for the sustainability of the data space should be on the revenue models and cost structures of the governing body or governing organization of the data space. Such organization would play somehow the role of a data space intermediary, but with extended responsibility. It would provide Organizational Federation Services including governance of the data space, structured integration of relevant stakeholders, development of the basic organisational and technical requirements,

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prerequisites and foundations of the data space, onboarding of new members, strategic linking of the data space with other data spaces.

While many of the business models depicted for intermediaries may apply, we have filtered all the options into 4 models that seem to be the most accepted ones by the stakeholders of the sector: (1) Membership fees, (2) Percentage of revenues resulting from specific activities, (3) In-kind contributions, (4) Payments based on the number of transactions or processes facilitated by the data space.

The following graphic shows the evaluation of such options by our stakeholder group. While it would be difficult due to the number of answers to scale these preferences and additional analysis should be developed, we clearly see that membership fees and payments based on transactions facilitated by the data space could be acceptable for data space members.

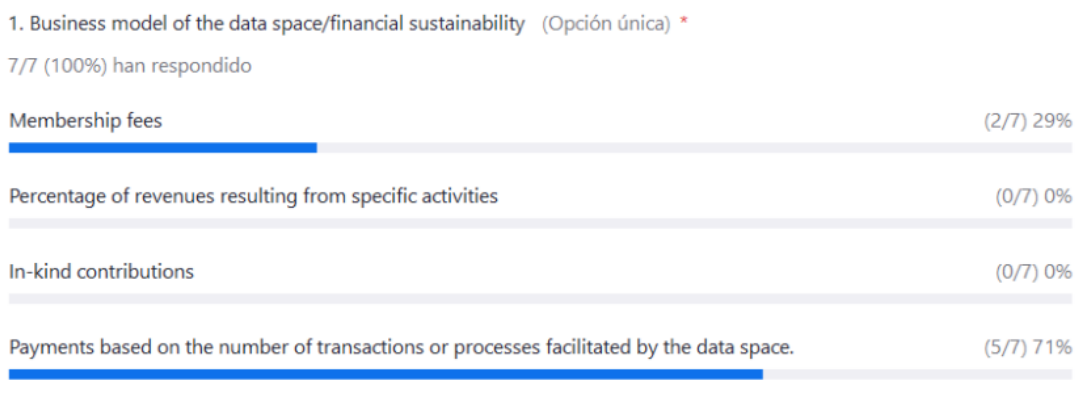


Figure 7 Replies to the question: "what is your preferred business model for the data space?" (source: DATES final stakeholder validation workshop)

A more extended survey undertaken by the sister project DSFT and shared in a joint event held close to the end of both projects in Brussels, showcases some additional possibilities and the potential degree of acceptance:

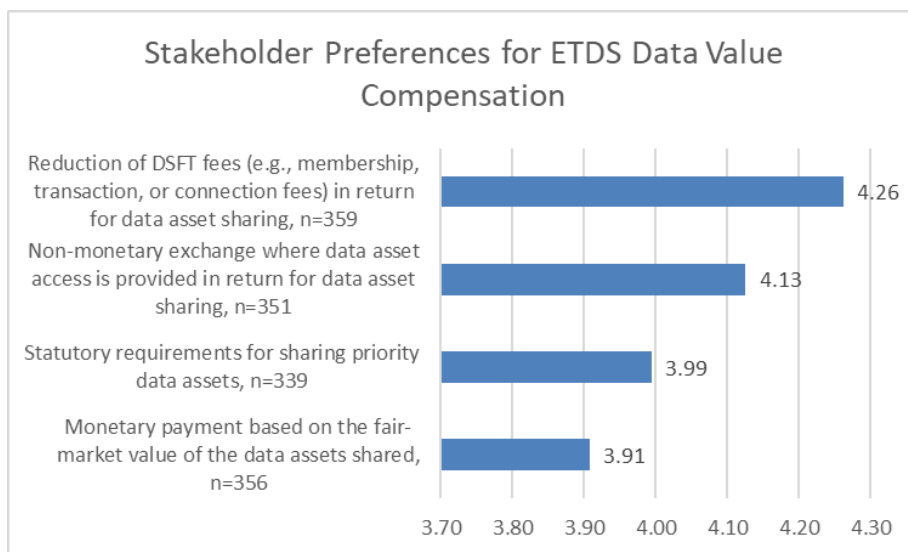


Figure 8 Results of the survey by ETDS on stakeholder preferences for data space compensation

## 7 IMPACT ASSESSMENT

### 7.1 Impact modelling

According to the fact sheet published by the European Parliament in March 2022: “The EU’s tourism industry in the strict sense of the term (traditional providers of holidays and tourism services) is made up of 2.3 million businesses, primarily small and medium-sized enterprises (SMEs), employing an estimated 12.3 million people. In 2018, the ‘travel and tourism’ sector directly contributed 3.9% to EU GDP and accounted for 5.1% of the total labour force (which equates to some 11.9 million jobs). When its close links with other economic sectors are taken into account, the tourism sector’s figures increase significantly (10.3% of GDP and 11.7% of total employment, which equates to 27.3 million workers).”

However, **counting the number of visitors, the revenue generated for the travel and tourism operators, the levels of employment and the tourist tax collected by municipalities is not sufficient anymore.** The tourism industry experienced multiple shockwaves in the past decade. Travel and tourism companies were swept by digitalization, which transformed the way tourists look for information and choose their vacation, book and pay for travel, and share their travel experiences. New, digitally enabled business models also impacted the broader stakeholders, such as residents of tourist destinations<sup>13</sup>. COVID-19 triggered one of the worst downturns in the industry’s history<sup>14</sup>, but also drove operators and policy makers to think of how they can make the industry more resilient<sup>15</sup>. On the demand side, consumers expectations have changed; tourists want more personalized offerings that align with their preferences, habits and income levels, generating demand for a much wider variety of offerings in terms of length of stay, ability to spend, types of experiences. Last, but not least, consumer and policy makers demand for environmentally, socially and economically sustainable tourism has increased<sup>16</sup>. Till here, there is nothing new, since all these trends and a more detailed market analysis have been shared earlier in this document. What is important is that, as a result of these changes, **measuring the performance of the industry, including assessing the impact of strategic digital transformation initiatives, such as data spaces, needs to be revised.**

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<sup>13</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0166046221000272>;  
<https://marketing.wharton.upenn.edu/wp-content/uploads/2019/08/09.05.2019-Proserpio-Davide-Paper.pdf>

<sup>14</sup> <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220707-1>

<sup>15</sup> <https://www.oecd.org/coronavirus/policy-responses/rebuilding-tourism-for-the-future-covid-19-policy-responses-and-recovery-bced9859/>

<sup>16</sup> <https://www.urbanagenda.urban-initiative.eu/partnerships/sustainable-tourism>;  
<https://sdgs.un.org/topics/sustainable-tourism>;  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9389488/>;  
<https://journals.sagepub.com/doi/abs/10.1177/1354816620934908>

To address the assessment of the impact of a European Tourism Data Space (or specific tourism data spaces operating at other levels) will require applying a **conceptual framework** that enables to:

1. **Measure value from the perspective of all stakeholders:** from operators to tourists, from policy makers to residents. That means that the framework should consider a **broad set of *outputs* and *outcomes*, including the direct economic returns for the tourism industry, the indirect economic returns for adjacent industries, such as culture, agri-food, transportation, the public value<sup>17</sup> for the tourism destination communities.**
2. Holistically account for the **cost of transforming *inputs* into those outcomes.** That means accounting for technological inputs, such as the databases, the data marketplaces, the API management tools, the data billing tools, the data science advisory services, but also for the cost related to transforming process and people's competencies that are needed to realize the benefits of data spaces.
3. **Consider the local context**, in terms of geographical, economic and social attributes of the tourist destinations and the local community beliefs, preferences and values, **that trigger the transformation, influence the perceived value of outcomes, the cost of input, and the time and risks of value realization.**

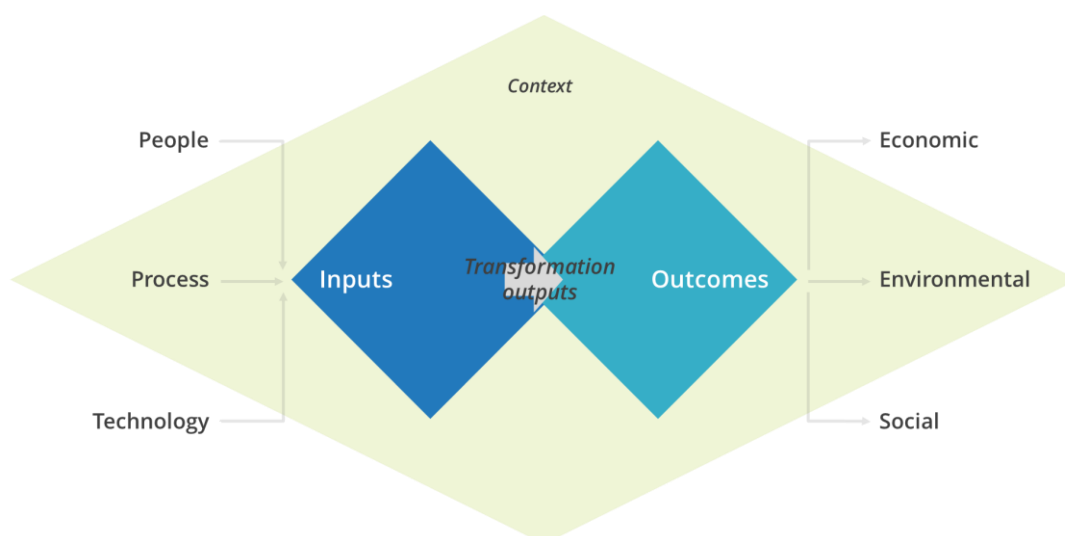


Figure 9 Tourism Data Spaces Impact Assessment Framework (IDC 2023)

17

[https://www.researchgate.net/profile/Steven-Brieger/publication/310791918\\_Public\\_Value\\_Performance\\_What\\_Does\\_It\\_Mean\\_to\\_Create\\_Value\\_in\\_the\\_Public\\_Sector/links/59c6e53f458515548f329d3b/Public-Value-Performance-What-Does-It-Mean-to-Create-Value-in-the-Public-Sector.pdf](https://www.researchgate.net/profile/Steven-Brieger/publication/310791918_Public_Value_Performance_What_Does_It_Mean_to_Create_Value_in_the_Public_Sector/links/59c6e53f458515548f329d3b/Public-Value-Performance-What-Does-It-Mean-to-Create-Value-in-the-Public-Sector.pdf);  
<https://publications.jrc.ec.europa.eu/repository/handle/JRC85480>;

### 7.1.1 Measuring Outcomes

As interest in sustainable tourism grew over time, the United Nations World Tourism Organization (UNWTO) has built and evolved a sustainable tourism indicators framework, inspired also by the UN Social Development Goals, that considers the ability to bring together economic, environmental and social returns for the whole stakeholder ecosystem<sup>18</sup> (see figure below).

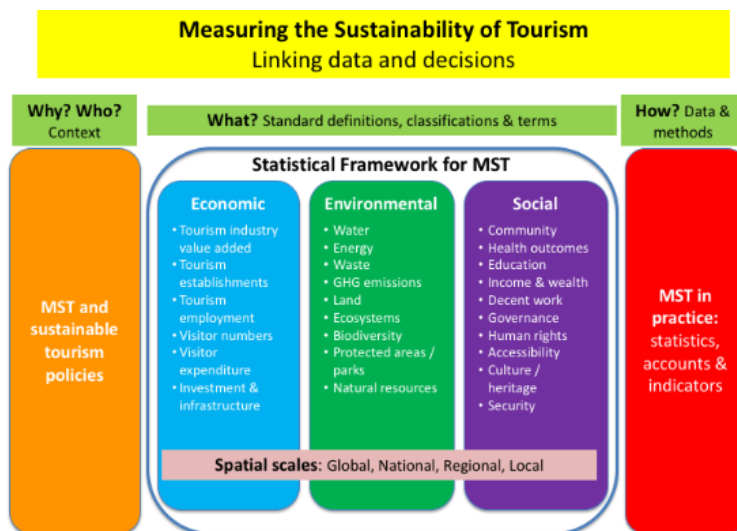


Figure 10 UNWTO Statistical Framework for Measuring the Sustainability of Tourism (source UNWTO)

To assess the impact of data spaces on those sustainable tourism outcomes, one must understand the *outputs* – in other words, the intermediate results of the transformation – that then can influence those outcomes. As discussed in other deliverables (e.g., D4.1, D2.2), outputs of tourism data spaces can include:

- **Improved customer/tourists' experience and engagement**, such as improving interaction with the tourist, developing increasingly personalised tourism services, engaging through personalized discounts and loyalty programs. These outputs can in turn lead to outcomes, such as longer stays, customers returning to the destination multiple times, increased expenditure per capita.
- **Improved employee experience**; jobs in the tourism industry tend to be highly seasonal, medium-to-low skill, thus not always paying fair salaries, ensuring equal employment and caring for employee wellbeing. Increased access to data can also help increase the transparency of tourism job supply and demand.
- **Better decision-making**, through better access to granular insights on tourism spending patterns, tourist profiles, information on adjacent services, such as local transportation, policymakers and tourist operators can improve planning and operations, thus increase competitiveness of their destination.

<sup>18</sup>

<https://www.unwto.org/tourism-statistics/statistical-framework-for-measuring-the-sustainability-of-tourism>



- **Enhanced sustainability & accessibility**, richer and transparent access to granular data on tourism can also include consumption of water and energy, production of waste, transparency over increase in the cost of transport and housing for residents, thus help making better planning and operational decisions regarding to increase sustainability and accessibility of destinations.
- **Increased collaboration, resilience and efficiency**; in fact, better understanding of market trends, opportunities and challenges enables tourist operators, policy makers and other stakeholders to collaborate to better address their interdependencies and eliminate duplications, for instance to scale the availability of food and accommodation during peak seasons, in a sustainable manner, or to promote multimodal travel in the case of large events thus reducing congestion and pollution, or to respond to disruptions, such as transportation strikes or adverse weather events.

### 7.1.2 Accounting for the inputs

*Inputs* refer to attributes that the transformation process taking place within an organization (public or private, big or small that wants to get benefits by joining a data space, typically a data provider or an intermediary). **¡Error! No se encuentra el origen de la referencia.** presents the Conceptual framework and indicates the position of Inputs in the framework. The Input attributes are highly relevant as they set the overall objectives. Furthermore, the Input attributes define the specific capacity that is available for the transformation process, not only in the as-is situation but also in the to-be situation. The Input attributes can as such be used to define the gap between the required resources available in the as-is situation (Time = 0) and the to-be situation (Time = 0 + 1).

Four main Input attributes can be identified: (1) Objectives, (2) Data, (3) Technologies (underlying infrastructure) and (4) Organisational resources. **¡Error! No se encuentra el origen de la referencia.** provides an overview of the four attributes.

| Attributes (Inputs) | Sub-attributes (Inputs)  |
|---------------------|--|
| Objectives          | The translation of the context attributes into specific objectives, which serve as an essential input attribute for the transformation process   |
| Data                | Refers to the data and the various aspects and dimensions of the data (e.g. metadata dealing describing how the data are acquired, what are the source(s), and how they are accessible (see also the FAIR principles – Findable, Accessible, Interoperable, Reusable (European Commission Expert Group on FAIR Data, 2018)), who has the ownership, etc.). |

|                          |  |
|--------------------------|--|
| Technologies             | Different types of technologies can be considered: hardware and software, new and more established technologies (please, refer to the section on digital transformation and the enabling technologies) |
| Organisational resources | Organisational resources refer for example to HR resources, financial resources, the digital skills and literacy of those involved in a specific project and/or organisation.                          |

Table 6 Impact assessment; Inputs: Attributes and sub-attributes

### 7.1.3 Transformation

*Transformation* refers to the approach of (re)designing and (re)developing services/applications and/or processes/operations in order to create value, whereby there is a radical innovation instead of an incremental innovation (Osborne & Brown, 2011). **¡Error! No se encuentra el origen de la referencia.** indicates the specific position of transformation in the conceptual framework.

This study focuses on transformation driven by or enabled by data, data-related technologies, objectives and organisational resources. Looking at the existing literature on digital and data-driven transformation, two specific attributes relevant to transformation could be identified, related to internal and external processes: Stakeholder Engagement (Chen et al., 2020; Estevez et al., 2016; Mergel et al., 2018; Simonofski et al., 2020) and Governance (Chen et al., 2020; Estevez et al., 2016; Fang, 2002; Scupola, 2018; Ubaldi et al., 2020) – see **¡Error! No se encuentra el origen de la referencia.**

| Attributes (Transformation)                 | Sub-attributes (Transformation)                                |
|---|--|
| Internal Processes: Governance              | Requirements, Principles, Governance approaches, Models, Roles |
| External Processes: Stakeholder Involvement | Types, Roles, Partnerships                                     |

Table 7 Impact assessment; Transformation: Attributes and sub-attributes

*Governance* is an important attribute for the successful value creation. Governance refers to both processes and structures for steering and managing parts of societies, entailing the networks of actors, institutional frameworks and processes that take place within these networks and frameworks (Rijke et al., 2012). The governance attribute consists of various sub-attributes: requirements, principles, governance approaches to manage resources, models and roles. Relevant requirements could include, for example, the creation of a central agency for coordination of initiatives, adopting resilient processes, or defining performance measures. Principles could include efficiency, effectiveness, transparency, openness, and accountability. Governance approaches to manage resources refers to the available and required infrastructure, partners, data and services. Models refer to the overall organisational model, the rules for decision-making, the execution mechanisms and the business processes. Finally, Roles is related to the need to make choices on where to locate

infrastructure investments and where to improve services, to ensuring efficient and transparent policy making and to building capacity of local actors.

*Stakeholder involvement*, and the way those stakeholders are involved, is a crucial requirement for the success of public value creation. Possible stakeholders' attributes, i.e. sub-attributes, to consider include: Types, Roles, and Partnerships. Examples of stakeholder's types are: Citizens, local government, city officials, private enterprises, Internet Service Providers, etc. Examples of stakeholder roles are: Project owner, project performer, strategic partner, civil society, and customers. Examples of partnerships are: Public-Private Partnerships and Public-Private-People-Partnerships. These partnerships are essential in service improvement (especially public services) enabling organizations to leverage private sector and citizens' capacities to innovate, invent and bring in efficient solutions.

### 7.1.4 Understanding the context

Data spaces could be created based on different criteria, such as specific sector segments, partnerships (as we saw before in the case of air travel ecosystem) or supply chains, but we think that in the case of tourism, one of the main elements of context will be the geographical one, since data spaces could operate at global, EU, national, regional or local levels but in all cases the geographical element is present. The more local they are, the more focused on the needs of that particular ecosystem will be. Differences may also exist not only based on the geographical level, but also based on the particular location of the data space. Differences rely for example on industrial and political history, culture, topology, geography, economic and societal developments, regional, national and international policies. Therefore, knowledge transfer of location-enabled solutions at the regional level needs to be carefully analysed based on the *Context*.

The Context refers to specific features and dimensions of the local and regional environment that must be considered for the transformation and value creation. The Context includes various attributes that could affect the choices for planning and implementing data-driven services at local and regional level, such as: Beliefs/Ideologies, Drivers, Challenges, Local embeddedness and Location management capacity (Christopoulou et al., 2014; Estevez et al., 2016). Table 8 presents the attributes and sub-attributes of component context. The context can refer to the potential and current impact. Those five different attributes and their respective sub-attributes are explained in detail below.

| Attributes (Context) | Sub-attributes (Context)  |
|----------------------|---|
| Beliefs/Ideologies   | City/Municipality/Region/Destination, Economic, Social, Environmental, Governance, Legal  |
| Drivers              | Administrative history of the destination, Development focus of the solutions, Local dimensions to be improved, Politics and administration from a multi-level governance perspective |

|                    |   |
|--------------------|---|
| Challenges         | Economic, Social, Environmental, Technological, Financial, Governance, Legal, Ethical, Institutional, Strategic |
| Local embeddedness | Groups of destinations sharing similar problems and opportunities   |

*Table 8 Impact assessment; Context: Attributes and sub-attributes*

**Attribute 1: Beliefs/Ideologies**

*Beliefs/Ideologies* are steering the local service solution(s). Those Beliefs/Ideologies are abstract and can be considered as the values to be followed. Values can be defined as concepts, distinctive of an individual or characteristic of a group, of the desirable which influences the services and applications (Chantillon, Cromptvoets, & Peristeras, 2020, pp. 281–282; Kluckhohn, 1951). They can be related to the local or regional area or can be related to the governance process and legal context adopted for conducting transformation processes. Following such considerations, those Beliefs/Ideologies are classified into the following categories: Unit (refers to the city, municipality, region or destination, economic, social, environmental, governance and legal. Table 9 presents the context values, their descriptions and some examples. Beliefs/Ideologies are not mutually exclusive and can be intertwined. The first sub-attribute, i.e. City/municipality/region/destination refers to Beliefs/Ideologies that are strongly connected to the local environment, and can consequently overlap with the Beliefs/Ideologies of the other sub-attributes.

| <b>Sub-attributes (Beliefs/Ideologies)</b> | <b>Description</b>  | <b>Examples</b>   |
|--|---|---|
| Unit                                       | Set of generally agreed values within the city/municipality/region/destination to be used in defining the vision of a service/product | Social, vibrant, liveable, clean, healthy, safe, responsive, resilient, promoting proximity between people’s accommodation and working environments, sustainable living environment |
| Economic                                   | Set of generally agreed values related to promoting economic development.   | Thrive in job creation and financial growth, and development of the entrepreneurial culture   |
| Social                                     | Set of generally agreed values related to societal development. Can also refer to generally accepted human rights.                    | Development of human capital through relevant e-learning platforms, talent development, equity and  |

|               |  |  |
|---------------|--|--|
|               |  | fairness, social inclusion, right to education, equality of treatment  |
| Environmental | Set of generally agreed values related to the sustainable development and use of the environment.  | Green area protection, commitment to reducing CO2 emissions, ensuring water availability   |
| Governance    | Set of generally agreed values related to the overall governance approach to be followed and applied.  | Giving voice to service users and citizens for planning and building their city/municipality/region/destination, developing citizen engagement and participation in community-related issues, consensus building for inclusive decisions |
| Legal         | Set of generally agreed values related to the judicial approach taken to handle the relations between public administration, politics and society. | Compliance with the law, proper use of public funds, integrity & honesty, accountability to political leadership, facilitating the democratic will, respect for the citizens, equality of treatment & access                             |

*Table 9 Impact assessment; Beliefs/Ideologies: Sub-attributes, description & examples (adapted from Christopoulou et al. (2014) and Estevez et al. (2016))*

**Attribute 2: Drivers**

*Drivers* for developing service solutions depend on the administrative history of the unit (related to the concept of path-dependency, unit refers to the city, municipality, region or destination), the development focus of the solutions (such as leveraging on the deployment of ICT for local development, leveraging on human capital, attracting investments, etc.), the local dimensions to be improved (such as economic, social, environment, mobility, health, living and governance) and the politics and administration from a multi-level governance perspective (global-local). Drivers are described as those factors that motivate actors to undertake action (Batty et al., 2012; Caragliu et al., 2011; Estevez et al., 2016; Glebova et al., 2014; Sánchez et al., 2013). Table 3 provides an overview of the sub-attributes for the Drivers.

Concerning the relation between Attribute 1: It has to be underlined that both Beliefs/Ideologies and this attribute are different but connected. Beliefs/Ideologies are more abstract in nature and can be considered as values. Drivers are more direct factors. It can as such be expected that there is a certain level of conformity between the two attributes. This is however not a certainty. For example, a city where touristic activity happens may, from a Beliefs/Ideologies point of view, not be favouring a high level of transparency. However, it is possible that – as a result of European legislation and national transposition the opening of data within the destination is required. This second point is as such a driver. In this example there would, consequently, be no consensus between those two specific attributes (Chantillon, Simonoski, et al., 2020).

| Sub-attributes (Drivers)                                | Description  | Examples  |
|---|--|---|
| Administrative history of the unit                      | Refers to path-dependency, limiting the possibilities and options for an administration.   | Political or legal choices from the past can lead to a number of policy options being excluded for future policy plans.   |
| Development focus of the solutions                      | Refers to the focus that is taken regarding the development of the services/products.  | Leveraging on the deployment of ICT for local development, leveraging on human capital, attracting investments, possibilities offered by the data availability etc. |
| Local dimensions to be improved                         | Refers to the economic, social, environmental, mobility, health, living and governance dimensions that can be improved within a certain location.  | Improvement of schooling, public lighting, traffic systems, waste-collection, food waste, energy consumption, etc.  |
| Politics & administration from a multi-level governance | “A system of continuous negotiation among nested governments at several territorial tiers supranational, national, regional and local as the result of a broad process of institutional creation and decisional reallocation that had pulled some previously centralised functions of the state up and down” (Marks, 1993) | Influence of EU legislation on national, regional and local administrations.  |

Table 10 Impact assessment; Drivers: Sub-attributes, description & examples

**Attribute 3: Challenges**

Besides the Beliefs/Ideologies and Drivers, a region/destination can also be confronted with *Challenges*, which are barriers and obstacles appearing in the context. The Challenges can be economic, social, environmental, technological, financial, governance, legal, ethical, institutional and strategic. Challenges define, together with the other Context Attributes, the overall context in which a transformation takes place. The Challenges can be overcome via the solution but can at the same time also impact the transformation process. Table 11 presents examples of these listed challenges (Anttiroiko et al., 2014; Craglia et al., 2004; Ercoskun, 2010; Estevez et al., 2016; Galdon-Clavell, 2013; Nam & Pardo, 2014).

| <b>Challenges</b> | <b>Examples: Need to...</b>   |
|-------------------|---|
| Economic          | improve local competitiveness against national markets, diversify economic activities, overcome spatial inequalities in productivity and income, deal with possible budget cuts that will affect local governments  |
| Social            | ensure equity and fairness, reinforce social and territorial cohesion, ensure social inclusion  |
| Environmental     | protect natural resources and green areas, reduce emissions generated by transport systems, reduce energy consumption, use renewable energy   |
| Technological     | deploy integrated destination infrastructure and service platforms, solve machine-to-machine communication, ensure system and data security   |
| Financial         | ensure availability of financial resources, address possible lack of capacity for attracting investors, ensure the construction of cost-effective buildings and facilities  |
| Governance        | engage societal organisations and private sector in testing solutions, adopt decisions and proposals made by citizens, attract talent, enable distributed implementation and execution by different stakeholders supported by central coordination                            |
| Legal             | ensure respect for citizen rights, protect (personal) data and user/citizen privacy, streamline legal frameworks to digital standards, agree on data licences and standards for digital services, promote digital-ready legislation at higher levels of public administration |
| Ethical           | ensure trust in the use of data and technology to deliver services, by avoiding data and algorithmic biases, ensure respect for privacy when using data and technology  |



|               |  |
|---------------|--|
| Institutional | ensure coordination and alignment, overcome bureaucracy in government agencies when this applies, attract qualified IT professionals and relevant IT players   |
| Strategic     | avoid the manipulation of biased information that could distort reality, ensure communication between city planners and citizens, ensure integration among policies, ICT deployment and city plans, avoid possible inter-organisational tension and conflicts. |

*Table 11 Impact assessment; Challenges: Examples (adapted from Estevez et al. (2016))*

**Attribute 4: Local embeddedness**

Another attribute of the context refers to the *Local embeddedness*. Two types can be considered here. A first type refers to local geographical embeddedness. A destination is in a geographical region, which may comprise more cities/municipalities sharing similar problems and opportunities. Strengthening collaboration of local authorities in the same region and pursuing common goals can facilitate the development of tourist services. When developing services and applications within a regional umbrella, specific concerns should be addressed, including (Dodgson & Gann, 2011; Odendaal, 2003; Weinstock & Gharleghi, 2013):

- leveraging local-interdependencies and the regional context;
- considering the local/regional organisational culture and priorities;
- considering the relative position of the destination in a wider geographical area;
- preserving the urban heritage as identity.

A second type of local embeddedness does not have a geographical component but a policy-oriented component. Indeed, it is possible that two or more destinations that are not necessarily located close to each other, share similar challenges and opportunities. If this is the case, it is possible that those destinations collaborate with each other.

In conclusion, it has to be underlined that the four different attributes and the related sub-attributes presented here are important to steer the transformation and to ensure that the new data-driven services, products and solutions will lead to the creation of value for the stakeholders in the extended tourism ecosystem. While there is often more than one way to deal with the Challenges and to achieve the Objectives –those Objectives are set in the Input component, based on the Drivers and Challenges –, the other Contextual attributes (and the other Input attributes) will reduce the options available to achieve the Objective(s) set in the Input component. Indeed, the Contextual attributes provide the framework in which actions can be taken by the different stakeholders (e.g. destinations), and consequently reduce the available options.

The framework described in this section builds upon sound impact assessment methodologies for public services that we have selected because of similarities with the tourism sector, whose services are well-rooted into geographical areas. The framework dives into some of the elements that should be considered to understand and maximize

## DATES: European Data Space for Tourism

Deliverable D4.4 Market analysis, emerging business models and impact assessment

the impact and value of tourism data-driven services /products. It is a starting point that should be revisited in the context of the deployment of the European Tourism Data Space and then applied based on the value of the different criteria that will define the data space. While it could serve as a way to understand the overall impact of the data space in the tourism industry and other related sectors (indirectly or directly touched by tourism), It could also be a good basis for the assessment of impact of the usage of a data space in a particular ecosystem, such as the impact of services and solutions created by DMO as a result of using the data space.



Figure 11 Details and data for data space impact assessment

## 8 CONCLUSIONS AND NEXT STEPS

D4.4 provides insights on the tourism market, giving us a perspective of which trends are influencing the investment in technologies and the relevance of data in most of them. Main drivers for the tourism industry include: a focus on **resiliency and sovereignty of the sector** as a result of the consequences of the pandemic, **labour shortages combined with an increased demand** for personnel, and **digital transformation**. In fact, while digital transformation started some time ago, the factors aforementioned have accelerated this path and most companies understand that technologies will probably be the best enabler to face many of the challenges of the sector. An example of this is the **trend towards automation**, facilitated by technologies like **robotics and AI**, which could replace or support existing personnel and address the problem of labour shortage. What we see is that the successful realization of **most trends will depend on access to high-quality data**. An obvious example is building **digital twins**, where data from different sources must be combined for a digital replica of the reality.

In the report, we also mention the so-called “**3 Cs**” (**Customization, convenience and conscience**), as elements that are driving most developments with respect to customers. **Hyper-personalization** of services and applications can only happen with deep knowledge about the customer and the context where the service is used; conscience refers to the **increasing value that both customers and employees give to ESG goals** (Environment, Social, Governance). IDC data shows that “**by 2026, 40% of enterprise hospitality and travel organizations will apply more than 25% of IT budgets to achieve sustainability-focused goals and KPIs**”. This will be a big push for the data economy, since many of the scenarios that we could imagine are not feasible nowadays because lack of access to data, or lack of quality, accurate and audited data. In the document we develop specifically the **case of collecting and reporting CO2**, showing the state of play and giving light to a topic that could be misinterpreted due to misleading messages of many companies that claim to be net-zero companies, while this is not true in reality. Data could not only help to implement the necessary measures companies are trying to put forward, but also to avoid the “greenwashing” process many companies are going through (claiming that they do what they don't) and support the credibility of the sector. Our market analysis concludes with an overview of major investments by tourism companies in technologies like cloud, edge or AI. This is part of the digital transformation path and a pre-requisite for organizations to take advantage of the data economy, and thus, benefit from data spaces. We include some reflections by the World Economic Forum around the value of data spaces in manufacturing that could be well applied to the case of tourism and any other sector, since they focus on the need to understand data owned by the company and qualify it as an asset, which implies understanding which data is needed, which data could be shared, the risks associated with the data sharing process, etc. This is key to fight against those concerns that many organizations have around lack of competitiveness if data is shared, because it is obvious that not everything should be shared, but it is also true that sharing a part of data could lead to enormous benefits. So, **companies need to understand their**

•  
**own transformation towards data-driven solutions and processes before they can benefit from the use of data spaces.**

The second part of the report addresses precisely the **value that data spaces could bring to the different stakeholders**, which we target by adopting the **perspective of data providers, data consumers and intermediaries**, replicating most commonly used roles by IDSA, GAIA-X or the DSSC. We start with a generic approach towards such benefits that is then followed by specific analysis of which indicators could be used to quantify the value, the advantages of migrating to data spaces with respect to other data-related infrastructures like data platforms or data lakes, and how to achieve OPEX reduction.

While this analysis could be the basis of the analysis of any data space independently on the sector, we bring the specificities of tourism in the following sections that tackle the **business approach to the analysis of use cases** (as defined in WP2 of this project) and the illustration of potential **business models that could be applied in the tourism data space**, with specific examples. While most of the content refers to business models that could be put in practice by data providers and intermediaries (since the value of using data as consumer is exemplified through the use case analysis), we finish that section of the document with reflections about business models that could contribute to the financial sustainability of the data space as such. Our stakeholders have been instrumental in providing positions around those ones. While it is clear that most players are in favour of having a public or non-for-profit organization governing the European Tourism Data Space, there is a multiplicity of revenue sources that could work, including membership fees, payments based on transactions facilitated by the data space, or a combination of some of them. In all cases, an important message to convey is that **the data space should get public financial support at the beginning of its operations** (including deployment) until critical mass is reached and the maturity of its operations enables a better estimation of the cost and revenue structures.

Since we have highlighted the importance of creating network effects through the engagement of a critical mass of both data providers and consumers, it is important to create different business models that are sufficiently attractive for the different tourism stakeholders and the different ETDS roles. These business models must provide **benefits not only in the short term but in the medium and long term**. The main current problem is that large data holders, on the one hand, are reluctant to share their data or commercialize it since they consider that it has great internal potential (see the comment above), and those who decide to commercialize it do so at a very high price for potential buyers. On the other hand, many potential data consumers, especially SMEs, cannot afford to purchase such data. What's more, in many cases, even if they could afford it, they would not have the capacity to exploit them, so they have no incentive to buy them. The result is that this data's buyer is often public administrations or DMOs, who can afford the purchase and have resources for its exploitation. To break this vicious circle, business models must be designed so that they work in the short, medium, and long term and that **encourage both sellers and buyers** to participate in them.