Blueprint and Roadmap for Deploying the European Tourism Data Space

Final Draft 3.0

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
API	Application Programming Interface
BDVA	Big Data Value Association
CSA	Coordination and Support Action
DEP	Digital Europe Programme
DMO	Destination Management Organisation
DSBA	Data Space Business Alliance
DSSC	Data Space Support Center
DGA	Data Governance Act
EC	European Commission
EDC	Eclipse Data Space Component
EDIC	European Digital Infrastructure Consortia
EDIB	European Data Innovation Board
EDPB	European Data Protection Board
EEA	European Economic Area
EIF	European Interoperability Framework
ETDS	European Tourism Data Space
ETL	Extract Transform Load
EU	European Union
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
HORECA	Hotels Restaurants Catering
IDS	International Data Space
IDSA	International Data Space Association
IT	Information Technology
KPI	Key Performance Indicator
LAU	Local Administrative Units
MVDS	Minimum Viable Data Space
NUTS	Nomenclature of Territorial Units for Statistics
ODTA	Open Data Tourism Alliance
OTA	Online Travel Agency
PoC	Proof of Concept
SGT	Sector Group Tourism
SME	Small and Medium Size Enterprise
SOLID	Social Linked Data

1 EXECUTIVE SUMMARY

In the future, a European single market for data will play a major role in Europe's digital sovereignty, competitiveness, and sustainable growth. For this reason, the European Commission laid out the European Data Strategy, envisaging the free flow of data within and across sectors in the EU supported by the establishment of Data Spaces for key sectors of the European economy, tourism being one of them. This Blueprint provides the details for establishing an interoperable European Tourism Data Space (ETDS) that facilitates efficient cross-sector data sharing among all tourism stakeholders in Europe. The objective of the ETDS is to provide a trusted data sharing environment that will foster innovation by supporting collaboration and community building for data-driven value creation in tourism and its interconnected sectors. The expected outcomes will enhance visitor experiences, improve tourism management, and support the decision-making of stakeholders. The ETDS will also stimulate innovation and have a positive impact on the future of tourism by promoting the digital transformation of tourism SMEs and supporting the scaling of sustainable tourism practices.

This document is the collaborative effort of the DATES[1] and DSFT[2] projects, the two Coordination and Support Actions (CSAs) responsible for the preparatory actions for the data space for tourism. In addition to providing the Blueprint for establishing the ETDS and a roadmap for its implementation, this document is also intended to serve as an entry point for understanding the core frameworks and building blocks upon which the data space concept is based. While the essential descriptions of the ETDS components are included, this Blueprint is not meant to serve as an exhaustive reference. Instead, whenever possible links to additional resources are provided for those readers seeking greater detail.

The ETDS Blueprint presents a conceptual framework that defines the core conditions for semantic interoperability, technical reference architecture components, governance principles, business models and data stewardship structures to facilitate efficient data sharing based on European values and rights.

The document provides guidance for:

- Creating the ETDS
- Onboarding ETDS participants
- Addressing additional requirements to ensure the success of the ETDS (e.g., an initiative/organisation and communication platform to coordinate semantic interoperability aspects and the standardisation processes on a European level,

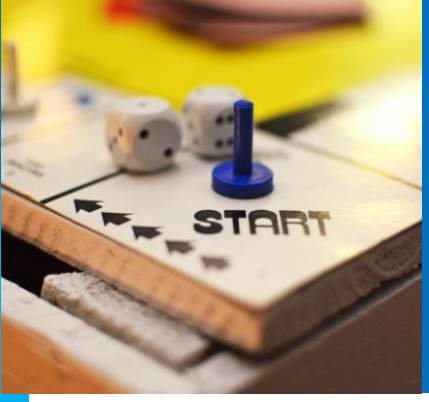
[1] European Data Space for Tourism. Retrieved in September 2023 from: https://www.tourismdataspace-csa.eu/

[2] Data Space for Tourism. Retrieved in Septembers 2023 from: https://dsft.modul.ac.at/about/

bringing national, regional, and local data sharing initiatives together and ideally consolidating them).

Key success factors for the ETDS have been identified:

- Before establishing the ETDS, the founding members should sign a **vision and mission statement for the data space** that clearly outlines why the data space is needed, describes how the data space will provide added value for real use cases, and what **governance and technologies** will be applied to ensure its operation.
- The ETDS should align with the European Tourism Transition Pathway.
- The ETDS should **increase the efficiency and reduce the complexity of the data-sharing process** for participants compared to sharing data bilaterally and independently outside the data space.
- The ETDS should provide clear guidance on **semantic interoperability standards** regarding data types, attributes, and value (e.g., OTA, AlpineBits, ODTA).
- The ETDS **value proposition** and **communication strategy** to potential participants should be based on **use cases** that will provide added value for data providers, data intermediaries, and data consumers.
- The ETDS should offer **coaching and training** support for participants (digitalisation, data literacy, data analytics, and sustainable transformation).
- The ETDS should maintain **a set of standard licences/licence agreements** that can be implemented by participating data providers and data intermediaries.
- The ETDS should feature **easily installable software** (e.g., **Connector as a Service**) for participants with limited IT skills and resources.
- The ETDS should be flexible and inclusive to support federation with other tourism data ecosystems and interoperability with other data spaces.
- The ETDS should define **data quality requirements** and offer **data-sharing support services** (e.g., quality validation support, duplicate detection, global-ID-matching, data enrichment, etc.).
- The ETDS should align with the building blocks of the Data Space Support Centre (DSSC) and the Code of Conduct for Data Sharing in Tourism to foster trust and security among data space users.



2 INTRODUCTION

The vital role that the tourism industry plays in the European economy is indisputable. In the year 2018, its direct contribution to the EU's GDP amounted to 3.9%, providing employment to an estimated 12.3 million people. When other economic sectors closely linked with the tourism industry are taken into consideration, the impact of tourism rises to 10.3%, providing jobs for 27.3 million employees in the EU. At the same time, the European tourism sector is comprised of about 2.3 million individual businesses[3]. While some of these businesses are major players, such as international airlines or global hotel chains, 99% of all tourism companies active in the EU are small or medium-sized enterprises (SMEs)[4]. This very fragmented sector with diverse stakeholders is currently facing challenges in fostering the innovation and efficiency required to retain and improve its competitiveness in the global marketplace. Moreover, recent international crises (e.g., COVID-19, supply chain disruptions, wars in Ukraine and the Middle East) have highlighted its vulnerability and made clear the need for solutions to increase the European tourism sector's resilience. As tourism is currently responsible for about 8% of global carbon emissions (with a rising tendency)[5], supporting environmental sustainability and helping the tourism sector realise its obligations to the European Green Deal is another major challenge that needs to be addressed.

To navigate the present challenges faced by European tourism, access to timely information based on reliable data is paramount. Data are now ubiquitous, reusable resources generated at unimaginable speed that can be shared, utilised in multiple contexts or combined to discover new insights and patterns. To fully realise the power of data, the European Commission has outlined the European Data Strategy[6], which envisions a single market for data where data flow within the EU and across sectors, tourism being one of them. The Transition Pathway for Tourism[7] also calls for investments in the digitalisation of the European tourism industry.

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[3] Davide Pernice and Ariane Debyse 2023: Fact Sheets on the European Union – Tourism. Retrieved in September 2023 from: https://www.europarl.europa.eu/factsheets/en/sheet/126/tourism

[4] European Commission, GROW and Joint Research Centre 2023: Annual Report on European SMEs 2022/2023: SME Performance Review 2022/2023. Retrieved in September 2023 from: https://single-market-economy.ec.europa.eu/smes/sme-strategy/sme-performance-review_en

[5] Sustainable Travel International: Carbon Footprint of Tourism. Retrieved in October 2023 from: https://sustainabletravel.org/issues/carbon-footprint-tourism/

[6] European Commission. European Data Strategy. Retrieved in September 2023 from: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

[7] Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (European Commission) 2022: Transition Pathway for Tourism. Retrieved in October 2023 from: https://op.europa.eu/en/publication-detail/-/publication/404a8144-8892-11ec-8c40-01aa75ed71a1

The European Commission identified the common ETDS as a key tool for achieving these strategic goals and supporting the transition of European tourism towards greater sustainability and higher digitalisation[8]. To implement this vision within the European tourism industry several key challenges must be addressed, including specifying an interoperable, easy to access and secure technical environment, and developing business models and data governance schemes that can help overcome participants' uncertainty and distrust[9]. Importantly, the ETDS must consider the specificities of the European tourism sector and the needs and wishes of its diverse stakeholders (i.e., SMEs, governmental agencies, research institutes, technology firms, and other tourism entities at the national, regional, and local scales of operation).

Currently, many tourism data sharing initiatives are being created throughout Europe. These include top-down approaches introduced by the EU and the tourism sector, such as smart destination projects initiated by cities or tourism projects initiated by Member States and tourism offices. There are also bottom-up approaches initiated by private stakeholders who have joined forces locally (e.g., EONA-X with Amadeus, Air France, SNCF, Aéroports de Paris, Accor Hotels, etc.). However, there is currently no solution with the potential to connect these initiatives, neither technically nor in the governance domain.

The common ETDS presented in this Blueprint is designed to become an overarching infrastructure ensuring interoperability for existing, as well as new, tourism data sharing initiatives through federation mechanisms. This ETDS Blueprint shall guide the creation of a shared, trusted, transparent, and user-friendly data ecosystem where all European tourism stakeholders, private or public, irrespective of their size or geographic location within the EU, can participate, collaborate and exchange data. Furthermore, it is essential that the ETDS can connect to and facilitate the exchange of information with other sectoral data spaces such as mobility, health, finance, agriculture, cultural heritage, green deal, energy, media, etc.

The ETDS can foster innovation in tourism through data sharing, the development of new data-driven products and the creation of new, high-value tourism jobs. By providing decision-makers with reliable information, the ETDS will enhance strategic planning within the tourism industry and lead to increased competitiveness, sustainability and resilience. The ETDS will create value by supporting emerging new services, quality job creation, improved stakeholder collaboration and the adoption of new business models.

It is important to note that the target audience for the ETDS Blueprint at hand includes prospective data space participants with various roles: from policymakers and developers of the data space technology to data contributors and data consumers of varying sizes (e.g., corporate stakeholders, SMEs) and scope (e.g., national, regional, local). Consequently,

[8] Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (European Commission) 2023: C(2023)4787 Communication from the Commission – Towards a Common European Tourism Data Space: boosting data sharing and innovation across the tourism ecosystem, 20 July 2023. Retrieved in October 2023 from: https://single-market-economy.ec.europa.eu/publications/communication-commission-towards-common-european-tourism-data-space_en

[9] Klein & Verhulst 2017

the relevance of the following sections for the readers may vary depending on their ETDS role and objectives.

The remainder of this Blueprint is organised as follows. **Chapter Three** presents the state of the art of data sharing for the European tourism sector, providing a summary of the existing sources of tourism-related data and their basic characteristics, as well as existing data sharing initiatives. After establishing the European tourism sector's current data sharing practices and the gaps in data availability, this Blueprint next follows the structure recommended by the Data Space Support Centre (DSSC)[10] and describes the requisite governance, technical and business building blocks of the common ETDS. **Chapter Four** presents in detail the governance requirements for the creation of the ETDS, followed by the technical requirements for the ETDS explained in **Chapter Five**. Then, in **Chapter Six,** possible business models and requirements for ensuring the long-term sustainability of the ETDS are presented. **Chapter Seven** elaborates upon ETDS use cases and illuminates the importance of use cases as a fundamental starting point in shaping the development and implementation of the ETDS. **Chapter Eight** concludes the Blueprint by outlining a roadmap for the deployment of the ETDS.

[10] Data Spaces Support Centre 2023: Conceptual Model of Data Spaces | Version 0.5 | September 2023. Retrieved in September 2023 from: https://dssc.eu/space/CME/176554182/Conceptual+Model+of+Data+Spaces+%7C+Version+0.5+%7C+September+2023

3 DATA WITHIN THE EUROPEAN TOURISM INDUSTRY: STATE OF THE ART

Before developing the ETDS Blueprint and drafting recommendations, it is essential to understand the current data practices within the European tourism sector. Building upon the efforts of the two CSAs (DSFT[11] and DATES [12]), this chapter provides an overview and analysis of the current state of data sharing within the European tourism sector, outlines tourism stakeholders' data needs and data sharing priorities.

3.1 Current EU Data Sharing Landscape

Over 900 tourism-relevant data sharing initiatives and data sources in the EEA, as well as relevant data sharing initiatives from other regions were identified through the desk research conducted by the two CSAs. These findings are summarised in the two separate data inventories that are available online: DATES Inventory[13], DSFT Tourism Data Inventory[14]. Together, these inventories cover 27 EU countries, 3 European Free Trade Association countries, 8 non-European countries, as well as supranational data sources, both at the European and multi-country level.

Analysis illustrated in **Figure 1** reveals that most tourism-related data concern the economic impact of tourism (77.3%), while data describing social impact is less available (22.3%). Furthermore, data are most prevalently available at frequency rates of annually or monthly, while data with a higher than daily frequency represent less than 5% of the overall data sources analysed. Another important observation is that most data (92.1%) are available in a processed format (i.e., manipulated to produce meaningful information) and characterised by a publication lag (95.6%). Also, analysis finds that tourism data are most commonly obtainable at national and local scales (i.e., NUTS 0 = 58.1% and LAU 1/2 = 54.3%), in part because not all intermediate data scales (i.e., NUTS 1/2/3) are defined for all EEA countries. In addition to the above, it is found that only 18.4% of the data are

[11] DSFT 2023: Preparatory Actions for the Data Space for Tourism: Tourism Data Inventory and Stakeholder Questionnaire, Summary Report (D2.2). Retrieved in October 2023 from: https://dsft.modul.ac.at/wp-content/uploads/2023/03/TDI-Summary-Report.pdf

[12] DATES 2023: Data Sharing initiatives inventory (D2.1). Retrieved in October 2023 from: https://www.tourismdataspace-csa.eu/wp-content/uploads/2023/10/DATES-D2.1-Data-sharing-initiatives-inventory-DEF.pdf; DATES 2023: Analysis of gaps and overlaps (D2.2). Retrieved in October 2023 from: https://www.tourismdataspace-csa.eu/wp-content/uploads/2023/09/DATES-D2.2-Analysis-of-gaps-and-overlaps_v2.1.pdf

[13] DATES Data Sharing Initiatives. Retrieved in October 2023 from: https://www.tourismdataspace-csa.eu/data-sharing-initiatives/

[14] DSFT Tourism Data inventory. Retrieved in October 2023 from: https://dsft.modul.ac.at/tourism-data-inventory/

currently available in a remotely accessible format, for example via an Application Programming Interface (API). Regarding the geographical distribution of the tourism data sources, high levels of heterogeneity are observed among European countries in terms of data themes and data frequency rates, while there is more homogeneity between countries regarding the abstraction of data available, such as the level of detail to which the presented data are processed.

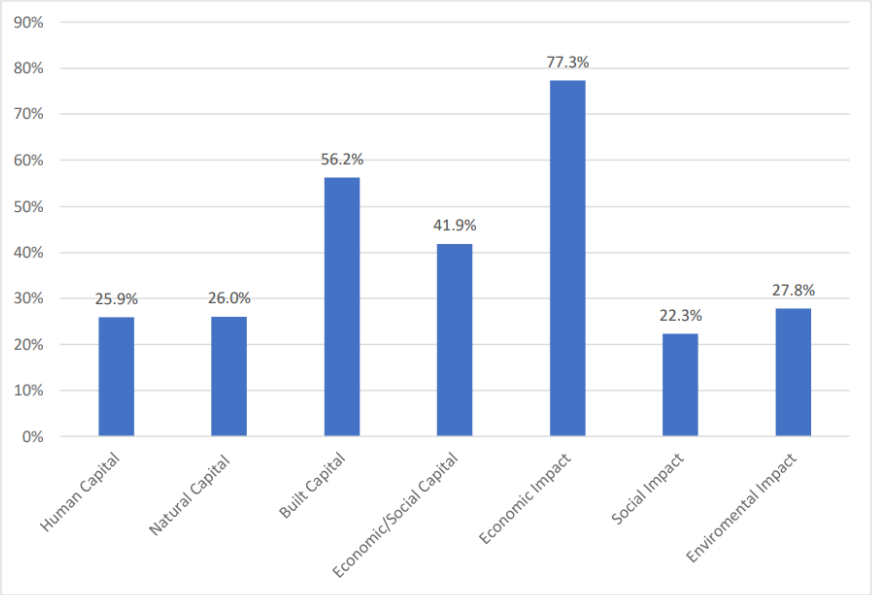


Figure 1 *Share of European data sources by theme, n=810*

(Source: DSFT 2023: Preparatory Actions for the Data Space for Tourism: Tourism Data Inventory and Stakeholder Questionnaire, Summary Report. Retrieved in October 2023 from: https://dsft.modul.ac.at/wp-content/uploads/2023/03/TDI-Summary-Report.pdf)

Most of the data initiatives included in the inventories provide a combination of private business datasets (e.g., data on the number of airline passengers), statistics (e.g., datasets published by public authorities), and context-specific information (e.g., information on the history of a place) (see **Figure 2** The taxonomy of data dimensions). These data are collected from authorised and/or certified partners and shared as open data in various formats (e.g., raw data, processed data, data-driven insights).

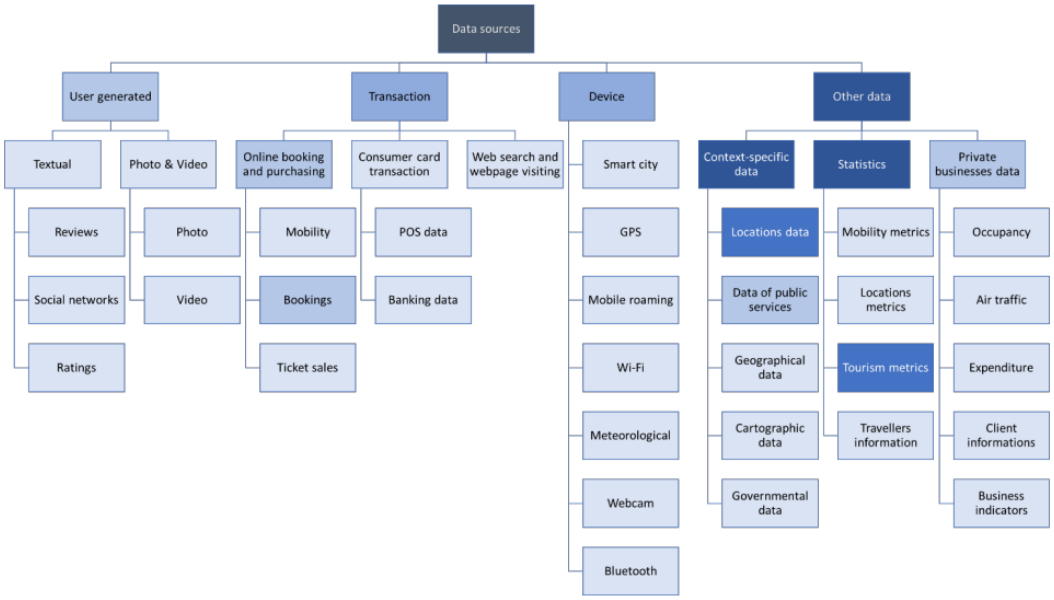


Figure 2 *The taxonomy of data dimensions*

(Source: DATES 2023: Analysis of gaps and overlaps. Retrieved in October 2023 from: https://www.tourismdataspace-csa.eu/wp-content/uploads/2023/09/DATES-D2.2-Analysis-of-gaps-and-overlaps_v2.1.pdf)

Based on the extensive analysis of the current state of the data sharing initiatives within the European tourism industry, conducted by both CSAs within the respective work packages and published in the above-mentioned reports, the following conclusions relevant for the set-up of the ETDS can be drawn:

1) Although the current data landscape is very heterogeneous, not all data themes or categories are equally available. Importantly, there is less data available regarding the social and environmental dimensions of tourism, and the ETDS should prioritise the inclusion of these data sets in order to support sustainable tourism development solutions.

2) Data monetisation is a big challenge and currently an underexploited potential for future use of data in the European tourism sector. The ETDS should help to overcome these challenges and help to facilitate future exploitation of tourism-related data.

3.2 Data Sharing Needs of European Tourism Stakeholders

In addition to analysing the existing tourism-related data available, both CSAs engaged with European tourism stakeholders in order to understand what data are needed and what opportunities and obstacles are affecting data sharing both within the tourism sector and across other related sectors. Both projects identified important business challenges influencing the core data practices of European tourism stakeholders, challenges which could be alleviated through having access to safe and reliable data sharing opportunities.

The opinions of tourism experts from across Europe regarding the general categories of tourism data, data usage practices, budget available for data purchases, data accessibility, data offering opportunities, technical specifications and other relevant topics can be summarised as follows:

(1) Economic impact data (e.g., visitor flows, demand and offer data, tourist arrivals, bednights etc.) have the highest value and priority, while natural capital data (e.g., size/surface area, climate, natural resources, etc.) have the lowest priority (See **Figure 3**).

(2) Data that relate to environmental impact and sustainability are perceived as highly valuable but, at the same time, are the most difficult to obtain (See **Figure 3**).

(3) Economic key performance indicators (KPIs), visitor flow/spatial/real-time data, and sustainability/climate change-related data are most frequently mentioned as currently difficult to access, but desired data categories (See **Figure 3**).

(4) The data that are accessible are often incomplete, not interoperable, and not timely updated.

(5) Availability of time and financial resources, insufficient data analytics skills among the tourism workforce and the lack of the sector's cooperation and collaboration regarding data sharing are considered to be significant limitations for both data analysis and data sharing.

	Human Capital		Natural Capital		Built Capital		Economic/ Social Capital		Environmental Impact		Economic Impact		Social Impact	
	Mean	σ	Mean	σ	Mean	σ	Mean	σ	Mean	σ	Mean	σ	Mean	σ
Value	0.83	1.05	0.45	1.20	0.83	0.97	1.09	0.85	1.24	0.83	1.49	0.74	1.25	0.84
Priority	0.66	1.11	0.36	1.20	0.61	1.09	0.82	0.97	1.17	0.92	1.44	0.75	1.23	0.90
Access	-0.47	1.14	-0.03	1.25	-0.21	1.23	-0.53	1.13	-0.88	0.92	-0.05	1.24	-0.41	1.17
Analysable	-0.04	1.06	0.00	1.20	0.13	1.14	-0.04	1.10	-0.39	1.15	0.44	1.09	0.27	1.16
Shareable	-0.04	1.13	0.35	1.17	0.22	1.15	0.03	1.14	0.08	1.22	0.39	1.20	0.40	1.18

Figure 3 *Perceptions for each theme of tourism data (means and standard deviations (σ)), n=201*

Note: Each dimension was measured using a five-point semantic differential scale, where -2 was "strongly negative" and +2 was "strongly positive". (Source: DSFT 2023, Preparatory Actions for the Data Space for Tourism: Tourism Data Inventory and Stakeholder Questionnaire, Summary Report. Retrieved in October 2023 from: https://dsft.modul.ac.at/wp-content/uploads/2023/03/TDI-Summary-Report.pdf)

Regarding financial resources, nearly 75% of SMEs, which are a very important subgroup of tourism stakeholders, report an annual data budget of €5,000 or less. The analysis shows that tourism experts consider different business models for sharing/obtaining data. Close to 47% of European tourism stakeholders would consider partnership schemes or similar mechanisms for organisations to exchange data-for-data without payment, whereas the most popular fee-based business models for obtaining data are subscriptions (61.8%) and one-time payments (50.5%). Alternatively, freemium-pay-per-use models, and freemium models with charges applied based on customers' needs were also mentioned.

Regarding the ways in which the stakeholders will participate in data sharing, it is likely that the most needed data will be provided by Hotel, Restaurant and Catering (HoReCa) companies, public authorities, and private organisations. At the same time, it is likely that the stakeholders most interested in retrieving data from the ETDS will be public authorities, tourism service providers, and DMOs. Finally, the most frequently mentioned final users of the proposed use case solutions are DMOs, HoReCa companies, and public authorities.

Regarding governance, there is a lack of maturity among tourism stakeholders on possible operational ways to organise data sharing ecosystems in general. Concerning the legal status of the analysed existing data sharing initiatives, most of them are associations of SMEs and DMOs, non-profit associations and research consortia. The technical requirements adopted vary according to the nature of each initiative. However, many reported using the same formats in which data can be downloaded and using APIs for retrieving and exchanging data. The most advanced initiatives include additional features such as the automatisation of data harmonisation, the handling of duplicate data, extract, transform, load (ETL) processing, scoring algorithm and the integration of different applications, including chatbots, data lakes and artificial intelligence[15].

Finally, analysis revealed a major concern among European tourism stakeholders regarding compliance with the General Data Protection Regulation (GDPR) when using, accessing, and sharing data. Most European tourism stakeholders ask for clear and transparent contracts, terms and conditions, and/or licences for data sharing. Another important finding is the recognition of the importance of standardisation and transparency in terms of IT systems, legal frameworks, methods for data collection, quality control measures, and definitions for key metrics, all of which also highlight the importance of risk reduction. Hence, the ETDS presents an opportunity to increase the adoption of European data standards, while keeping in mind the revealed gaps and preferences and the need for transparency, ease of use, and equal opportunity for all prospective users.

[15] DATES 2023: Identification of data typology and priority list of datasets, potential use cases and common building blocks with other data spaces. Retrieved in October 2023 from: https://www.tourismdataspace-csa.eu/wp-content/uploads/2023/07/DATES-D2.3-Identification-of-data-typology-and-priority-list...V1.1.pdf

4 GOVERNANCE REQUIREMENTS FOR THE EUROPEAN DATA SPACE FOR TOURISM

The establishment of a clear governance structure for the ETDS is crucial. Clear governance helps overcome distrust among data space participants, which is one of the major barriers to data sharing. Therefore, setting up a clear compliance chain that is built upon data sharing rules will serve as a fundamental building block of the ETDS. Given the diversity among European tourism stakeholders, as well as the high proportion of SMEs, an "atomic level" of data space governance is essential.

Tourism is a key industry for Europe since it contributes to more than 10% of its GDP, but it is also distinct since 99% of its companies (2.5+ million) are SMEs and micro-enterprises. The deliverables of both CSAs have demonstrated that the ETDS is an opportunity for SMEs to digitalise further, reduce their costs and develop new revenue streams. Therefore, it is crucial that the governance of the ETDS accommodates tourism SMEs as they will contribute to the wealth of the ecosystem when they innovate into niches that are too narrow for larger players, thus broadening the offering of the European tourism sector. Several characteristics of the ETDS need to be taken into account when deciding on an optimal governance approach and developing a sustainable business model for its future operation (for more details on business models, see **Chapter 6**):

- Complexity of the data space system, including the stakeholder composition, variety of data types, formats, and data volume
- Data quality, reliability, and security
- Interoperability and standardisation of data through shared protocols, methodologies, and data vocabularies
- Legislation (including differences at the national level)
- Accessibility and ease of use of the data

This chapter provides an overview of the governance framework designed specifically for the future ETDS, based on the research carried out by the DATES and DSFT CSAs and validated through several rounds of consultations with European tourism stakeholders. It also addresses the main issues associated with the proposed framework and its components. The ETDS governance framework presents a comprehensive set of collectively determined rules and processes specific to the ETDS and aimed at defining and coordinating all stakeholders' roles, rights and obligations in the data space ecosystem.

Due to varying levels of maturity among stakeholders within the data sharing ecosystem and the unpredictable outcomes of individual data sharing rules, time must be allowed for observation, learning, and assessment of the effects of each rule. This process will enable

the adaptation of regulations to align with the general public's best interests and the on-boarding of new technologies, including advancements in digital infrastructure, user interface, or artificial intelligence.

4.1 Building the governance of the ETDS initiative

Design of the ETDS governance framework requires decisions regarding the legal entity of the data space governance authority and the decision-making approach, as well as the design of the Rulebook.

4.1.1 Data governance authority legal entity and decision-making

There are multiple choices for setting-up the formal representation of the governance of a data space which, among others, include:

- Contractual arrangement with no formal entity
- Government agency (public)
- Association
- Private company
- Cooperative
- Others

While there is no one size fits all solution, the decision regarding the legal status of the data space governing body depends on:

- The mission statement of the ETDS (general/public interest, economic interest, etc.)
- The scope (national, regional, local, sector segment, etc.)
- Vision and preferences of the diverse data space participants.

Each option has drawbacks and advantages:

- **Contractual arrangement with no formal entity**: faster to put in place but complicated to deal with liabilities. This solution is not recommended.
- **Government agency:** large reach and political impact, but not best suited to private sector players.
- **Association:** This solution adapts well to public/private projects and allows for easy onboarding of new members, but can present difficulties in raising funds and might need complementary structures (e.g., private operating companies) for dealing with more operational/financial aspects. Based on consultation with tourism experts and a validation survey (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey Questionnaire**), an association is the stakeholders' preferences. As illustrated in **Figure 4**, European tourism stakeholders demonstrated a strong preference for a public or non-profit legal status of the ETDS.

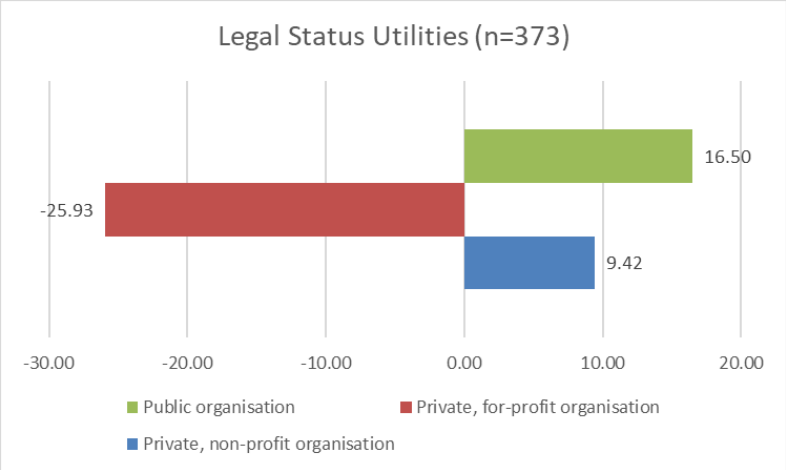


Figure 4 *European tourism stakeholder attitude towards the legal status of the future ETDS governing organisation*

- **Private company:** private actors might struggle to come to an initial agreement. Other challenges include complicated onboarding processes and difficulties in involving public sector stakeholders.
- **Cooperative**: governance constraints might be too stringent and may present difficulties in raising capital.

The next step is to define the internal decision-making processes, specifically who has the decision-making (voting) rights and how these should be cast. The choices include:

- One voting right per member.
- More voting rights for early members
- More voting rights for specific kinds of members (e.g., public players)
- Voting rights relative to capital ownership
- Voting rights relative to the members' activity in the data space (e.g., how many data assets are shared, etc.)
- Voting rights relative to the contribution to the data space (e.g., contribution to the technological infrastructure, etc.)

Recommendation 1: Legal Entity of the ETDS Governance Authority

- It is crucial the ETDS governance authority has a legal entity.
- Format should be collegial (i.e., no founding members with favourable voting rights
- European cooperative form (SCE) can be considered as an option.
- A variety of business models (e.g., membership, subscription or access fees) should enable access to all.

4.1.2 Designing a Data Governance Rulebook

The **ETDS governance authority** is the body responsible for creating, developing, maintaining, and enforcing a governance framework: the policies and rules of the data space, the so-called **data space governance framework or Rulebook**. The responsibilities of the ETDS governance authority include:

- According to the decision-making process of their choice, defining rules and policies (data space governance framework) for:
  - becoming an ETDS participant;
  - services;
  - resources; and
  - intermediaries.
- Define/implement the onboarding process (issuing membership credentials).
- Regulate the membership lifecycle (participant discoverability, verification).

The Rulebook represents all ETDS participants. Every entity taking part in the ETDS has to follow the compliance process defined by the data space governance authority.

These rules included in the Rulebook encompass:

- **Hard law**: EU and member state legislation that directly or indirectly relates to data or data sharing.
- **Soft law**: Standards, codes of conduct, guidelines, etc., that are not legally binding. Soft law rules cover a wide range of issues, including technical, business, ethical and security.
- **Internal rules**: Rules developed specifically between participants in a data space, such as business agreements/rules and context-specific data standards and policies.

The **ETDS governance authority** ensures that the Rulebook contains relevant regulations (hard law), helps the ETDS participants to agree on common standards and guidelines for implementation (soft law) and helps them to decide on internal rules.

Data spaces are innovative and complex projects that often move through unexplored terrains. As such, they are still in an open-ended development phase, often requiring pivoting and refinement. The governance of the ETDS initiative needs to be flexible enough to allow for such iterative development.

4.1.2.1 How does the Rulebook ensure compliance?

Compliance with the ETDS Rulebook **creates trust** in data sharing among data space participants. It ensures that trust components, such as business agreements, contracts, authorisations and consents, are respected by all parties. When collaborating with external entities, assessing the compatibility of joint use cases with the rules of the different data spaces involved is crucial. Infrastructure providers that enable data sharing through

technology must also comply with the rules detailed in the Rulebook. This approach prevents technology players from imposing their own policies without consultation with the communities involved.

4.1.2.2 Why are Rulebooks difficult to create and maintain?

The data sharing rules that will populate the Rulebooks of all data sharing initiatives can come from multiple places (regulations, guidelines, standards, etc.) and are formulated by multiple organisations all over Europe at many levels: EU level, Member State level, sectoral or cross-sectoral, regional, local, data space initiative level, etc.

It is hard for data space initiative operators to know precisely who does what, who decides on what, and to keep up to date with new regulations, standards, guidelines, etc. There are also multiple duplications, gaps, and overlaps that make the governance task of a single data space initiative cumbersome and costly.

Following the SITRA's Rulebook[16] for a Fair Data Economy, it is proposed:

- to create an ETDS Rolebook, which is a dynamic mapping of who does what and who decides on what within the ETDS ecosystem, encompassing all levels of participants.
- to federate all tourism data space initiatives throughout Europe by creating a Tourism Data Space Coordinating body.

4.2 Legal and Regulatory Frameworks for the ETDS

Having a broad understanding of the legal context is crucial for maintaining the integrity of data sharing in tourism, as well as establishing the rights and obligations of both data holders and end-users. This understanding also promotes transparency, flexibility, and adaptability to changes, such as those brought about by unpredictable events like the COVID-19 pandemic.

Since the ETDS will specifically serve the European tourism industry, it is essential that it is aligned with the current European legal frameworks for data sharing. This Blueprint maps the legal requirements for developing the ETDS at the EU-level while considering that some EU Member States may have more restrictive requirements and regulatory constraints that must be incorporated into the technical solution options for the development of the ETDS. Furthermore, having a clear legal reference framework will ensure that the governance structure of the ETDS can be updated whenever a change in the legal environment pertaining to data and their use is made. Thus, the following sections review and analyse all relevant EU policies, regulatory frameworks, new initiatives, and Codes of Conduct that are available to date concerning data sharing.

[16] Pitkänen and Luoma-Kyyny (Sitra) 2022: Rulebook for a fair data economy, version 2.0. Retrieved in October 2023 from: https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/

This review also identifies the pipeline of EU, national and regional initiatives to ensure that the ETDS is compatible with planned future investments. This task is essential to ensure that the ETDS will be able to grow organically within a fair, practical, and transparent legal framework[17], and should help reduce risk and uncertainty among ETDS participants around matters such as data privacy, data theft, and data ownership. To accomplish these goals, the main legal issues in data sharing are first identified before specifying the basic legal requirements for the development of the ETDS. A concise list of relevant EU legislation is then provided.

When establishing the ETDS, it is crucial to consider existing regulatory and legal mandates to ensure its long-term sustainability and the secure management of data. Additionally, the Code of Conduct on Data Sharing in Tourism[18] outlines a set of fundamental guiding principles, including interoperability, data usage rights, value and remuneration for data, liability, competition, security, intellectual property, transparency, data limitation, privacy, and data quality.

A list of the key legal requirements that the ETDS must adhere to for successful development is provided below.

- **GDPR Compliance:** the ETDS must adhere to GDPR regulations, ensuring data collection transparency, user rights, and security measures.
- **Alignment with the Data Governance Act and Data Act:** the ETDS should align with EU strategies to create a single data market, increase trust in data sharing, and harmonise data access rules.
- **FAIR[19] Principles:** the ETDS should follow FAIR principles for findable, accessible, interoperable, and reusable data management.
- **EU IPR and Copyright Protection:** Respect EU Intellectual Property Rights to ensure data quality, origin, and proper agreements for data provision.
- **Data Security & Confidentiality:** Prioritise data security beyond GDPR compliance and define clear user security responsibilities.
- **Contractual Agreements:** Establish clear terms and conditions for data sharing through contractual agreements.
- **IDSA Rulebook:** Consult the IDSA Rulebook[20] for guidance on various data-sharing scenarios, including data ecosystems and marketplaces.
- **SITRA Rulebook:** SITRA's Rulebook[21] for a Fair Data Economy provides contractual templates and resources for establishing a data sharing network. It sets out legal,

[17] Force 11, The FAIR Data Principles. Retrieved in October 2023 from: https://force11.org/info/the-fair-data-principles/

[18] European Travel Commission 2023: Code of Conduct on Data Sharing in Tourism. Retrieved in September 2023 from: https://etc-corporate.org/reports/code-of-conduct-on-data-sharing-in-tourism/#:~:text=The%20goal%20of%20the%20Code,partnerships%20in%20the%20tourism%20industry

[19] The FAIR data principles stipulate that such data should, in principle, be findable, accessible, interoperable and reusable. See Force 11, The FAIR Data Principles. Retrieved in October 2023 from: https://force11.org/info/the-fair-data-principles/

[20] International Data Spaces Association 2023: IDSA Rulebook. Retrieved in October 2023 from: https://docs.internationaldataspaces.org/ids-knowledgebase/v/idsa-rulebook/front-matter/readme

[21] Pitkänen and Luoma-Kyyny (Sitra) 2022: Rulebook for a fair data economy, version 2.0. Retrieved in October 2023 from: https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/

business, technical, and administrative regulations, along with ethical principles that organisations within data sharing networks must adhere to.

Other general legal aspects are also critical to guarantee compliance, data security, and ethical data management. These aspects encompass, but are not limited to the aspects summarised in the chart below (see **Figure 5**):

Figure 5 *Regulatory aspects of a data space governance*

As anticipated in the European Strategy for Data, a number of legislative instruments have been developed to facilitate a governance framework within the EU and across sectors. This framework should enable a data-agile economy and help address common data sharing challenges. The Joint Research Centre[22] identified several key non-functional requirements for data spaces: Inclusivity, Fairness, Sustainability, Trustworthiness, and Transparency. Appendices C, D, and E elaborate the aforementioned legislative instruments which are pertinent for the development of common European data spaces. While not meant to be exhaustive, this catalogue provides an overview compiled from EU policy documentation and strategies organised in the following way:

- Policy & Regulation (**Appendix C: Catalogue of key EU-level policies and regulations**).
- Programmes, initiatives, and resources (**Appendix D: Catalogue of relevant EU-level programmes and resources**).
- Structures (**Appendix E: Catalogue of relevant EU-level structures**).

[22] Data Spaces. Joint Research Centre. Retrieved in September2023 from: https://joinup.ec.europa.eu/collection/semic-support-centre/data-spaces#:~:text=ask%20for%20support%3F-,What%20are%20Data%20Spaces%3F%C2%A0,-According%20to%20the

Although the European Data Strategy offers general guidelines and principles for governing and sharing data, specific legal frameworks for data spaces are envisioned to be created and put into effect gradually. The compilation of EU policy documentation and strategies in these catalogues should serve as support for addressing a range of important legal matters concerning the ETDS, including data privacy, security, intellectual property, liability, and more when it comes to data sharing in a data space environment. A legal framework will ensure that data sharing and utilisation within data spaces align with existing laws and regulations.

In summary, a solid understanding of the legal frameworks for data spaces is paramount to safeguard privacy, ensure data protection, uphold legal compliance and establish a fair and transparent environment for data sharing and collaboration among stakeholders in the tourism industry. This legal foundation is crucial for the success and sustainability of the ETDS.

4.2.1 What are the legal issues in data sharing that the ETDS should consider?

From a legal standpoint, various factors impact the creation and operation of the ETDS. These include data protection, competition law, contracts and intellectual property rights. Navigating these complexities is crucial for the lawful and effective establishment of the ETDS and other European data spaces in the digital realm.

The development of the European Tourism Data Inventory and the consultations with stakeholders revealed common legal obstacles in using, accessing, and sharing data[23]. Many stakeholders are notably concerned about GDPR compliance. Other legal issues include defining data property, revenue-sharing models, unclear data ownership, and usage restrictions. Additionally, stakeholders face challenges in cross-institutional collaboration and have ethical concerns about data permissions and recognition for their contributions.

In the DSSC's Starter Kit for Data Space Designers[24], three main areas with potential legal issues were identified:

(1) Cross-cutting legal frameworks, encompassing contract law, data protection, intellectual property, competition law, and cybersecurity;

(2) organisational aspects involving mapping data governance systems and determining decision-making rights; and

(3) the Contractual dimensions, focusing on developing models, templates, and architectures for data exchanges.

[23] DSFT 2023: Preparatory Actions for the Data Space for Tourism: Tourism Data Inventory and Stakeholder Questionnaire – Summary Report. Retrieved in October 2023 from: https://dsft.modul.ac.at/wp-content/uploads/2023/03/TDI-Summary-Report.pdf

[24] Data Spaces Support Centre, 2023: Starter Kit for Data Space Designers | Version 1.0 | March 2023. Retrieved in July 2023, from: https://dssc.eu/space/SK/29523973/Starter+Kit+for+Data+Space+Designers+

The essential issues are identified and elaborated upon in detail below:

- **Substantive rights and obligations related to data**: Data Protection is vital due to privacy concerns, with GDPR imposing strict requirements on data processing, storage, and sharing. Intellectual property issues can arise when transferring or licensing data protected by copyright or other rights, potentially leading to ownership disputes.
- **Data contracts**: Legal issues in data contracts encompass contract law, data protection, intellectual property, competition law, cybersecurity, and enforcement regulations. Modular contractual terms and guidelines can ensure compliance.
- **Competition law**: Preventing anti-competitive behaviour is crucial, as data misuse can harm competition. Data sharing should avoid anti-competitive practices.
- **Organisational aspects**: These pertain to governance, operational agreements, and disputes over data ownership, confidentiality breaches, or contract violations. Clear governance frameworks and decision-making processes are necessary to address these issues.
- **Techno-legal interoperability**: This involves seamless coordination between technology and legal systems. Challenges include a lack of a common framework for data exchange and conflicting legal requirements, which hinder interoperability and data space implementation.

Additionally, fragmentation among Member States poses a significant risk to the realisation of a common ETDS and the continued advancement of a truly unified single data market within the European Union. Hence, it is necessary for initiatives in different Member States related to data spaces to adhere to similar interoperability requirements, both in terms of technical specifications and regulatory compliance.

4.3 The holistic governance of the ETDS

4.3.1 Creating and using the ETDS Rolebook

The Rolebook is an open, transparent, and dynamic registry of roles and bodies involved in data sharing. Role refers to the set activities that the one performing the role is expected to do. Rights and duties (obligations) can be associated with the role. Bodies are formal or informal organisations participating in the data-sharing governance processes by creating, implementing, or enforcing the rules. The Rolebook would comprehensively document “Who does what” and “Who decides what” and establish an interconnected network of data-sharing decision-making entities.

The Rolebook aims to increase clarity and enable stakeholders at all levels (EU, member states, data spaces) to easily map the current data governance structures and their respective scope. Together with the Rulebook approach, it provides a comprehensive framework for European data governance. The roles and bodies presented in the Rolebook

could be referenced from the Rulebook and vice versa. The Rolebook would also build a common understanding of the possible policy interventions needed to ensure the continuity of those roles and functions that are evaluated critically from the perspective of resilience and a functioning market.

The Rolebook will map all key players of the EU data sharing ecosystem at all levels, not only those related to the tourism sector. All the key documents containing rules they publish (regulations, standards, guidelines, code of conducts, etc.) will be published in an open rulebook library, using the ODRL format. Tourism data space initiatives will be able to reuse all elements of the open rulebook library, connected to the ETDS Rolebook, in order to build their own data space rulebook.

Figure 6 illustrates an example Rolebook and Open Rulebook library for the creation of the Rulebook of a mobility data space in Finland.

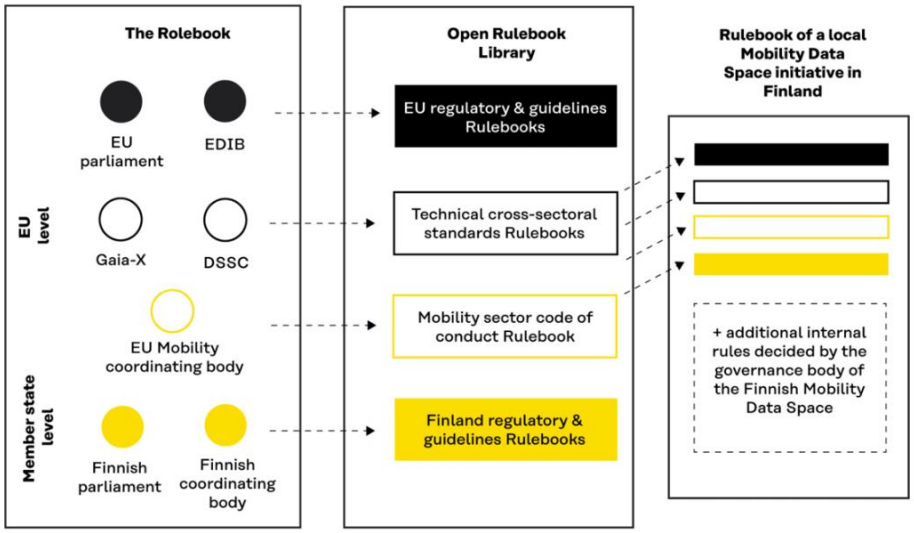


Figure 6 *Example of a data space Rolebook and Rulebook*

(Source: Sitra: Towards a Holistic EU Data Governance: Taking stock of the progress of the EU Data Strategy and proposals. Retrieved in October 2023 from: https://www.sitra.fi/en/publications/towards-a-holistic-eu-data-governance/)

4.3.2 Setting-up an EU-level governance body

The key organisations to be involved in the ETDS management include the European Commission, Eurostat, national statistics offices, research institutions, the DSSC, and non-governmental organisations. In the medium-term, an interface with the DSSC needs to be created to ensure seamless interoperability with other data spaces. It is also key to ensure representation of the private sector, including both large businesses, SMEs and micro-enterprises. In the public sector, destinations also have a key role to play since most initiatives will materialise at the local level.

Recommendation 2: Membership of the European Tourism Data Space (ETDS)

- European Commission
- Eurostat and representatives of national statistics offices
- Sectoral research institutions
- Sectoral non-governmental organisations
- Representatives of destinations
- Representatives of the tourism industry
  - Large businesses
  - SMEs
  - Micro-enterprises
- Representatives of local, regional or national data spaces

As illustrated in **Figure 7**, none of these organisations should manage the ETDS alone. Instead, it should be governed by a consortium of experts from the aforementioned institutions and led by a European-level organisation endorsed by the European Commission. Hence ETDS's governance is a two-tier model consisting of the **ETDS Governing body** overseeing the strategic development of the data space and the **expert working groups** managing the data space on the tactical and operational levels. ETDS governance is best described as a participatory inclusive structure with strong involvement at the institutional level.

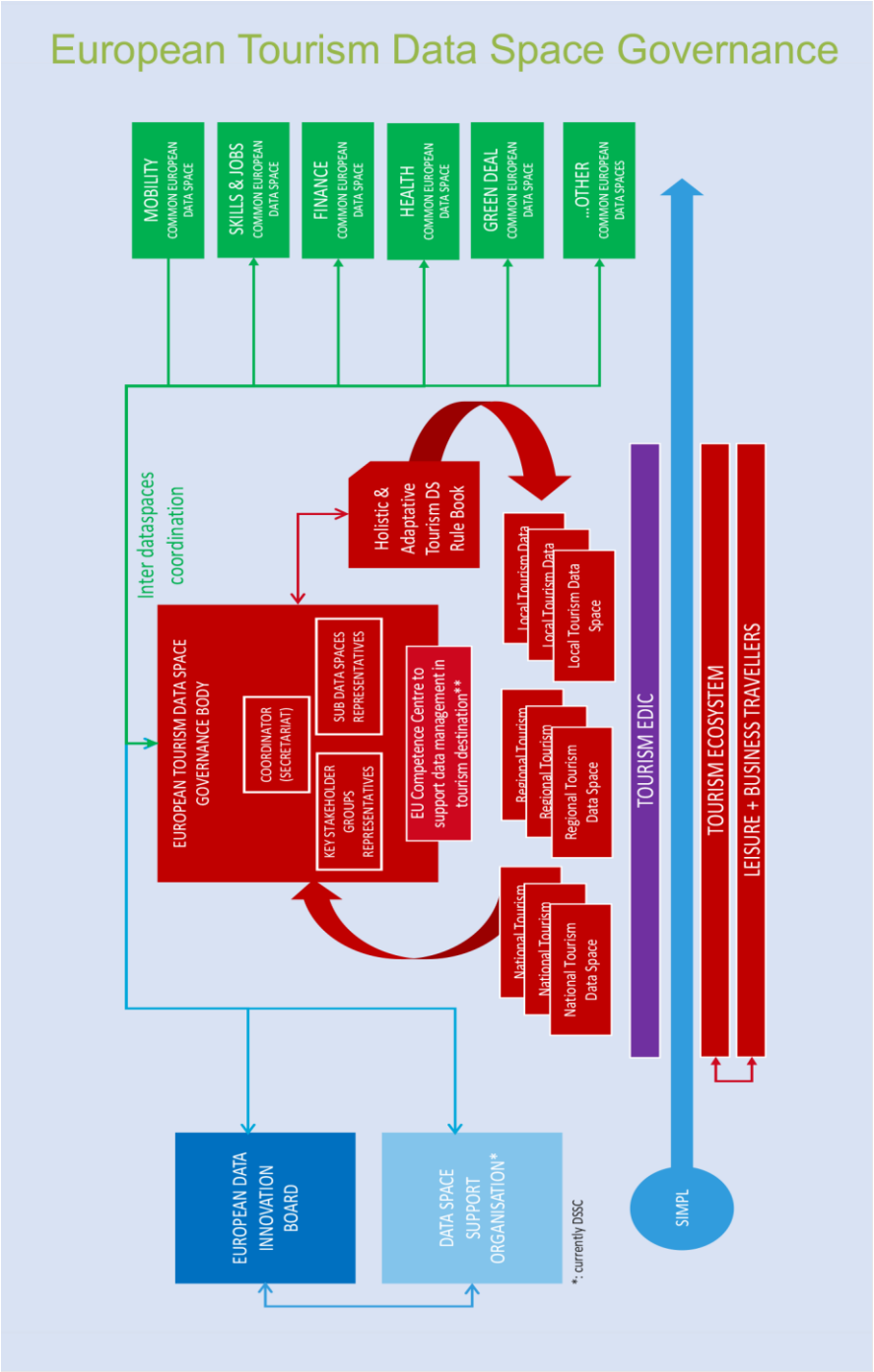


Figure 7 *ETDS governance model*

The **ETDS Governing body** should be a European-level institution structured as either a public body or a not-for-profit public-private partnership endorsed by the European Commission, which **oversees** the ETDS **operations** and ensures **continuous monitoring** of the compliance with the standards and procedures for ETDS participants. These functions can be performed by a tourism-specific **European Digital Infrastructure**

Consortia (EDIC) initiated by several Member States with the European Commission[25]. Accountability will be crucial, especially since trust is a clear requirement for the ETDS to gain traction. It is, therefore, recommended that the ETDS governing body be a legal entity. These recommendations are based upon consultations with tourism experts, and a validation survey (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey Questionnaire**) was used to determine stakeholders' preferences. **Figure 8** shows the strong negative sentiment towards a privately funded ETDS.

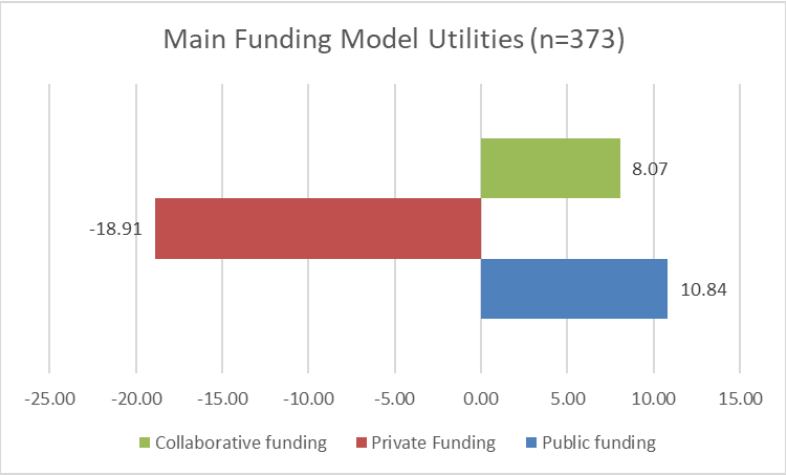


Figure 8 *European tourism stakeholder attitude towards the funding model of the future ETDS governing organisation*

4.4 Composition and tasks of the ETDS governance body

At the operational level, it is recommended that the ETDS governance body is supported by participatory working groups composed of tourism experts and ETDS participants representing a diverse range of public and private tourism stakeholders. The role of the expert working groups is to develop **data quality standards** and **methodologies, set up transparent** and **accessible data exchange processes**, **share** use cases and best practices, and **provide expert support and education** to the ETDS participants. This participatory structure would create a level playing field for the diverse tourism stakeholders (e.g., SMEs), promote democratic decision-making, and enable bi-directional communication between the ETDS governing body and participants. Importantly, the openness and accessibility of the ETDS ecosystem should not compromise its stability. These recommendations are supported by findings from stakeholder consultations and the results of the validation survey (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey**

[25] European Commission 2023: Communication from the Commission - Towards a Common European Tourism Data Space: boosting data sharing and innovation across the tourism ecosystem. Retrieved in October 2023 from: https://single-market-economy.ec.europa.eu/publications/communication-commission-towards-common-european-tourism-data-space_en

Questionnaire). **Figure 9** indicates the perceived importance of coordinating tasks, with high priority placed on maintenance, innovation and strategic decision-making.

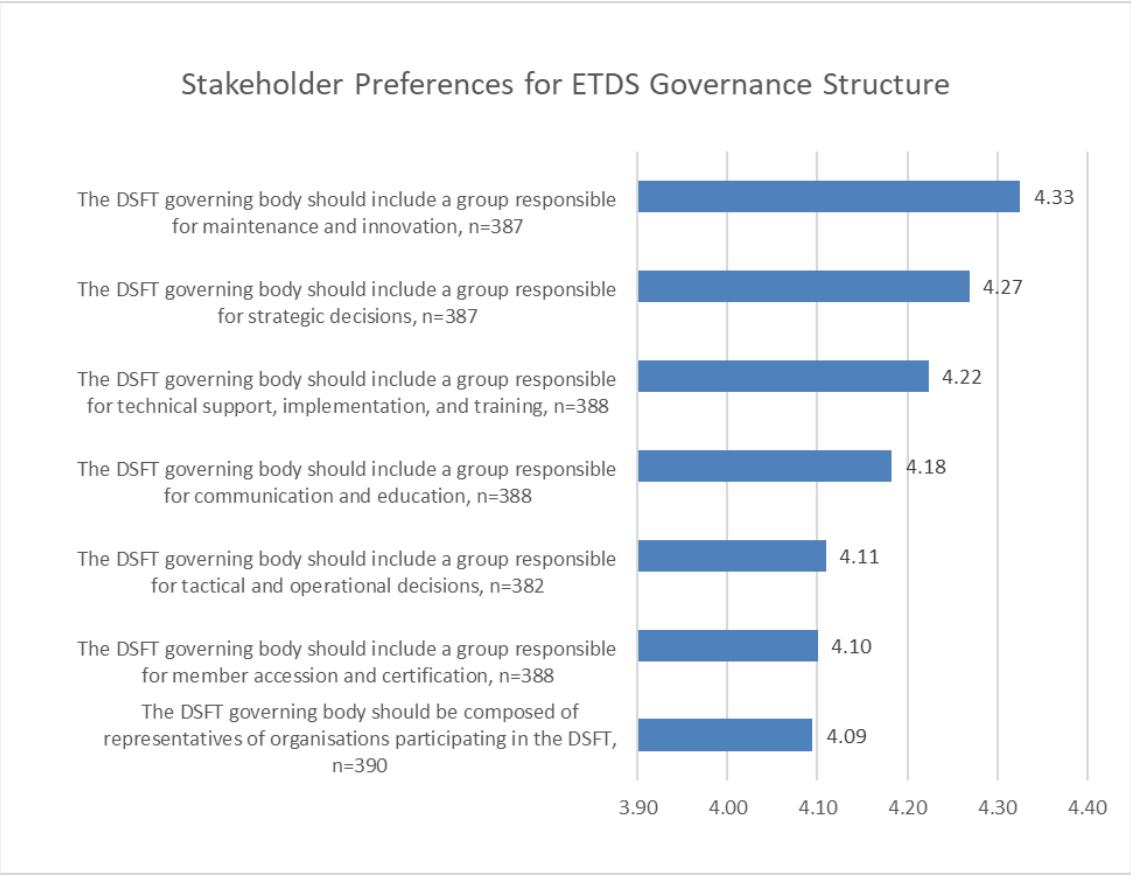


Figure 9 *European tourism stakeholder preferences for governance structure options for the ETDS*

Institutions like ministries, EU bodies, research institutions, and other relevant entities can play important roles in supporting and participating in the governance of the ETDS. Here are some potential **roles** they can fulfil:

- **Policy Guidance:** Ministries and governmental bodies can provide policy guidance and regulatory support to the governance structure. They can contribute to the development of regulations, standards and guidelines related to data management, privacy, and security in the tourism industry. Their involvement ensures alignment with national or regional strategies and legal frameworks.
- **Funding and Resources:** Organisations such as research institutions or EU bodies can provide funding opportunities, grants or resources to support the activities of the governance body. This support can enable the implementation of projects, research initiatives, capacity-building programs and technical infrastructure development within the data space. Funding and resources contribute to the sustainability and effectiveness of the governance structure.

To ensure the sustainability of the ETDS and its governance body, several supporting roles (upon which business models could be developed) are recommended:

- **Research and Data Expertise:** Research institutions can bring their expertise in data analysis, modelling and research methodologies to the governance structure. They can contribute to data-driven insights, market analysis and evaluation of the impact of data initiatives in the tourism industry. Research institutions can also collaborate on joint research projects to advance knowledge and practices in tourism data management.
- **Technical Expertise and Standards Development:** Institutions with technical expertise, such as standardisation bodies or technology research centres, can support the governance structure by providing guidance on technical aspects of data management. They can contribute to the development of industry-specific data standards, interoperability frameworks, or data exchange protocols relevant to the tourism sector.
- **Collaboration and Networking:** Institutions can facilitate collaboration and networking opportunities for the governance body. For instance, EU bodies may organise events, conferences or workshops where stakeholders from the tourism industry and relevant institutions or other industries can connect, exchange knowledge, and share best practices. These collaborative platforms foster partnerships, facilitate knowledge exchange and contribute to the credibility and visibility of the governance structure.
- **Advisory and Consultative Roles:** Institutions can serve in advisory or consultative roles within the governance structure. They can provide expert advice, guidance and strategic insights on emerging trends, technological advancements and policy developments in the tourism industry. Their input ensures that the governance body remains informed, up-to-date and aligned with the broader industry and regulatory landscape.
- **Evaluation and Impact Assessment:** Institutions can contribute to evaluating the effectiveness and impact of the ETDS governance initiatives. They can conduct independent assessments, impact studies or audits to assess the outcomes, benefits, and challenges associated with the governance structure. This evaluation helps ensure accountability, transparency and continuous improvement of the data space governance efforts.

Some of the aforementioned roles (e.g., advisory, collaboration) can be fulfilled by data intermediaries – data space actors that connect the dispersed segments of the data space ecosystem and help create efficient and ethical conditions for data sharing. The Data Governance Act specifies that these data intermediaries will function as **neutral third parties** that connect individuals and companies with data users. The services they could provide include the following:

- **Data aggregation**: ensuring standardisation and aggregation of tourism-related data from various sources.

- **Harmonisation:** harmonising data across regions, ensuring that diverse data sources align with standardised concepts, taxonomies and classifications.
- **API Integration for Travel Agents**: developing APIs that allow travel agencies and operators to seamlessly integrate standardised tourism data into their systems. This could well be the case of a data space connector provider.
- **Data Analytics and Insights**: offering analytics tools and insights derived from standardised data to help tourism stakeholders make informed decisions.
- **Educational Services**: providing trainings and educational resources to tourism stakeholders on how to effectively use standardised data for accurate estimations.

One specific kind of Data Intermediary is the Personal Data Intermediary (PDI). The PDI will play a very important role in the ETDS as it will allow travellers to share their personal data seamlessly and with control between their multiple tourism digital services. The trust in PDIs relies, for the most part, on the notion of consent. Following the Data Governance Act, all Data Intermediary services will be required to notify their national regulator and will have to assess their neutrality regarding data sharing practises. In October 2023, the notification process is in its very early phase and there remain multiple issues to address within the community of practice, including:

- What does neutrality for a Data Intermediary entail?
- Which tools involved in the data spaces are or are not considered Data Intermediaries (e.g., is a marketplace always considered a Data Intermediary)
- Will the different national regulators be coherent?

It is recommended the ETDS considers encouraging private entities to provide data intermediary services and to act as facilitators for SMEs and micro-enterprises in order to enable them to easily locate relevant data or implement solutions.

Figure 10 below summarises the building blocks of the governance of ETDS. More information on the key components is listed in the recommendation box underneath.

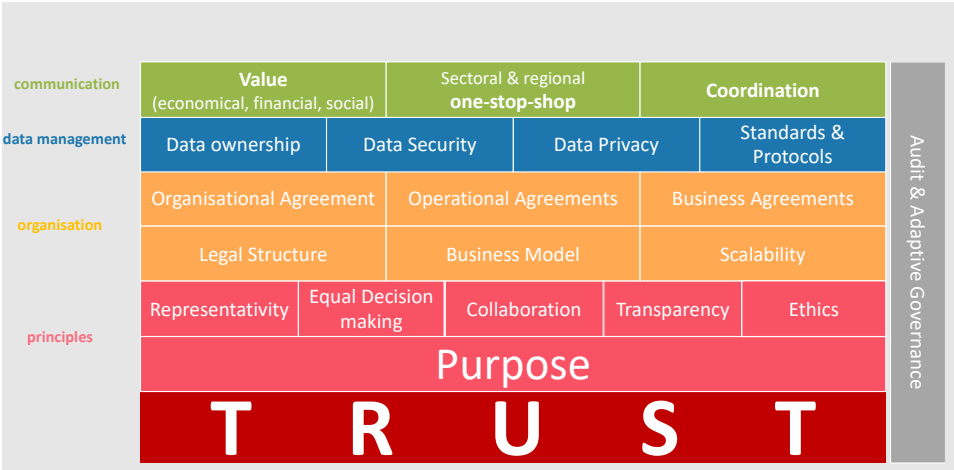


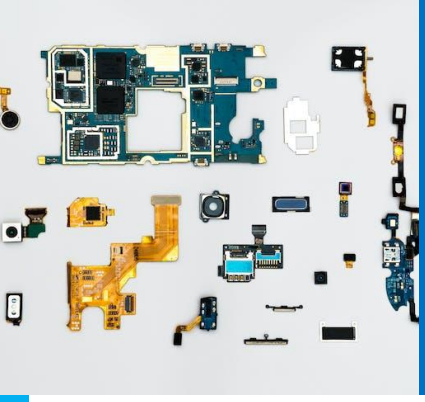
Figure 10 Key building blocks to establish a working ETDS

Recommendation 3. Building an operational governance for the ETDS

- Draw a purpose/mission statement for what the ETDS wants to achieve, and what it does not.
- Set decision making, transparency principles and how ethical questions will be addressed (when relevant). In that case, the ETDS may want to establish an external ethics committee to avoid any conflict of interest.

It is critical that the value of the ETDS is assessed and measured in order to help it develop and to attract new members. Value generated by the data space should be measured and communicated:

- Measure continuously the value created by the ETDS.
- The ETDS may consider asking aspiring members to report on specific KPIs to gain access.
- Regularly audit the efficiency and development of the ETDS, referring to the initial purpose to ensure the right governance is applied.
- If differences are identified, the governance body should take action. This can be through adaptation to the governance rules, ensuring however the purpose is followed.



5 EUROPEAN TOURISM DATA SPACE TECHNICAL SPECIFICATIONS

The core function of a data space is to broker trust between participants and to negotiate available data contracts. A data space enables control over data sharing and creates value for all involved parties. A data space is both a multi-organisational agreement and a supporting technical infrastructure for data sharing.

5.1 ETDS technical context

This initial section provides basic information about current initiatives relevant to data spaces and their expected evolution in the near future, with focus on those deemed most influential: DSSC, IDSA, Gaia-X, the Data Space Business Alliance (DSBA), SOLID, and SIMPL. Following this short overview, recommendations about their possible adoption during ETDS deployment are provided.

5.1.1 DSSC

The **DSSC** has been actively involved in shaping the Data Space Blueprint[26], placing particular emphasis on the DSSC Glossary[27], the data space Conceptual Model[28], a first description of the technical Building Blocks[29] as well as an initial Collection of Technical Standards[30]. Detailed explanations of the DSSC and its implications for the ETDS are provided in **Appendix F**: Data Space Support Centre.

[26] Data Spaces Support Centre 2023: Conceptual Model of Data Spaces | Version 0.5 | September 2023. Retrieved in September 2023 from: https://dssc.eu/space/BPE/179175433/Data+Spaces+Blueprint+%7C+Version+0.5+%7C+September+2023

[27] Data Spaces Support Centre 2023: DSSC Glossary | Version 2.0 | September 2023. Retrieved in October 2023 from: https://dssc.eu/space/Glossary/176553985/DSSC+Glossary+%7C+Version+2.0+%7C+September+2023

[28] Data Spaces Support Centre 2023: Conceptual Model of Data Spaces | Version 0.5 | September 2023. Retrieved in September 2023 from: https://dssc.eu/space/BPE/179175433/Data+Spaces+Blueprint+%7C+Version+0.5+%7C+September+2023

[29] Data Spaces Support Centre 2023: Building Blocks | Version 0.5 | September 2023. Retrieved in October from: https://dssc.eu/space/BBE/178421761/Building+Blocks+%7C+Version+0.5+%7C+September+2023

[30] Data Spaces Support Centre 2023: Collection of Standards and Technologies landscape | Version 1.0 | October 2023: Retrieved in October 2023 from: https://dssc.eu/space/SE1/185794561/Collection+of+Standards+and+Technologies+landscape+%7C+Version+1.0+%7C+October+2023

5.1.2 IDSA

The **IDSA** has taken a distinctive path by publishing the IDSA Rulebook 2.0.[31] This publication offers a comprehensive understanding of the data space concept along with guidelines for its implementation across diverse technical strategies. Additionally, the IDSA takes the lead in the development of the IDS data space protocol, which is being implemented by some of the most advanced data space connectors[32]. Detailed explanations of the IDSA and its implications for the ETDS are provided in **Appendix G**: IDSA.

5.1.3 Gaia-X

The **Gaia-X**[33] initiative distinguishes itself with the most mature trust framework, a rigorous compliance process, along with the required software infrastructure to operationalise the onboarding process. Detailed explanations of Gaia-X and its implications for the ETDS are provided in **Appendix H**: Gaia-X.

5.1.4 DSBA

The **DSBA**'s mission is dedicated to fostering technical convergence among the main data space initiatives. It strives to define a common data space framework while defining the roles that each initiative can fulfil. The result of this analysis is included in the Technical Convergence Discussion Document (v2.0)[34].

5.1.5 SOLID

SOLID is an emerging solution that explores the potential of other decentralised architectures such as Web 3.0. SOLID envisions a future where users, or in the case of tourism, the travellers themselves, have much greater control over their data, driving a paradigm shift towards self-sovereignty. This approach has been explored by initiatives such as the Europeana Aggregators' Forum[35], underlining a shift towards more user-centric and decentralised data governance. Detailed explanations of SOLID and its implications for the ETDS are provided in **Appendix I**: SOLID.

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[31] International Data Spaces Association 2023: IDSA Rulebook. Retrieved in October 2023 from: https://docs.internationaldataspaces.org/ids-knowledgebase/v/idsa-rulebook/front-matter/readme

[32] International Data Spaces Association 2023: Data Connector Report. Retrieved in September 2023 from: https://internationaldataspaces.org/wp-content/uploads/dlm_uploads/IDSA-Data-Connector-Report-92-No-8-September-2023-3.pdf

[33] Gaia-X. Retrieved in October 2023 from: https://gaia-x.eu/what-is-gaia-x/about-gaia-x/

[34] Data Space Business Alliance 2023: Unleashing the Data Economy: Technical Convergence: Discussion Document Version 2.0. Retrieved in October from: https://data-spaces-business-alliance.eu/wp-content/uploads/dlm_uploads/Data-Spaces-Business-Alliance-Technical-Convergence-V2.pdf

[35] SOLID-based Decentralised Aggregation Task Force 7 30. Retrieved in July 2023 from: https://pro.europeana.eu/project/solid-based-decentralised-aggregation-task-force

5.1.6 SIMPL

SIMPL is an EU-funded initiative under the Digital Europe Programme[36], focusing on streamlining cloud-to-edge federation within major EU data spaces. The introduction of SIMPL (Smart Middleware) marks a significant advancement in technological infrastructure. In particular, its main goal is to provide data space operators with a common denominator technical foundation that will ensure adequate levels of trust, security, ease of access, adaptability, and interoperability. SIMPL is positioned as a mandated requirement for all European sectoral data spaces, which underscores its critical role in facilitating efficient data processing and management. SIMPL is closely aligned with the DSSC and is committed to implementing DSSC compliance software in line with their specifications and recommendations. It holds significant promise within the data spaces domain. However, given that the project is yet to commence, and its initial outcomes are not anticipated until the final quarter of 2024, it is unfeasible to provide detailed analysis in relation to the ETDS.

5.1.7 Summary of key data space initiatives

Based on the above discussion, the characteristics of each data space initiative are summarised in **Table 1** below. While each initiative will continue to develop, anticipated strengths and weaknesses for each solution are also identified relative to the context of the ETDS.

[36] The DIGITAL Europe Programme – Work Programmes. Retrieved in October 2023 from: https://digital-strategy.ec.europa.eu/en/activities/work-programmes-digital

Table 1 *Key features of data space initiatives*

Aspect/ Initiative	Primary Focus	Origin	Technology Base	Key Features	Use Cases	Governance	Strengths	Weaknesses
Solid	Decentralized data ownership and web applications	Developed by Sir Tim Berners-Lee and the MIT	Web standards, Linked Data	User-owned data stores (PODs), data control	Decentralized social applications, personal data management	Open-source community	User-centric data control, promotes data privacy	Limited adoption, complexity in integration, although steps ahead have been made
Gaia-X	European data infrastructure and cloud services	European Union initiative	Cloud, federated data infrastructure	Federated services, data sovereignty, cloud framework	Cloud and data services, European digital sovereignty	Consortium of European companies and organisations	Supports digital sovereignty, strong EU backing	Complex governance, implementation challenges
IDSA	Secure data sharing and data spaces	European Commission initiative	Data sovereignty, secure data sharing	Data sovereignty, secure exchange	Cross-industry data sharing, secure data ecosystems	Association of companies and research institutions	Standardised secure data sharing, cross-industry applicability	Requires broad industry collaboration, still evolving
FIWARE	Open-source platform for smart solutions	EU's Future Internet Public-Private Partnership	Open source, IoT, smart applications	IoT integration, smart solutions, APIs	Smart cities, IoT, industry 4.0	FIWARE Foundation	Versatile IoT solutions, strong EU support	May require technical expertise, IoT focus limits scope
SIMPL	Cloud-to-edge federation for major EU dataspaces	European Union initiative	Middleware platform to support data access and interoperability among European data spaces	Open-source library for data interoperability, supports various data formats and protocols	Middleware Platform	European Commission support	Enables seamless data exchange between different systems	Adoption and standardisation Not currently operational
DSBA	Collaboration for data spaces	Collaboration of IDSA, Gaia-X, FIWARE and BDVA	Data spaces, interoperability	Promote interoperability, standards	Data space collaboration, cross-sectoral	Alliance of multiple organisations	Fosters collaboration, promotes interoperability standards	Still in development, lacks widespread recognition
DSSC	Support for data space initiatives	Supports European data space initiatives	Support and guidance for data spaces	Facilitate development of data spaces	Support and coordination for data space projects	European Commission support	Provides essential support and coordination	Dependent on EU policies and funding

5.2 Data Space Intermediaries

Data space intermediaries provide some common technical functionality to the whole data space, including:

- Identity management
- Trust anchors (accreditation authorities, notary services)
- Federated Resource Catalogue of accessible offered data
- Logging and auditing (these services are usually grouped in what is known as a Clearing House)
- Vocabulary provider (ontologies, reference data models, etc.)
- Other:
    - Contract negotiation service
    - Personal data intermediary
    - App Store, Service Catalogue

5.3 Data Space Connectors

Data space connectors facilitate and orchestrate the sharing of data assets, while enforcing requirements set by the data provider. A connector includes policies, configuration and other metadata artefacts that can run on any cloud infrastructure, on-premises or on an edge device. The existing connectors can be classified under two main categories: connectors based on previous IDS specifications and connectors following the new IDS specifications[37]: The main characteristics of the new protocol include:

- Reliance on well-known standards to define the data product and data usage policies: **DCAT** (Version 3.0) and usage control expressed as **ODRL** Policies.
- Decoupling of control and data planes in data transfer technologies, making it possible to use any transfer protocol or technology available.

There are two main connectors following the principles of the new IDS protocol: the **Eclipse Data Space Connector** and the **FIWARE Data Space Connector**. Regarding connectors, the Eclipse Data Space Connector is a specific technology component used within the IDS ecosystem. It helps organisations connect to and participate in the IDS network. It plays a crucial role in enabling data sharing, access control, and data security while adhering to the IDS principles. On the other hand, the FIWARE Connector within the context of IDSA allows for the integration of FIWARE technologies within the IDS ecosystem. This

[37] International Data Spaces Association 2023: Dataspace Protocol - Working Draft. Retrieved in October 2023 from: https://docs.internationaldataspaces.org/ids-knowledgebase/v/dataspace-protocol/overview/readme

integration ensures that data and services provided by FIWARE can be securely shared and accessed within the IDS framework.

5.3.1 Eclipse Data Space Components (including the connector)

The Eclipse Dataspace Components (EDC) is a comprehensive framework (concept, architecture, code, samples) providing a basic set of features (functional and non-functional) that data space implementations can re-use and customise by leveraging the framework's defined APIs and ensure interoperability by design. It is powered by the specifications of the **Gaia-X AISBL Trust Framework** (See **Appendix H**: Gaia-X) and the **IDSA Data space** protocol (See **Appendix G**: IDSA).

Several initiatives implementing data spaces are using the Eclipse Data Space connector, including EONA-X and CATENA-X. Furthermore, this connector has been selected by several Gaia-X proof of concepts.

Recently Gaia-X announced the plans for integrating Gaia-X related features with EDC (Eclipse Data Components) to simplify the utilisation of Gaia-X Verifiable Credentials for Participant Compliance in contract negotiations and access control within this ecosystem. This integration aims to enhance the accessibility of Gaia-X Verifiable Credentials for participants, enabling service providers to exclusively grant access to their services to Gaia-X compliant participants. In simpler terms, this means that service providers can limit access to their services solely to Gaia-X-compliant participants.

5.3.2 FIWARE Data Space Connector

Recently FIWARE has announced the development of a new data space connector that follows the principles, requirements and specifications included in the second version of the DSBA convergence document[38]. The information about this new connector is based solely on the public documentation provided by FIWARE since there has been no time to test it.

The FIWARE Data Space Connector is an integrated suite of components every organisation participating in a data space should deploy to "connect" to a data space. Following the DSBA recommendations, it allows to:

- Interface with Trust Services aligned with EBSI specifications[39];

[38] Data Space Business Alliance 2023: Unleashing the Data Economy: Technical Convergence: Discussion Document Version 2.0. Retrieved in October 2023 from: https://data-spaces-business-alliance.eu/wp-content/uploads/dlm_uploads/Data-Spaces-Business-Alliance-Technical-Convergence-V2.pdf

[39] EBSI: Retrieved in October 2023 from: https://api-pilot.ebsi.eu/docs/apis

- implement authentication based on W3C DID[40] with VC/VP standards[41] and SIOPv2[42]/OIDC4VP[43] protocols;
- implement authorisation based on attribute-based access control (ABAC) following an XACML P*P architecture[44];
- provide compatibility with ETSI NGSI-LD[45] as data exchange API; and
- supports the TMForum APIs[46] for contract negotiation.

5.4 ETDS-specific requirements

Based on the Current EU Data Sharing Landscape and state of the art data practices identified in **Chapter 2**, the following specific issues and recommendations must be taken into account in the process of creating the ETDS.

- **Personal data management**: People are at the centre of the ETDS, so privacy protection and compliance with data protection legislation and initiatives play a very important role.
- **SMEs:** Most companies in the tourism sector are SMEs. Both the process to onboard in a data space and the technology required to participate in it are currently too complex, too costly and very far from their usual business practices. Most SMEs have neither the technical nor operational skills required to handle the complexities of a data space. Approaches, such as **connector-as-a-service**, within the context of IDS and Gaia-X, could be very useful for SMEs.
- **Public and private actors**: Tourism sector stakeholders include both public administrations and private companies with different strategies and objectives regarding data sharing. Open data public administrations' strategy should be aligned with data protection, value generation and monetisation strategies of private companies.
- **Interoperability with other data spaces:** The tourism sector is directly related to other sectors such as transport, mobility, environment, energy, cultural heritage and construction. In this way, data from these sectors should also feed the

[40] W3C 2022: Decentralised Identifiers (DIDs) v1.0 Core architecture, data model, and representations. Retrieved in October 2023 from: https://www.w3.org/TR/did-core/

[41] W3C 2022: Verifiable Credentials Data Model v1.1. Retrieved in October 2023 from: https://www.w3.org/TR/vc-data-model/

[42] OpenID 2023: Self-Issued OpenID Provider v2. Retrieved in October 2023 from: https://openid.net/specs/openid-connect-self-issued-v2-1_0.html#name-cross-device-self-issued-op

[43] OpenID 2023: Self-Issued OpenID Provider v2. Retrieved in October 2023 from: https://openid.net/specs/openid-4-verifiable-presentations-1_0.html#request_scope

[44] Oasis Open: OASIS eXtensible Access Control Markup Language (XACML) TC. Retrieved in October 2023 from: https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=xacml

[45] ETSI 2023: Industry Specification Group (ISG) Cross Cutting Context Information Management (CIM). Retrieved in October 2023 from: https://www.etsi.org/committee/cim

[46] TMForum. Retrieved in October 2023 from: https://www.tmforum.org/oda/open-apis/

ecosystem of the ETDS. Inter- and intra- data space interoperability is a critical issue for the ETDS.

- **Geographic data**: Almost all tourism-related data have a geographic scope that can be a region, a specific geographic address or a set of addresses forming a line or a path. Also, vector and raster data are used. Geographic data can be organised in a layer of different types that facilitates geographic based reasoning and analysis. Geographic data requires the use of some specific models and standards.
- **Local vs regional vs national vs international scope**. The geographic scope of tourism data might also induce a tendency to set up local, regional and/or national tourism data spaces. The implementation of such should be thoroughly controlled in order to avoid a too fine-grained substructure of the European tourism data ecosystem on one hand, which will inevitably challenge interoperability, and might reduce the cross-border data visibility. On the other hand, a certain degree of decentralisation facilitates resilience by avoiding single points of failure. It may be a task for EDIB and the future EDIC for Tourism to define the right equilibrium of (de)centralisation, taking into account both strategic and technical arguments.

5.4.1 ETDS-specific requirements technical challenges: Personal data

The importance of personal data to data sharing

The EU Data Strategy's success relies heavily on sharing personal data, which is expected to drive adoption across various sectors such as health, administration, education, mobility and tourism. GDPR compliant personal data sharing will also help ensure that the EU's values, principles and regulations are fully implemented. As the EU digital single market is grounded in human-centricity, it aims to give back value to citizens by creating decentralised alternatives to the Big Tech platforms and their lock-in effect. By prioritising the needs and interests of citizens, the EU can foster a more transparent and equitable digital landscape that benefits everyone.

For the tourism sector

For the tourism sector, tourists will need to be able to share data across multiple organisations from different sub-sectors like mobility, hospitality, and tourism activities through a seamless user experience (tourist identity tools), while protecting their privacy (GDPR consent).

The challenges of personal data sharing

Human-centricity represents a paradigm shift in how we think about managing data and its potential. It stands in stark contrast to the prevalent "organisation-centric" approach by placing the focus on the individuals involved in generating the data, rather than the organisation responsible for capturing it, such as a company or government agency. Human-centricity encompasses concepts such as (self-)sovereignty, self-determination,

self-governance, autonomy and agency, which derive from the notion of human rights. At its core, a human-centric approach acknowledges that individuals have the right to determine, without coercion or compulsion, what happens to their personal data.

But human-centricity also comes with several challenges: technical issues (identity management, standardisation, user experience, etc.), business issues (costs, IP strategy, etc.) and legal issues (compliance with GDPR, DGA, etc.), as well as psychological factors like trust and digital resignation. Given this complexity, few existing data spaces today are actually processing personal data, despite personal data-sharing being a priority for most.

Addressing these challenges will require collaboration between stakeholders from a variety of levels and domains, including technical experts, legal professionals, business leaders, and psychologists. Only through such cross-disciplinary efforts can the full potential of a human-centric approach to data management be realised. Given the coming widespread use of AI models in data spaces for purposes such as recommendation or personalisation, it is crucial that individuals have effective means to maintain control over their personal data, which may be stored and processed by multiple organisations.

In most data spaces (e.g., mobility, agriculture), data are generated by industrial applications. However, in the ETDS the tourist takes centre stage as the primary generator of data. Hence, the ETDS is distinctively human-centric. This makes the ETDS more akin to health or education data spaces, where individuals (patients or students) play a leading role in generating data through their activities and interactions.

Given this human-centric nature, it becomes essential to adapt how data are accessed and processed. Tourists generate information by consuming services offered by private companies and public authorities, making data sovereignty and privacy paramount considerations. The design of the ETDS takes inspiration from the broader global community of data spaces, but it is uniquely tailored to address the specific needs and challenges that arise from managing human-generated data in the context of tourism.

By emphasising privacy, data sovereignty, and the centrality of the tourist in data generation, the ETDS aims to create a secure and trusted environment for data sharing and collaboration. This approach ensures that data are used responsibly and ethically, empowering tourists while also fostering innovation and providing valuable insights for stakeholders in the tourism ecosystem and other cross-sectorial data spaces.

Personal data sharing and regulation

The Data Governance Act (DGA) introduces the concept of data intermediaries' tools that will allow the sharing of data within a data space and that need to be notified to competent authorities. A subset of the data intermediaries will enable the management of personal data: the *personal data intermediaries (PDIs)*. Beyond facilitating personal data-sharing, the personal data intermediaries will also provide data subjects with standard mechanisms to protect data subjects' privacy and rights (GDPR): right to be informed, right of access, right to rectification, right to erasure, right to restrict processing, right to data portability and right to object.

Tools for sharing personal data

The issue of personal data sharing is particularly complex due to specific concerns around privacy and GDPR compliance, and also given the fact that the individual is, in this case, the central point of data integration, not the organisations controlling data. The individual can potentially interact with data spaces of all locations and all sectors. Since he/she does not bear technical capabilities in itself, the individual has 2 options:

- The individual authenticates to organisations controlling his/her data separately and gives consent separately each time, which can be cumbersome.
- The individual uses dedicated tools, personal data intermediaries (PDI) for managing his/her identity and data, that aggregate data and simplify identity and consent management.

There exist different approaches/paradigms to designing PDI tools in Europe. Here are some of the major ones:

1) **MyData operators**[47] are tools for GDPR consent management and personal data stores respecting the MyData declaration and label. MyData is a prominent movement advocating for human-centricity. Originally emerging from open data activism in Finland, it has since expanded into an international movement that is now run by "MyData Global," a non-profit organisation. MyData provides guiding principles aimed at giving individuals greater control over the data trails they leave behind in their everyday activities. The goal is to enable individuals to see what happens with their personal data, specify who can use it, and modify those decisions over time. The MyData operator concept (see **Figure 11**) is not solely focused on individuals' perspectives but also aims to serve commercial interests by promoting business opportunities for personal data. The MyData Principles strive to make privacy, data security, and data minimisation standard practices in application design. The movement also seeks to empower individuals to understand privacy policies and to give, deny, or revoke their consent to share data based on a clear understanding of why, how and for how long their data will be used. The Declaration of MyData Principles outlines ethical principles for personal data management and has been endorsed by over a thousand organisations and individuals worldwide.

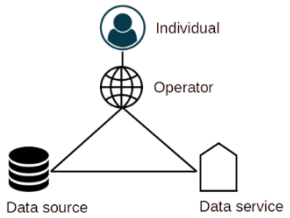

Figure 11 *MyData operator concept*

[47] MyData: MyData Operators. Retrieved in October 2023 from: https://archive.mydata.org/mydata-operators/

2) **SOLID PODS** are tools following the SOLID specification/protocol (See **Appendix I**: SOLID) that let people store their data securely in decentralised data stores. The Social Linked Data project (SOLID) is a web decentralisation initiative led by Sir Tim Berners-Lee, the inventor of the World Wide Web, and developed collaboratively in an open-source project consisting of multiple commercial and independent contributors. It aims at realising Tim Berners-Lee's original vision for the internet as a medium for the secure and decentralised exchange of data. SOLID is, at its core, a specification/protocol that lets people store their data securely in decentralised data stores called PODS (personal online data stores)[48]. Apart from a focus on separation between the application, identity provider and data storage as three interconnected entities (See **Figure 12**), SOLID has a strong focus on machine-readable linked data to ensure interoperability between different applications that reuse the same data source. The Linked Data architecture also helps to create (quite literally) links between one data set and another, including links between personal data and public data from various semantically related data spaces.

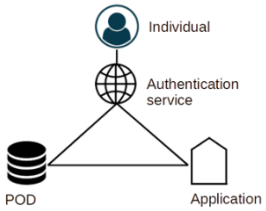

Figure 12 *Solid POD concept*

3) **POTENTIAL EU Wallets**[49] would allow all European citizens to store and manage personal data in an ecosystem of standard wallets. POTENTIAL unites 148 participants from 19 EU-member states – representing more than 70% of the European population. POTENTIAL's pilots drive European digitalisation and ease numerous administrative as well as tedious identification processes in everyday situations. The aim is to vividly illustrate the possibilities, functionalities, and added value of a European Digital Identity Wallet. By involving relevant market players, POTENTIAL quickly scales solutions which build on existing market-relevant national solutions.

Within the context of the ETDS, a PDI must be interoperable (the user can switch from one to another); however, discussions about interoperability are still at a very early stage. The two main topics to address regarding interoperability for personal data in the data spaces will be about federating the individual's identity and consent. Some standardisation discussions are happening now in organisations like Decentralised Identity Foundation[50],

[48] See Buyle et al. 2020

[49] Idemia 2023: The POTENTIAL Consortium selected by the European Commission to pursue its journey to digital European identity. Retrieved in October 2023 from: https://www.idemia.com/news/potential-consortium-selected-european-commission-pursue-its-journey-digital-european-identity-2023-01-11

[50] Decentralised Identity Foundation. Retrieved in October 2023 from: https://identity.foundation/

Kantara[51] (consent receipt standards that inspired ISO), and MyData. At this stage, Gaia-X, IDSA, FIWARE and other related data space support organisations all explore IAA (identity, authentication & authorisation) capabilities, but they do not consider personal data apart and to not address the question in depth.

Focus on consent

Explicit consent is a cornerstone of personal data sharing, as it is the lawful basis (GDPR) of personal transfers between independent data controllers in a wide range of use-cases. When it comes to data sharing, GDPR requires that individuals are informed about the data being shared, the purpose/finality for which it will be used, and the recipients of the data. Additionally, the individual must provide their explicit consent for their data to be shared for that specific purpose. Explicit consent means that the individual must take a clear and affirmative action, such as checking a box or signing a form, to indicate their consent. Consent must be freely given, meaning that individuals cannot be forced or coerced into giving their consent, and they must be informed of their right to withdraw their consent at any time. It's important to note that GDPR applies to any organisation that collects or processes personal data of individuals residing in the EU, regardless of whether the organisation is based in the EU or not. Failing to obtain explicit consent for data sharing can result in significant fines and other legal consequences. The major hurdle for consent management within the data spaces landscape now is the variety of consent formats and the lack of interoperability. In the tourism context, it should be assumed that an individual may share data across borders, which will be complex if consents are incompatible.

5.4.2 ETDS-specific requirements technical challenges: SMEs

For most SMEs the process to on board in a data space and the technology needed to participate are too complex and very far from their usual business. They do not have the technical nor operational skills to deal with data spaces. Some approaches, both in the IDS and Gaia-X context, could be very useful for SMEs: **connector as a service** and the more ambitious **data space as a service**. The objective of both approaches can be summarised by the slogan used recently by Sovity[52]: *"Setting up data space technology in minutes instead of months"*.

The strategy is to provide SMEs with consultancy services and the software needed to share (both provide and consume) data. The software includes a user interface that hides the technical and operational complexity of data spaces, showing the final user a high-level overview of the available data, the data contracts and the data transfer processes taking place, facilitating the connection with the internal applications used to produce or consume data.

Figure 13 below shows an example of the Eclipse data space components data dashboard, an example developer frontend application for the EDC Data Management API.

[51] Kantara Initiative. Retrieved in October 2023 from: https://kantarainitiative.org/
[52] Sovity. Retrieved in October 2023 from: https://sovity.de/about/

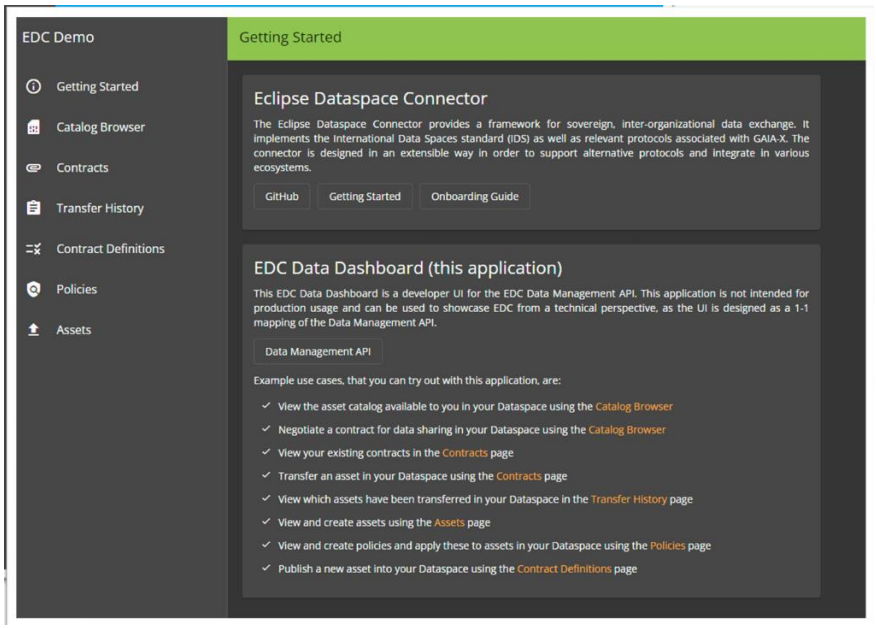

Figure 13 *Eclipse Data Space components data dashboard*

To better demonstrate the possibilities of data spaces and their management, the Eclipse data space components project has created under the minimum viable data space the so-called **Vision Demonstrator** to showcase a possible user interface that would enable end-to-end interaction - all the way from joining a data space to being able to publish a new data asset for others to consume. **Figure 14** shows the main window of the vision's mock-up.

This vision was based on seven tasks essential to managing a data space:

1. Managing data spaces
2. Discovering data shared by others
3. Negotiating a data contract
4. Creating a new policy
5. Creating a new data asset
6. Creating a data contract
7. Reviewing existing data contracts and managing notifications

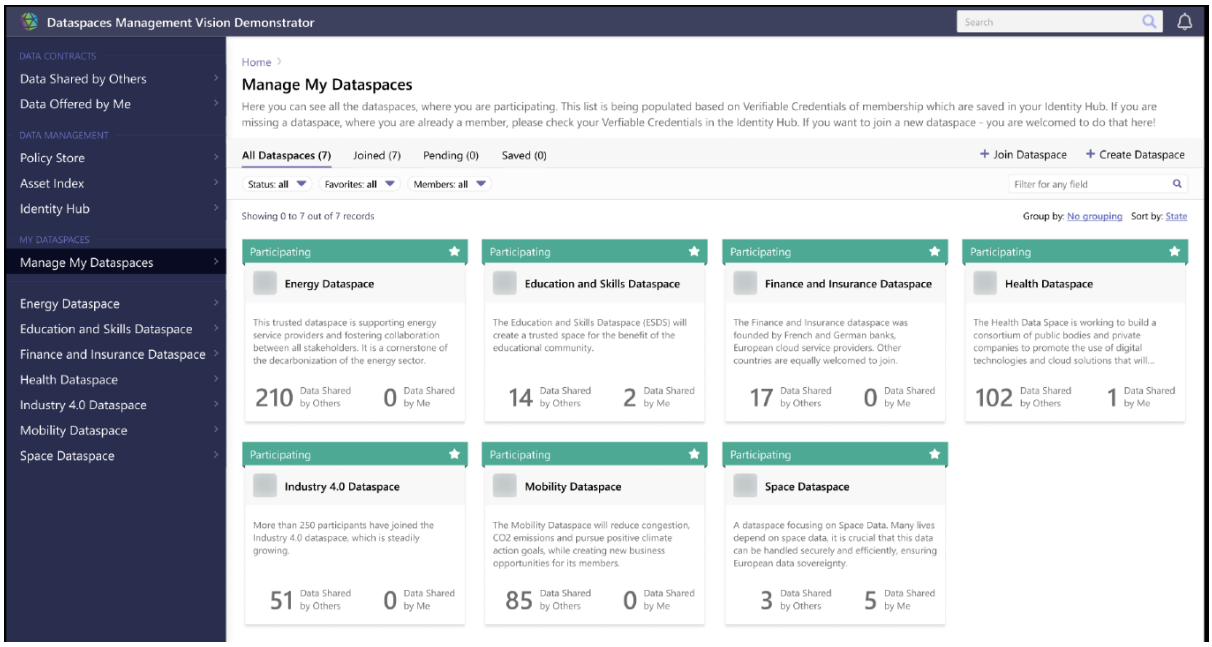

Figure 14 *Data Space Vision mock-up*

Gaia-X and SIMPL go a step forward, offering cloud infrastructure needed to run the software, data products that encapsulate data sets or access to data APIs, applications and services providing data-based applications or algorithms and the orchestration functionality needed to define specific service compositions and workflows.

The data space as a service concept includes all the steps needed to participate in a data space:

- Participant onboarding
- Compliance and certification (data and services)
- Catalogue registration
- Data sharing functionalities and dashboard
    - Search for data products/infrastructure/applications or services
    - Use or provide data products/infrastructure/applications or services
    - Monitor data spaces

The adoption of this kind of technology by SMEs depends highly on the perceived added value of data management, as well as both internal data and external data sources participating in a data space.

5.4.3 Tourism-specific requirements technical challenges: Public and private actors

Tourism sector stakeholders include both public administrations and private companies with different strategies and objectives regarding data sharing.

Public administrations are concerned about improving tourism destinations, improving users' experience (both tourists and people living in the destination) and assuring long-term tourism sustainability from economic, social and environmental points of view. Regarding data, the main objective of public administrations is to make data as open and available as possible, so open data is the main approach. An example of this strategy is the recently approved EU Commission Implementing Act on High-Value Datasets[53]. This regulation is set up under the Open Data Directive, which defines six categories of such high-value datasets: geospatial, earth observation and environment, meteorological, statistics, companies and mobility. The datasets will be available in machine-readable format, via an API and, where relevant, as bulk downloads. Some of these high-value datasets are very relevant to the tourism sector.

Many public administrations provide open-data portals and open-data based applications based on public data, also including private data from companies when possible. The current data sharing initiatives discussed in **Chapter 2** include many examples of this kind of "open data lake" style approach. However, public administrations are not allowed to include commercial data or include data products for profit. Besides, public administration data sharing approaches do not facilitate B2B data sharing, which is one of the main data space goals.

The public administration strategy and the technology used for implementation are not aligned with three of the main characteristics of a data space: data monetisation, valorisation and data sovereignty.

- Regarding data transfer, since business is at the core of the current data space initiatives, these initiatives include contract negotiation as a mandatory step that is not needed in an open data context.
- Open data access normally has very low security requirements, just downloading files or a rest interface with no security is enough.

Datahub.tirol[54] has both open data and commercial data in its catalogue, though only the open data are monetised. The only example of merging both open and proprietary data (for profit) in the same platform is the FIWARE monetisation architecture.

One possible approach could be to adapt the current open data initiatives to the data space initiatives requirements, constraints and compliance rules, thus allowing open data initiatives to become participants in the data space. The public administration managing the open data portal should follow the data space on-boarding process and all the data sets/products included should be defined and certified according to the trust framework defined in the data space. Furthermore, another channel to get the data should be added to the current ones, a data connector compliant with the data space requirements.

[53] Commission Implementing Regulation (EU) 2023/138 of 21 December 2022 laying down a list of specific high-value datasets and the arrangements for their publication and re-use C/2022/9562. Retrieved in October 2023 from: https://eur-lex.europa.eu/eli/reg_impl/2023/138/oj

[54] datahub.tirol. Retrieved in October 2023 from: https://www.datahub.tirol/

5.4.4 Tourism-specific requirements technical challenges: Interoperability with other dataspaces

The strong interconnection between the ETDS and other European sectoral data spaces holds immense significance due to several compelling reasons. Firstly, data sharing among these data spaces is imperative because datasets are inherently linked, but value comes from specific data semantics on each particular data space. For example, in the relationship between the mobility and tourism domains, it's crucial to not only track people moving between countries using any transportation medium, but also to discern who among them are tourists. Identifying the origin and destination of tourists, as well as the purpose for travel, is vital for understanding the economic impact and environmental footprint of the tourism sector.

Tourism is intricately intertwined with various other data spaces, such as mobility, healthcare, sustainability, and smart cities. The interactions between these domains are profound, as tourists' movements and activities have wide-ranging implications. Their healthcare needs, influence on urban infrastructure, and contributions to sustainability practices all rely on data from these interconnected spaces.

To facilitate effective interoperability and data exchange among these spaces, the establishment of standardised protocols and formats is paramount. These standards serve as a compatibility layer, enabling data from diverse sources to harmonise while preserving the unique tourism-specific aspects of each dataset. This approach fosters data sharing and collaboration, facilitating insights, innovation, and a comprehensive understanding of the tourism ecosystem within the broader context of interconnected data spaces.

In this context, **data intermediaries** play a pivotal role. They bridge the gap between data producers and consumers, enriching and standardising tourism data while facilitating seamless data exchange. These intermediaries bring valuable analytics, predictive models, and actionable insights, empowering tourism stakeholders to make informed decisions, optimise operations, and enhance traveller experiences. Their adaptability and transformation capabilities are critical for ensuring compatibility and integration across data spaces, thus maximising the potential of these interconnected ecosystems.

These are some examples of the connection between tourism and other sectors:

- **Transport:** The volume of air passengers and the reservation forecasts are very useful indicators for any tourism manager.
- **Telecommunication**: Data from mobile phone operators are used to measure the flow of tourists and tourist profiles at a specific destination or point of interest.
- **Environment**: Tourism activity data is used to monitor the carbon footprint of a destination.
- **Energy:** Monitoring of energy consumption data (e.g., resort) should optimise energy efficiency systems.
- **Cultural and environmental heritage**: it is essential to identify the maximum carrying capacity for protected resources in order to preserve ideal conditions and, usually, maximum entry quotas are established.

In this way, **data from these sectors should also feed the ecosystem** of a tourism data space. The current approach in Europe is to build separate data spaces for each sector or domain or, in some cases, even more than one, depending on the data space scope and characteristics. Therefore, inter- and intra-data space interoperability is a critical issue for tourism data spaces.

The technical challenge to solve is: What happens if one company needs data from a company participating in another data space? The key topics to address regarding inter-data spaces interoperability are:

- Legal
- Technical
- Business
- Semantic
- Onboarding processes
- Monitoring

Two main strategies can be applied:

- **Participate in several data spaces**. The company needs to follow several on-boarding processes. This strategy probably implies the use of different data models, identity providers, connectors, etc. This approach is not scalable but nowadays is the more pragmatic one.
- **Federation among data spaces**. With this strategy, the participation in several data spaces is transparent for the companies. However, this approach is not feasible from the technical point of view unless the data spaces use the same data space governance framework.

5.5 Recommendations for the ETDS from the technical perspective

This section presents key recommendations regarding the technology and technical building blocks. The recommendations are based on the current state of the main data space initiatives in Europe, particularly the Gaia-X initiative, which is more advanced from the point of view of the technical governance framework/Rulebook and the onboarding process.

When defining the technical Blueprint for the ETDS, the first step is to identify the main technical issues and challenges that need to be solved to implement the concept of a data space. Next, it is necessary to analyse the state of the art of existing initiatives and how these issues are being addressed. The main technical issues are identity management, self-description, trust framework, on-boarding, data and services discoverability, data sharing, data space monitoring and observability.

Several ongoing initiatives are now running in parallel to design and implement the data space concept. Gaia-X and SIMPL provide, by now, more comprehensive data space architectures and specifications, including infrastructure, data and services in the same

framework, while IDSA and FIWARE provide solutions dealing with more specific aspects of the data space technology landscape.

The DSBA convergence effort and SIMPL project add even more complexity to the data space scenario. However, even with this complex scenario, some solutions and approaches to specific aspects of the data space architecture are common or quite similar in all the initiatives, emerging as the most promising ones:

- The concept of a data space governance authority defining and implementing the rules to be part of a data space is paramount to generate trust. These rules should include the tourism specific criteria.
- The need for a decentralised solution for identity management. Self-sovereign identity solutions along with verifiable presentation and verifiable credentials for self-descriptions. The use of verifiable credentials signed by trusted organisations to describe the entities participating in a data space provides an additional level of trust, which is very important in an open data sharing framework.
- Decoupling of control and data planes in data transfer technologies makes it possible to use any transfer protocol or technology available.
- Use common and well-established standards if available, both for generic (sector agnostic) models as well as tourism specific domain models.
    - DCAT for data product
    - ODRL for data usage policies
    - W3C DQV for data quality (based on ISO).

Next, based on these specific aspects, some recommendations regarding technical building blocks and the main technical issues are presented:

5.5.1 Recommendation on Data Space Governance Framework/Rulebook and Data Space Governance Authority

The Gaia-X Governance framework (see **Figure 15**) is being widely adopted as the base for mandatory compliance criteria. It is a good starting point because of its maturity and flexibility. Adopting Gaia-X will allow the future ETDS to gain interoperability with a wide range of data space initiatives while maintaining a non-opinionated strategy for adopting connectors and other components into the implementation. The Gaia-X Compliance process is composed of the Trust Framework, and the Policy Rules & Label document.

In addition, Gaia-X explicitly encourages adopting domain specific compliance criteria that could improve the coverage of the specific challenges presented in this Blueprint, such as the policies to ensure GDPR compliance when dealing with PDIs within the use cases or the integration of traceability practices when accessing personal data.

Also, Gaia-X federation and decentralisation architecture will allow an inclusive strategy to onboard different regional tourism data space initiatives into a shared implementation of the ETDS.

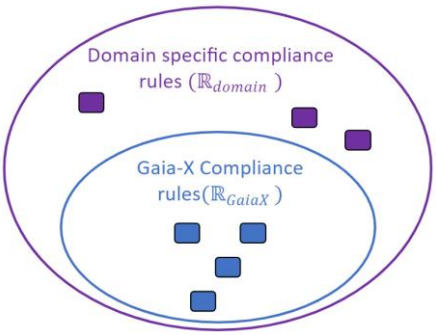

Figure 15 *Gaia-X Governance framework as a base for mandatory and optional criteria with additional Tourism specific criteria*

Source: Gaia-X 2022: Gaia-X Trust Framework – 22.10 Release. Retrieved in October 2023 from: https://docs.gaia-x.eu/policy-rules-committee/trust-framework/latest/

5.5.2 Recommendation on data space infrastructure/intermediaries

5.5.2.1 Clearing house (GXDCH)

According to Gaia-X, the GXDCH is the necessary element to operationalise Gaia-X in the market. The Gaia-X Framework describes functional specifications, technical requirements, and assets necessary to be Gaia-X compliant.

The GXDCH is a network of execution nodes for the compliance components that Gaia-X has developed. This safeguards the distributed, decentralised ways of running the Gaia-X compliance, not operated centrally by the Gaia-X Association, and where anybody can benefit from the open, transparent, and secure federated digital ecosystem.

Currently, there are four clearing houses up and running, and several organisations are working to become new clearing houses within Europe (see **Figure 16**).

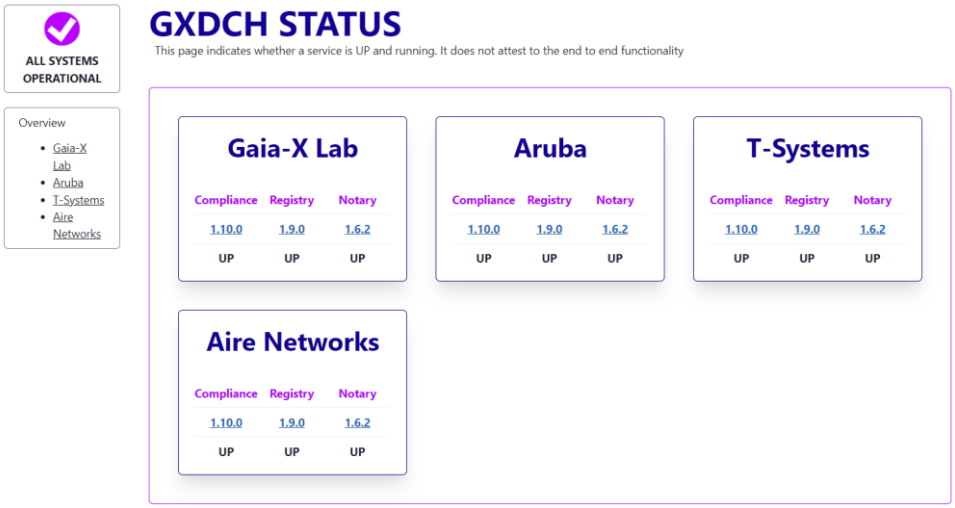

Figure 16 *Current Gaia-X clearing houses.*

One interesting feature of the clearing house is the Gaia-X wizard that will facilitate the companies, especially the SMEs, in the onboarding process (see **Figure 17**).

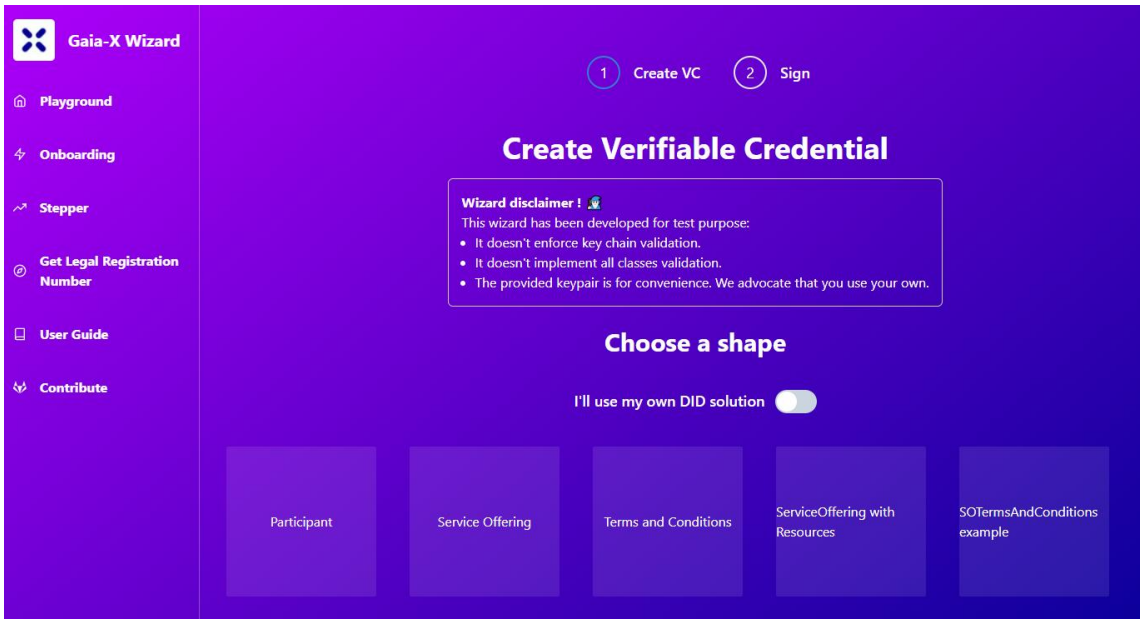

Figure 17 *Gaia-X wizard*

5.5.2.2 Services discoverability

In order to provide service discoverability, all the data space initiatives include the Catalogue Federation Technology. This technology is used to create a unified, federated catalogue of available data and services across different entities within the data space. It allows data space entities to discover, access, and utilise resources and data assets across the network easily. The IDS architecture includes the metadata broker, and Gaia-X is defining and developing a federated catalogue. The Gaia-X federated catalogue technology is still being developed, and the IDS metadata broker is not compatible with the Gaia-X data product model. Therefore, service discoverability is still an open issue.

5.5.2.3 Data space monitoring and observability

Observability refers to the capability to monitor, log, and analyse system activities and performance. In Gaia-X, a logging service is used to provide transparency and visibility into the data-sharing processes, ensuring that the ecosystem is operating securely and efficiently. This is crucial for compliance, auditing, and issue resolution. However, the Gaia-X logging service[55] has not been developed by Gaia-x, and it is not clear if it will finally be part of the official Gaia-X software.

[55] GitLab: Data Exchange Logging. Retrieved in October 2023 from: https://gitlab.eclipse.org/eclipse/xfsc/del

5.5.2.4 Recommendation on metadata models

One of the general trends for data models in general and especially for metadata vocabularies, is to use common and well-established standards, if available, both for generic (sector agnostic) models as well as tourism-specific domain models. In the case of generic metadata models, the following ones are being adopted by Gaia-X and are necessary to follow the onboarding process.

- Data product model
  - DCAT 3.0 for data product
  - ODRL 2.0 for data usage policies and rulebooks
- Participant model.
- Service offering model.

However, the definition of the generic data product is one of the main ongoing processes in Gaia-X and in other data space initiatives.

5.5.2.5 Tourism data models

At present, there is no single common European ontology in tourism that has been universally adopted and standardised across all European countries. Nevertheless, serious efforts have been made to develop ontologies and standards that can be used as common reference points for tourism-related data and interoperability within Europe.

Notable initiatives in this regard have been carried out by organisations like the World Tourism Organisation (UNWTO) to promote interoperability and data sharing in the tourism sector. For example, they promoted the multilingual "Thesaurus on Tourism & Leisure Activities". This thesaurus can be used as a guide to tourism terminology, as well as for the standardisation and normalisation of a common indexation and research language at an international level.

It is not recommended to create a new tourism data model but to use the current national initiatives. In case there is not a national initiative in place, it is advised to select and adapt an existing tourism ontology from another country. Some examples of these ontologies include **Digital Tourism Hub** in Italy[56], **Ontology DATAtourisme** in France[57], **Segittur Tourism Conceptual Reference Model** in Spain[58], and the **Open Data Tourism Alliance (ODTA)** in Germany, Austria and South Tyrol[59].

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[56] Digital Tourism Hub. Retrieved in October 2023 from: https://www.italiadomani.gov.it/content/sogei-ng/it/it/catalogo-open-data.htm

[57] Datatourisme. Retrieved in October 2023 from: www.datatourisme.fr

[58] Segittur: Foro de Inteligencia Turística y datos claves de la sostenibilidad. Retrieved in October 2023 from: https://www.segittur.es/plataforma-inteligente/proyectos-plataforma-inteligente/modelo-conceptual-de-referencia-para-el-desarrollo-de-una-red-de-ontologias-del-sector-turistico/

[59] GitHub 2023: ODTA schema. Retrieved in October 2023 from: https://github.com/ODTA/schema; The ODTA model is currently integrating with the models of organisations from other European nations (they mention Sweden, Great Britain, Belgium and France)

Since the ODTA model is currently integrating with the models of organisations from other European nations (they mention Sweden, Great Britain, Belgium and France)[60], it is the most recommendable candidate to provide the foundation for a consolidated European Tourism data model. However, the harmonisation of the data models will be a great challenge for the future ETDS, since it is anticipated that many data providers will offer their data under individually customised and legacy formats, and SMEs in particular might not have the skills and the resources to change them in the short-term. To further support SMEs, the ETDS should guide data providers towards national programs of digitalisation so as to induce a steady evolution towards standardised data models and data formats. Additionally, in an early phase of deployment the ETDS will be responsible for determining a data model strategy. In the cases where data providers and consumers adhere to different data models, under whatever circumstances that prevent harmonisation, the use of custom parsers/translators that map the data from a source model to a target model and transfer them from one format to another may be required. This is of course a feasible but inefficient workaround that should always be a transient status.

5.5.2.6 Recommendation on connectors

The current trend regarding data space protocols is decoupling of control and data planes in data transfer technologies, making it possible to use any transfer protocol or technology available. According to the DSSC blueprint, it is important to distinguish between a control plane and a data plane. The control plane is responsible for deciding how data is managed, routed and processed. The data plane is responsible for the actual moving of data.

For example, the control plane handles the identification of users, data offers and the handling of access and usage policies. The data plane handles the actual exchange of data.

Therefore, it is recommended to use one of the connectors using this approach, and the one being used by the main data space implementations is the Eclipse Data Space connector.

5.5.2.7 Privacy-enhancing technologies

The high significance of the processing of personal data in tourism requires precautions in the form of technical and organisational measures to protect them. There are some technological concepts to enhance data privacy and GDPR compliance, which are summarised under the term “Privacy Enhancing Technologies” (PET). A major pillar among all PET is the personal data intermediaries introduced in **Chapter 5.4.1**, which could ensure that data subjects affected by data processing in a data space can easily manage their consent.

Another straightforward way to protect the personal data of individuals involved in data exchange and in the operation of the applications associated with it, is obviously the

[60] German National Tourist Board, 2023; Retrieved in December 2023 from: https://open-data-germany.org/en/open-data-germany/#tab-f05a110d5032ae0b247

consequent anonymisation, wherever possible. Key PET concepts have recently been summarised in a whitepaper published by the British Data Protection Authority (CIO)[61], and are briefly introduced in the following paragraphs.

Homomorphic encryption (HE)

The homomorphic encryption principle means to perform the processing of encrypted data without decrypting it before manipulation. The processing operations are also executed in an encrypted manner. Upon decryption, the computation result is the same, as if the operations had been performed on the original human readable data.

Secure multiparty computation (SMPC)

SMPC applies the cryptographic technique called "secret sharing", which is a protocol that enables the distribution of a shared data "secret" among each of the parties involved in shared computing. This means that the data of any involved partner is split into fragments which are the only data that are shared with other parties. Each party's data cannot be revealed to the others unless some proportion of fragments of the data of each of the parties are combined. According to the British CIO, SMPC facilitates (1) the security principle, as the inputs of other parties are not revealed and internal or external attackers cannot easily change the protocol output; and (2) the data minimisation principle, as no one should learn beyond what is absolutely necessary. Parties should learn their output and nothing else.

Private set intersection (PSI)

PSI is a variant of SMPC where two parties, each operating with their own data, identify the "intersection" between their datasets (i.e., the elements the two datasets have in common), without mutually disclosing the complete datasets. The PSI concept facilitates data minimisation because only data is shared which all parties have in common.

Federated learning (FL)

This is a technique which allows multiple different parties to train AI models on their own data ("local" models). They then combine some of the patterns that those models have identified (known as "gradients") into a single, more accurate "global" model, without having to share any training data with each other. FL is a PET because it can help to (1) minimise the use of personal data processed during the training of an AI model; (2) enhance the level of security when applied in AI training; and (3) reduce the risk and extent of data breaches due to its decentral data storage paradigm.

Trusted execution environments (TEE)

A TEE is an isolated processing "area" within central processing units (CPU). Programs can be executed together with the required data without interactions with other processes on a computing unit. The high degree of isolation ensures that even central functions of the

[61] Some terms of this subchapter have been taken from the following publication of the British Information Commissioner's Office (ICO 2022). Retrieved in December 2023 from: https://ico.org.uk/for-organisations/uk-gdpr-guidance-and-resources/data-sharing/privacy-enhancing-technologies/

operating system cannot read the code and the data processes in the TEE. This feature enhances the adherence to the principles of data integrity, confidentiality, and security.

Zero-knowledge proofs (ZKP)
According to the definition of the British CIO, a "ZKP refers to any protocol where a prover (usually an individual) is able to prove to another party (verifier) that they are in the possession of a secret (information they know but is unknown to the verifier)." This means that only relevant general information is proved (e.g., a person is an adult and might be eligible to close contracts), without giving the exact details (e.g., the date of birth). ZKP is a means to achieve data minimisation because relevant data is not processed in detail; moreover, the absence of (sensitive) data enhances security and confidentiality.

Differential privacy (DP)
The principle of DP consists in "making arbitrary small changes to individual data that do not change the statistics of interest. Thus, the data cannot be used to infer much about any individual."[62] This method allows, therefore, to anonymise personal data, if the extent of inferred changes is thoroughly chosen.

Synthetic data
An obvious method to avoid risks for existing individuals is the use of synthetic data for testing software, training of AI, or simulations. Synthetic data have again to be chosen with care, since they need to contain essentially the equivalent information (e.g., demographic data) as the real-life data they should replace, without referring to the data of concrete data subjects. Nevertheless, synthetic data generation is always based on some real personal data. However, normally a small amount of real data can be sufficient to generate big synthetic datasets. This facilitates the principle of data minimisation and allows for some anonymised data processing, given that the original real data is not used in processing, nor is it disclosed.

5.5.2.8 List of essential technical components

According to the concept of the IDSA, essential components of a Minimum Viable Data Space (MVDS) should be:

- At least two parties, each equipped with a connector (one acting as a data provider, and one as a data consumer), and
- An identity provider: (Dynamic Attribute Provisioning Service, Certificate Authority), eIDAS.

They mention thirdly several optional and additional components, such as a metadata broker (catalogue feature), an app store, a clearing house, or a vocabulary provider, which in fact must be considered as mandatory for any data space initiative, like the future ETDS, that should serve an unlimited number of registered parties.

[62] Differential privacy. Retrieved in December 2023 from: https://en.wikipedia.org/wiki/Differential_privacy

Table 2 below details the essential technical components of the ETDS, together with recommended concrete best practice implementations (for more details about the recommended tools, see Deliverable D3.2 of DATES[63]). However, it is imperative to mention that EU-funded deployment projects are obliged to use the standard software yet to be proposed by the SIMPL initiative (with the DSSC specifications as its input). Therefore, depending on their provisions, the tools which will be implemented by the future ETDS might at some point differ from the state-of-the-art indicated in the table below.

Table 2 *Recommended essential technical components of the ETDS*

Essential Component	Example
DATA SPACE CONNECTORS	Eclipse Connector FIWARE TRUE Connector
TRUST FRAMEWORK (IAM, DAPS, CA)	GAIA-X Trust framework (Eclipse XFSC (Cross Federation Services Components)
METADATA BROKER (catalogues for parties, data offers, and aps)	FIWARE Metadata Broker Eclipse XFSC (Cross Federation Services Components)
METADATA EDITORS (participants self service)	Xfsc Metadata Wizards
CLEARING HOUSE	Aruba, T-Systems, Aire Networks
VOCABULARY PROVIDER (vocabulary hub)	IDS vocabulary provider for publishing data models, e.g., SKOS (Simple Knowledge Organization System), W3C recommendation, Tourism ontologies, etc.

Furthermore, a highly desirable feature of the ETDS is an easy and automated onboarding process, which is especially important to facilitate the participation of SMEs. Onboarding is of course a process that has strong organisational aspects, besides its technical one, with respect to software components which should support the onboarding process. Onboarding might be initiated by entering the parties' identifying data in a web-portal. Optimally, this could be connected or prefilled with the data of the tourism stakeholders collected within the inventories of data sharing initiatives (see **Chapter 3**). At the same time, the data available (e.g., type, scope, etc.) from the data catalogue can be indicated, where available. If implemented appropriately, such a feature can simplify the onboarding process for the known data holders on one hand and provide visibility among other potential partners.

[63] DATES 2023: Deliverable D3.2 Technical specifications for interoperability, 14 f. Retrieved in December 2023 from: https://www.tourismdataspace-csa.eu/wp-content/uploads/2023/08/D3.2_Technical_Standards_v1.pdf

6 BUSINESS MODELS FOR THE EUROPEAN TOURISM DATA SPACE

Participation in a data space creates opportunities for companies to improve their decision-making based on data. The value of the ETDS will be enhanced by the ability to attract a critical mass of participants (the so-called network effect). Organisations that already see the value of data are expected to become early ETDS adopters. However, it is essential for ETDS to remain inclusive and communicate a convincing message about the value of the ETDS to a wide range of actors, including those sceptical of the data economy. In any case, understanding the potential benefits, costs, efforts and risks of sharing data are key to the decision to participate in the ETDS.

The starting point in conveying the value of the ETDS and the data economy is to view **data as assets.** This has been facilitated by technologies like IoT, analytics or AI. Understanding, categorising and managing data will help companies define the value of the data assets they hold and, consequently, take appropriate actions to protect, share or sell these data assets. It is evident that most companies will only be inclined to share data when the value of sharing is higher than the cost of making data available (e.g., preparation of data, curation, etc.).

Importantly, the value of the data is not only linked to the price of a dataset but is also associated with the **benefits or opportunities and risks incurred**: both financial (e.g., monetary costs, revenue) and non-financial (e.g., partnerships) nature. Hence, similar to how hotels and airlines use dynamic pricing to decide the price of a room or flight based on supply and demand, it is possible that the same data asset could have a different value and price depending on the context of the exchange or use.

The ETDS creates multiple business opportunities for its participants, such as:

- **Market Growth**: access to a wider range and more diverse customer segments due to an increased number of channels to sell data or data services. For instance, the ETDS will allow access to data for SMEs and destinations.
- **Diversification**: new roles and business opportunities within the market, starting with data monetisation. Currently, most companies are not using data as an additional revenue stream.
- **Revenue Streams**: generation 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.
- **Cost Savings**: the ETDS will allow organisations to share the costs of technical infrastructures as well as other data-sharing services, implying cost savings and enhancing overall profitability.

- **New Partnerships**: Easier access to data from other tourism stakeholders as well as other ecosystems/domains: The ETDS will allow data sharing with mobility, energy, health, and other industries, and the tourism industry will get additional data insights.

To effectively convey these business opportunities, it is important to develop metrics that can demonstrate the tangible benefits and advantages of the data space. The recommendations described below will be useful for quantifying and illustrating the return on investment for participating in the ETDS.

Cost Savings:

- Reduction in Data Storage Costs: Measure the decrease in data storage expenses as data spaces allow for efficient organisation, 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 optimised data management.

Efficiency:

- Time Savings in Data Access: Measure the time users save in locating and accessing relevant data due to improved organisation and search capabilities of the ETDS.
- 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 the ETDS.
- 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 utilise each other's data assets.

Data Monetisation:

- 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 unauthorised 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 the ETDS.

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 the ETDS.

User Satisfaction:

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

6.1 ETDS Value Capture

Benefits can be diverse, as seen above, and the ETDS should allow users to identify the potential value of ETDS participation and provide flexible mechanisms to capture that value. Business models define the revenue channels for data space actors with different levels of ETDS engagement. It is important to distinguish between the business models for **data asset providers**, **data consumers,** actors both **sharing and consuming the data** and **data intermediaries or service providers**.

Table 3 presents the most feasible business models identified by the tourism experts during the research undertaken by the two CSAs. The provided examples indicate the applicability of the business models for each of the four data space actor types.

Table 3 *ETDS business models per data space actors' roles*

1. Freemium Access	Free access to a basic version or limited volume of standardised tourism-related data. A fee is applied to access more detailed or extensive datasets.		
Data/data assets provider *A travel agency shares the basic information about demand volumes across regions for free but may charge a fee for detailed data, including specific breakdowns by tourists' origin, type, etc.*	**Data/data assets consumer** *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.*	**Data/data assets provider and consumer** *A travel agency shares basic information about demand volumes across regions for free and can access respective information in the data space; more in-depth information may be exchanged for a fee.*	**Data intermediary/ data service provider** *A data space intermediary may charge for facilitating the identification of the relevant datasets and accessing those data, e.g., customisation fees.*
2. Freemium Access with Paid Data-Based Products/Services	Stakeholders get free access to a basic version or a limited volume of standardised tourism-related data. A fee is applied when stakeholders use data to create customised products or services, such as analytics reports, insights, personalised data sets or tailored recommendations.		
Data/data assets provider *A tour operator shares basic data for free but charges a fee when providing custom reports that analyse travel demand trends for a specific region.*	**Data/data assets consumer** *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.*	**Data/data assets provider and consumer** *A tour operator shares and can access basic data for free, but charges a fee/pays a fee for custom reports for a specific region.*	**Data intermediary/ data service provider** *A data space intermediary may charge for added-value services: consultation fees, project-based fees for data harmonisation services, API-access or licensing fees, ongoing support fees, certification and quality assurance fees.*
3. Participation-Based Reductions	Stakeholders who actively contribute data or insights to the ETDS receive incentives such as discounts, tax cuts or redeemable points.		
Data/data assets provider *A hotel sharing detailed occupancy data may receive tax benefits or discounts on premium features of the data space.*	**Data/data assets consumer** *N/A*	**Data/data assets provider and consumer** *A hotel sharing detailed occupancy data may receive tax benefits or discounts on premium features of the data space.*	**Data intermediary/ data service provider** *A data space intermediary may provide some services as a benefit for stakeholders sharing their data.*

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.		
Data/data assets provider	**Data/data assets consumer**	**Data/data assets provider and consumer**	**Data intermediary/ data service provider**
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. All partners can share and access data within those agreements.			*A data space intermediary can facilitate collaboration or offer service within the established agreements.*
5. Yearly subscription fees	A fixed annual subscription fee.		
Data/data assets provider	**Data/data assets consumer**	**Data/data assets provider and consumer**	**Data intermediary/ data service provider**
N/A	*Annual payment to access datasets throughout the year. Access may include regular updates, customer support, and additional features.*	*Annual payment to access datasets throughout the year. Access may include regular updates, customer support, and additional features.*	*A data space intermediary may charge some of its service as a part of the yearly subscription fee: e.g., continuous analytics service, custom analytics projects etc.*
6. Membership fees	A fee for becoming a member of the ETDS. It is important that the size of the fee is accessible for organisations of different sizes (e.g., corporate players and SMEs).		
Data/data assets provider	**Data/data assets consumer**	**Data/data assets provider and consumer**	**Data intermediary/ data service provider**
Interested parties pay a fee for becoming a member of the ETDS. The fee covers subsequent service and data transactions. It can also be combined with other fees.			
7. Technical fees	A fixed fee per data transaction.		
Data/data assets provider	**Data/data assets consumer**	**Data/data assets provider and consumer**	**Data intermediary/ data service provider**
A technical fee could be levied on each transaction undertaken through the data space. This fee should not be based on value (as this would take away added value from members and would be counterproductive) but be fixed per transaction. Thus, it remains democratic since heavy users pay more than smaller users. A similar model has been adopted for a few decades by SWIFT.[64]			

[64] Swift. Retrieved in October 2023 from: www.swift.com

As shown in **Figure 18** below, insights from a widespread consultation with the tourism stakeholders (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey Questionnaire**) indicate that the preferred consumer business models would include models that reduce the monetary cost of data, such as the previously discussed fee reduction schemes or partnership agreements.

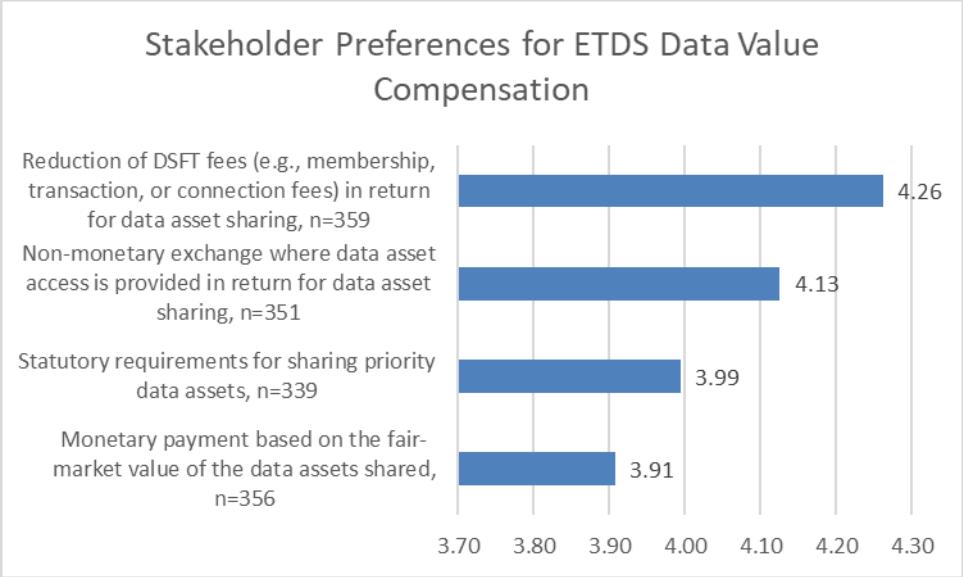


Figure 18 *European tourism stakeholder preferences for data value compensation*

6.2 ETDS Governance Body business models

It is expected that several business models will be enabled by the ETDS and that new roles in the value chain will be created as the data space infrastructure takes shape. In addition to the three profiles described above, business models have to be defined for the sustainability of the data space itself. Hence, the business model of the ETDS governance authority must also be considered. Monetisation, in this case, could happen through membership fees, percentage of revenues resulting from specific activities, in-kind contributions or payments based on the number of transactions or processes facilitated by the data space.

Expert consultation and the stakeholder validation survey (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey Questionnaire**) reveal that to maintain financial support for the ETDS governance body, membership fees would be the most preferred revenue source, followed by one-time connection fees (see **Figure 19**). However, transaction fees were identified as an option which would negatively impact ETDS participation.

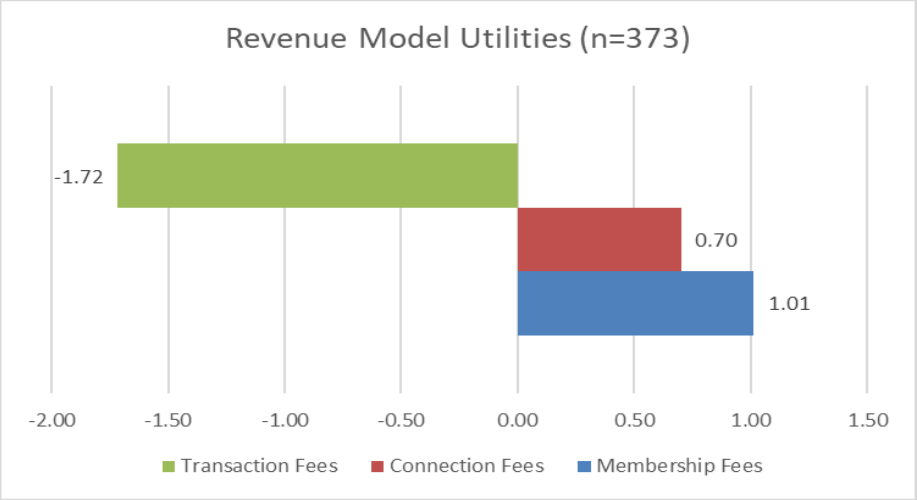


Figure 19 *European tourism stakeholder preferences for ETDS governing body revenue models*

6.3 ETDS expected impacts on the tourism data market

It is important to acknowledge that there is already a vibrant market for tourism-relevant data and data services, and that data providers, data consumers, and data intermediaries are continuously developing new value creation propositions and business models within this market. When established, the ETDS will be a new entrant within the existing tourism data market, and it is important to consider how the ETDS may reshape the forces of competition within the market. The development and facilitation of ETDS business models should take these shifting forces of competition into consideration.

One the one hand, it is expected that the bargaining power of data providers and data intermediaries will increase. Firms should be attracted to participate in the ETDS in part for the access to a larger number of data asset/service buyers. The ETDS will enable data providers and data intermediaries to bring high quality, differentiated and valuable data products and services to market, for which they can charge premium prices. The ETDS should also catalyse the development of data product and service innovations which could substitute incumbent products or services.

On the other hand, an increase in the bargaining power of data consumers should also be expected. The ETDS, by making the tourism data market more accessible (and larger), will magnify the bargaining power of buyers when the offers of data providers and data intermediaries are not significantly differentiated. Furthermore, if the ETDS vision for an easy to use and accessible data ecosystem is realised, then the potential for new data asset/service providers to enter the market will increase, which should again result in a positive benefit for data consumers.

7 DEFINING THE MINIMUM VIABLE DATA SPACE FOR THE EUROPEAN TOURISM DATA SPACE: USE CASES

To define the Minimum Viable Data Space (MVDS), both CSAs have based their work on the analysis and development of use cases. Use cases serve as a fundamental starting point in shaping the development and implementation of the ETDS. Use cases illustrate specific scenarios that address real-world challenges, enabling stakeholders to understand the benefits of data sharing and participating in the ETDS. The presentation of these cases is pivotal for contextualising the potential impact of applications and value-added services built on top of a data space and, by doing so, attracting diverse stakeholder participation in the data space. At the same time, use cases are helpful instruments for designing some of the features of the ETDS, identifying the datasets to be exchanged, the parties involved in the data sharing and their roles. Reasoning on use case scenarios and relationships also helps design the governance policies regulating the data space and its technological features.

The following set of principles and criteria has been created to guide the identification and selection of use cases during the initial deployment of the ETDS:

- Stakeholders' consultation is key, especially in two moments: to identify the needs that could be addressed through the data space and to develop the use case (i.e., defining the datasets to be exchanged, the stakeholders involved in data sharing and their roles)
- Distinguishing datasets containing personal data from those without personal data
- Involving various stakeholder groups
- Involving other sectors directly or indirectly related to tourism (climate, health, communication and technology, cultural heritage, risk management, etc.)
- Consider that at least one dimension of sustainable tourism is being addressed or is benefiting from the use case

In order to ensure a coherent structure and scope, the ETDS should catalogue use cases encompassing, at a minimum, the elements below:

- **Title**: a concise and descriptive title that captures the essence of the use case.
- **Problem(s)/need(s)**: explain the key stakeholders' need(s) or problem(s) that could be addressed by the use case, paying particular attention to resilience and sustainability.
- **Desired solution**: describe the application/use of the data space conceived to address the aforementioned problem(s)/need(s).
- **Needed data types**: macro-categories of the data needed to solve the aforementioned problem(s)/need(s).
- **Needed datasets per data type**: main needed datasets grouped by data type and mentioning the level of granularity needed.
- **Stakeholders and roles**: main stakeholders' categories involved in data sharing and their roles as data provider, data consumer or data intermediary.
- **Stakeholders' relations and type of data exchanged**: which datasets are provided and consumed by which category of stakeholders within the context of the use case.
- **Application of the solution**: specification on whether the same use case could be adapted to a different context or purpose and whether it can be scalable at different geographical levels.

Both CSAs identified and analysed numerous potential use cases for the ETDS. Detailed descriptions of those use cases can be found in the following reports completed by DATES[65] and DSFT[66]. Based on both CSA's findings, a new aggregate use case "**Enhancing tourism sustainability and resilience through data**" is presented in **Table 4** below. This comprehensive use case has been formulated in alignment with the guiding principles and criteria mentioned above. The objective of this use case is to demonstrate the potential of the ETDS in addressing real-world issues. In addition, three additional use cases from the two CSAs are presented below. The purpose of these use cases is to illustrate specific solutions and a pragmatic approach for pilot implementations of the ETDS.

[65] DATES 2023: Identification of data typology and priority list of datasets, potential use cases and common building blocks with other data spaces, 21-51. Retrieved in October 2023 from: https://www.tourismdataspace-csa.eu/wp-content/uploads/2023/07/DATES-D2.3-Identification-of-data-typology-and-priority-list...V1.1.pdf

[66] DSFT 2023: Technical Report, 62-76. Retrieved in October 2023 from: https://dsft.modul.ac.at/wp-content/uploads/2023/08/Technical-Report.pdf

Table 4 *New use case based on previous sustainability/resilience use cases*

Use Case Title
Enhancing tourism sustainability and resilience through data
Problem(s) / need(s) *Explain the key need(s) or problem(s) that should be addressed*
Despite its positive impacts, tourism may pose environmental, socio-cultural, and economic threats. For instance, an excessive number of tourists may damage or destroy fragile natural and cultural sites and contribute to the mounting waste and pollution. Moreover, residents may suffer from **overtourism** and see local services being increasingly devoted to tourists. At the same time, visitors' experience worsens when the number of tourists exceeds the destination's carrying capacity. Tourism seasonality also affects many destinations, meaning that tourism and its impacts (overtourism and economic effects) are highly concentrated in specific periods throughout the year. In recent years, Europe has faced various crises impacting tourism, including economic downturns, conflicts and wars, pandemics, and extreme weather. Effective crisis response and consequential **resilience of the European tourism sector** depend on access to reliable, timely, and diverse data about the situation at hand. In contrast, insufficient data exchange can hinder crisis response, leading to information gaps, coordination issues, and the potential spread of misinformation. The resilience of the European tourism sector can be achieved by acting upon endogenous elements (e.g., heavy reliance on tourism to support local jobs and businesses, seasonality, market dependence and product dependence), determining destinations' vulnerability to (unexpected) shocks (e.g., inflation, oil prices, supply-chain shortages, societal shifts, climate change, pandemics, etc.) and developing strategies to address those shocks.
Desired solution *Describe key aspects that could / should improve the use case problem/challenge, mentioning the possible solution.*
The above-mentioned problems could be addressed through an enhanced use of the data made available through the ETDS. The solution may be composed of three different parts, which could be individually or complementarily adopted by final users. The solution components are: 1. Development and monitoring of indicators through dashboards. 2. Data analytics tools for specific objectives. 3. Decision-making recommendations system. The first component focuses on the **development and monitoring of indicators through dashboards.** According to the problems mentioned, indicators should focus on environmental, socio-cultural, and economic sustainability. For instance, environmental indicators can measure tourists' waste production and energy and water consumption; sociocultural ones can measure residents' satisfaction towards local tourism and the incidence of tourism on residential housing; and finally, economic ones can measure tourism's contribution to local employment and economy. Dashboards developed based on the final users' needs could be useful for monitoring such impacts. These tools may be complemented with "alarms" (e.g., notifications via email) to be activated once the indicator's values reach critical thresholds. Specific indicators and monitoring systems can also be developed for emergency response, integrating real-time crisis management data with tourism data. The second component focuses on **data analytics tools for specific objectives.** Once raw data and indicators are available, they can be monitored and analysed to produce new knowledge and

forecasts to inform decision-making. For instance, a DMO can use historical data to predict when a Point of Interest's (POI) carrying capacity will be under stress. Similarly, tourism service providers and HoReCa companies may be able to estimate their potential market in specific periods and thus design more effective marketing campaigns.

Finally, building on these two components, the third focuses on **decision-making recommendations**. Once specific thresholds are met or are about to be met, an AI recommender system based on nudging approaches may be developed to provide suitable alternatives to reach the final users' objectives. For instance, AI-based procedures can be implemented to predict POI under stress. Based on nudging approaches, a recommender system will be developed to provide DMOs with alternative options to enhance visitors' experience and to ensure residents' satisfaction. The same concept can be translated into a mobile app for visitors, recommending alternative itineraries based on forecasts of the number of people present in a POI at specific moments.

Needed data types

What are the main data types that need to be considered?

Local/Residents' sentiment and satisfaction; tourist flows, industry data, purchase habits, the behaviour of tourists; mobility data, demand, and supply data; tourists' sentiment and satisfaction, typology of tourists, economic data, non-tourism data (e.g., health, mobility, weather-related data, etc.).

Stakeholders and roles

Who are the relevant stakeholders involved in this use case? With which role(s)?

Data provider: HoReCa, travel agencies, public authorities, private companies, NGOs/associations, tour operators, tourism service providers.

Data consumer: DMOs, HoReCa, travel agencies, tourism service providers, tour operators, public authorities, private organisations, media, research institutes.

Data space intermediaries: e.g., firms providing data connection, analysis and visualisation services.

Examples of stakeholders' relations and type of data exchanged

How do stakeholders interact with the data space, the proposed solution and within each other? What type of data do they share between them?

HoReCa:

- Provides data on the accommodation capacities and occupancy rate.
- Consumes a list of all attractions in the destination and customer profile.

Travel agency:

- Provides bookings of flights towards the destination.
- Consumes a list of all attractions in the destination.
- Consumes data on the schedule of activities for tourists.

Public authority:

- Provides statistics on tourism impact.
- Provides datasets on tourist spending per capita vs local spending per capita.
- Provides data on the CO2 footprint of an average tourist.
- Provides weather data and forecasts.
- Consumes forecasts of expected visitors to a destination.

Destination management organisation:
- Provides a list of all attractions in the destination.
- Provides a schedule of activities for tourists.
- Provides behavioural data of tourists (e.g., tourist guest cards).
- Consumes reviews on the destination.

Private organisations:
- Provides weather data and forecasts.
- Provides behavioural data of tourists.
- Consumes a list of preferences and satisfaction rates of tourists.
- Provides sector-related performance data (e.g., bookings or ticket sales).

Tourism service providers:
- Provides data on individuals' time spent in a POI, time of visit, and opening hours.
- Provides information on visitor profiles.
- Consume data on tourists' geolocalisation, visitor forecasts.

Tour operator:
- Provides a list of booked activities and the number of people for each booking.
- Provides visitor demographics in a POI.
- Consumes data on the schedule of activities for tourists.
- Consumes a list of all attractions in the destination.
- Consumers visitor forecasts.

NGOs/Associations:
- Provides datasets on the list of itineraries to enjoy destinations and POIs by walking.
- Provides datasets on the CO2 footprint of an average tourist.
- Consumer statistics, visitor forecasts, tourist activity data.

As the abovementioned use case offers a broad scope of fields of application and of solutions, the following three use cases are provided as inputs for initiating pilot programs or demonstrators. These use cases are selected based on their potential to offer significant value, while being relatively straightforward to implement. These use cases follow the recommended structure, covering critical information such as involved stakeholders, required types of data as well as the infrastructure setup essential for their successful implementation. It is assumed that their technical setup will adhere to the standards described in the preceding **Chapter 5**, but it will be adapted according to the evolving technological state-of-the-art and, of course, in line with any potentially different infrastructure proposals from SIMPL. Adherence to standards, is to ensure on one hand that the principles of trust, data sovereignty, fairness and legal compliance are respected, and on the other hand that interoperability with other EU data spaces is guaranteed.

Table 5 *Proposed ETDS pilot use case for creating immersive experience*

Use Case Title
Customised immersive experience using historical data
Problem(s) / need(s)
As the tourism landscape evolves, the imperative to cater to the demands and preferences of digital natives comes to the forefront. Millennials, generations Z and Y will become tourism consumers in the medium term (until 2030) and the main consumers in the long run (2050). They are highly digitally skilled tourists and will most likely ask for more inclusive and interconnected digital solutions. Indeed, they are looking for "transformative experiences" that deeply involve their mind and that are customised to their current mind-set/life stage/interests.
Desired solution
Based on digitalized cultural heritage (e.g. paintings, archaeology, architecture, fashion, etc.), it is possible to create extended reality (XR) experiences, including mixed reality (MR) and virtual reality (VR). Based on customers' data, it will be possible to offer personalized VR experiences. Indeed, data regarding visitors' preferences, previous visits, interests, but also age, etc. will allow to tailor the experience in real time. Example: A VR experience at the "Eiffel Tower" could adapt to the profile of the visitor. For instance, the experience could provide technical information and depict the history of the construction processes for tourists with a technical background/interests. Similarly, a VR experience with a "romantic narrative" can be displayed to a couple. Players from multiple data spaces (cultural heritage, smart city, etc.) can share data with tourism players wanting to build extended reality experiences. For this, exchange of data with other data spaces is required, as well as procedures to ensure secure use of personal information and GDPR-compliance. The solution should further focus on increasing cooperation between cultural institutions and tourism stakeholders, as well as giving the possibility to showcase these experiences in multiple languages or dialects.
Needed data types
Related industry data; Typology of tourists; Behaviour of tourists; Purchase habits; Tourist Flow
Stakeholders and roles
Data provider: Public authorities, DMOs, tourism service providers, private organisations. Data consumer: Private organisations, tour operators, tourism service providers.
Examples of stakeholders' relations and type of data exchanged
Public authority: ▪ Provides datasets on lists of 3D city models, both historical ones and current ones for change detection. ▪ Provides datasets on historical cultural archives. **Destination management organisation**: ▪ Consumes datasets on historical data on purchase of extended reality experiences (last 2 years).

- Consumes list of cultural preferences of tourists.
- Consumes datasets on number of tourists in a POI.

Private organisations:

- Provide datasets on a list of 3D city models, both historical ones and current ones for change detection.
- Provides datasets on a list of historical cultural archives.
- Consume datasets on number of tourists in a POI.

Tourism service providers:

- Consume list of attractions that can be used to generate transformative and extended reality experiences .
- Consume datasets on the number of tourists in a POI.

Tour operator:

- Provides and consumes datasets on the cultural preferences of tourists.
- Consumes datasets on number of tourists in a POI.
- Consumes datasets on historical data on purchase of extended reality experiences (last 2 years).
- Consumes datasets on historical figures.

Table 6 *Proposed ETDS pilot use case for supporting MICE travel*

Use Case Title
Improving flexibility for MICE travellers
Problem(s) / need(s)
The MICE (Meetings, Incentives, Conferences, Events) sector is still seen as essential to companies, but is now conditioned to a more sustainable travel, and as a possibility for many business travellers to mix personal trips with business trips. As for other segments of travel, last minute decisions are more and more common and need to be facilitated with appropriate data. All this results in a need for the MICE tourism professionals (agencies, hotels, concierges, DMOs, etc.) to dispose of a wider base of relevant information to meet the hyper-personalized demands of their clients, not only in purely business-related travel, but mixing services and activities usually associated with leisure or with everyday life. In addition, for Congress and Events organisers as well as the mentioned MICE professionals, the need for sound information about MICE travellers' requirements and, consequently, about sustainable options of travel is becoming increasingly pronounced.
Desired solution
This pilot project aims to implement a holistic tool for all MICE professionals and travelling individuals, providing them with real-time and role-specific contextualised data for multimodal transportation, leisure, and cultural activities. This includes AI-generated predictive data on affluence or traffic for enhanced recommendations. The tool would enable responses to a wide range of demands and budgets, relying on the knowledge of various MICE tourism stakeholders and personas built on aggregated data. The tool might be developed based on data provided by stakeholders located in a pilot region, but it has a high propensity to be duplicated and scaled at any geographical level.
Needed data types
Expenditures / Rail Transport, schedules, and real time data/ Road Traffic, schedules and real time data / Taxi availability and usage / Car rentals availability and usage / Airport operations / Accommodation / Tourism attractions / Airlines / GDS data / Demographic data / Leisure Tourism information data.
Stakeholders and roles
Data provider: GDS, Airport operators, Rail Companies, Car Rental Companies, Taxi Companies, Airlines, DMOs, tour operators, tourism service providers. Data consumer: Owners of the MICE support use case, DMOs, HoReCa, other travel endpoints (i.e., museums, monuments, leisure sites), business travellers. Data space intermediaries: data space governance authority (providing member management, governance frameworks, onboarding support etc.) data space platform provider (providing trust framework, marketplace functions, clearing house features, etc. according to DSSC data space blueprint). App Developer: Owners of the MICE support use case (develop the backend functions that analyse and compile the data for the different end users' needs; develop the Apps for desktops and mobiles to receive the compiled data).

Examples of stakeholders' relations and type of data exchanged
HoReCa: ▪ Provide data on the accommodation capacities and occupancy rate. ▪ Consume information (e.g., disruptions delays) about travellers towards the destination and customer profile. **Airport Operator, Airlines, Rail transport operators, Taxi companies, Car Rental Companies:** ▪ Provide schedules of their services. ▪ Provide status information of their services. ▪ Provide information about origins and destinations of travellers. **Destination management organisation**: ▪ Provides a list of all attractions in the destination. ▪ Provides a schedule of activities for tourists. ▪ Provides behavioural data of tourists (e.g., tourist guest cards). ▪ Consumes reviews on the destination. ▪ Consumes information of preferences and satisfaction rates of tourists. **Tourism endpoints/service providers**: ▪ Provides data on individuals' time spent in a POI, time of visit, and opening hours. ▪ Provides information on visitor profiles. ▪ Provides sector-related performance data (e.g., bookings or ticket sales). ▪ Consume data on tourists' itinerary status (e.g. disruptions, delays), visitor forecasts. **Tour operator, GDS**: ▪ Provides information about booked itineraries. ▪ Provides data about booked activities and the number of people for each booking. **Business Traveler (MICE):** ▪ Consume data on own itinerary status (e.g. disruptions, delays), trip forecasts. ▪ Consume information about destination features and dynamics. ▪ Consume information about itinerary extension opportunities (extend business trip with private elements, combine private trip with professional elements).

Table 7 *Proposed ETDS pilot use case for enhancing resident sentiment*

Use Case Title
Enhancing Residents' Sentiment Towards Tourism
Problem(s) / need(s)
Residents play a pivotal role in shaping the success and sustainability of any tourism destination. Their sentiment, attitudes, and engagement significantly impact the overall visitor experience and the long-term appeal of the destination. Recognising their importance as key stakeholders and involving them in the destination's strategy is crucial for fostering sustainable tourism development and ensuring positive outcomes for the community and visitors. As the number of tourists grows, residents often become frustrated and unhappy, leading to a decline in the destination's appeal. Despite tourism's significant role in a place's development, locals often have a limited understanding of its impacts due to a lack of cooperation and communication with public authorities. Without effective collaboration between these stakeholders, destinations face challenges in enhancing residents' support for tourism and maintaining their attractiveness.
Desired solution
The ETDS could be the solution, enabling an exchange of information that facilitates understanding tourism performance from the perspectives of businesses and residents. For example, residents in a city should have convenient access to information on essential indicators such as the number of travellers visiting the destination at a given period, tourism's contribution to the economy and employment, congestion levels, water and air quality, etc. Simultaneously, destination management organisations and local businesses should have access to information on residents' acceptance of tourism and develop strategies for necessary improvements. To facilitate these goals, the ETDS could employ, among others, the following technical outputs: ▪ **Interactive Dashboards:** user-friendly dashboards accessible to residents and authorities, showcasing real-time tourism data, including visitor numbers, economic impacts, and environmental data. ▪ **Community Engagement Apps**: Create mobile apps dedicated to engaging residents, enabling them to report concerns, provide feedback, and access information about tourism-related developments. These apps may foster direct communication and involvement. ▪ **Geolocation-based Notification Systems**: Develop systems that send notifications or alerts to residents regarding upcoming events, road closures, or initiatives related to tourism, enhancing transparency and awareness.
Needed data types
Residents' sentiment and acceptance of tourism from surveys or face-to-face interviews, type and number of accommodations, tourist volumes, length of stay, seasonality, and spending. Data on the economic, social, and environmental impact of tourism. Information on tourists' and locals' sentiments towards a destination as reflected in the online space (i.e., in blogs, news, articles, etc). Tourism foreign direct investment projects. Information on the property prices.

Stakeholders and roles
Data provider: public authorities (e.g., DMOs, municipal government, and statistical bureaus), international authorities and programmes (e.g., Eurostat, United Nations World Tourism Organisation, Copernicus Programme), private data companies and consultancies (e.g., TCI Research, fDi Intelligence, Murmuration, real estate agencies). Data consumer: local tourism businesses (e.g., accommodation, food, and beverage establishments), national, regional and city tourism organisations, private businesses (e.g., mobile app developers, tech companies). End users: residents, local tourism businesses, public authorities (destination management organisations, municipal government), policymakers.
Examples of stakeholders' relations and type of data exchanged
Public authorities (NTOs, DMOs, Statistical Bureaus): ▪ Provide data on the type and number of accommodation establishments, tourist volumes, tourists' length of stay, seasonality, spending, etc. ▪ Provide data on residents' sentiment and acceptance of tourism from surveys or face-to-face interviews. ▪ Consume data on the number of tourism businesses, air quality, water, food and water waste, etc. ▪ Consume data on tourists' and locals' sentiments as reflected in the online space (e.g. blogs, news, articles, etc.). **International authorities and programmes (e.g. UNWTO, Copernicus Programme, etc.)** ▪ Provide data on tourism contribution to GDP, employment, wages, and revenue per tourist. ▪ Provide information on the number and type of tourism businesses. ▪ Provide data on the water and air quality, CO2 emissions, noise pollution, energy consumption, food and water waste, etc. ▪ Consume data on tourism foreign direct investment projects. ▪ Consume data on tourism hotel properties. **Residents:** ▪ Provide sentiment data, e.g. opinions about the contribution of tourism to their life and city development. ▪ Consume data on the impact of tourism (e.g. economic, environmental and social) in their city. **Private companies**: ▪ Provide information on tourists' and locals' sentiments towards a destination as reflected in the online space (i.e., in blogs, news, articles, etc.). ▪ Provide data on foreign direct investment projects. ▪ Consume information on tourism volumes, tourism seasonality, property types, etc. ▪ Consumer data on the water and air quality, CO2 emissions, noise pollution, energy consumption, food and water waste, etc.

7.1 The Participant Journey

One of the main challenges the ETDS will face is to explain to potential participants, especially those with limited technical skills, the data space concept and how the data spaces paradigm is different from previous data sharing approaches. Furthermore, the real benefits of using the data space approach and how it can improve data valorisation both inside the company and externally must be clearly demonstrated.

The conceptual model and building blocks approach provides a good and detailed overview of the main concepts like trust, data sovereignty, interoperability, business models and data governance, but they fail to provide a non-technical overview of the data space processes (i.e., the steps a company must follow to participate in the ETDS either as a data provider, consumer or intermediary). Main concepts are easily understood, but the ways in which these concepts are applied at an operational level are often less clear.

When combined with the contextualisation of use cases, explaining the data space concept as a "participant journey" is a very helpful technique for illustrating how the building blocks cooperate to provide the whole experience of sharing data in an interoperable and standardised way.

The main steps of this journey, that can be considered as the main phases of the data space engagement life cycle, are the following:

Onboarding

- Participant
- Data product/service

Publish/search/purchase

- Data
- Services
- Applications

Data products/services

- Provider (offers the data/service through the catalogue)
- Consumer (accesses the data/service from the catalogue)
- Owner (the holder of the rights to access and use the data/service)

Monitoring

- Tracking the data exchanges and contract fulfilment

While the potential ETDS participant follows the necessary steps, the difficulties and challenges of each step are revealed, in addition to understanding how the concepts of sovereignty, trust and valorisation are reflected in each of the steps.

8 RECOMMENDATIONS FOR THE EUROPEAN TOURISM DATA SPACE (INCLUDING ROADMAP FOR ITS DEPLOYMENT)

The ETDS will enable the digitalisation of a critical mass of European tourism stakeholders, particularly local authorities and SMEs, that would otherwise take years to achieve. Tourism destinations will act as the main triggers to boost the digital transformation journeys of their territories.

The ETDS will represent a secure ecosystem for data from hundreds of destinations and thousands of SMEs connected and monitored, which will be implemented on three main axes:

- Destination-travellers-companies interaction, omnichannel communication, and personalised communication with travellers to attract them, make their stay profitable, improve their satisfaction and build their loyalty.
- Technological and management capabilities of Smart and Sustainable Tourism Destinations to integrate tourism management with local management, improving business strategy and employment, and anticipating, managing, and mitigating negative impacts.
- Tourism data economy, increasing data generation capabilities at the local level and data aggregation and intelligence at the country level to activate a new knowledge-based competitive advantage.

The results of the validation survey (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey Questionnaire**) reveal that there are already positive intentions for ETDS participation among tourism stakeholders. **Figure 20** shows that the ability to access data and data assets is of greatest interest. There is also a lesser, but still significant, intention among stakeholders to share their data and data assets via the ETDS.

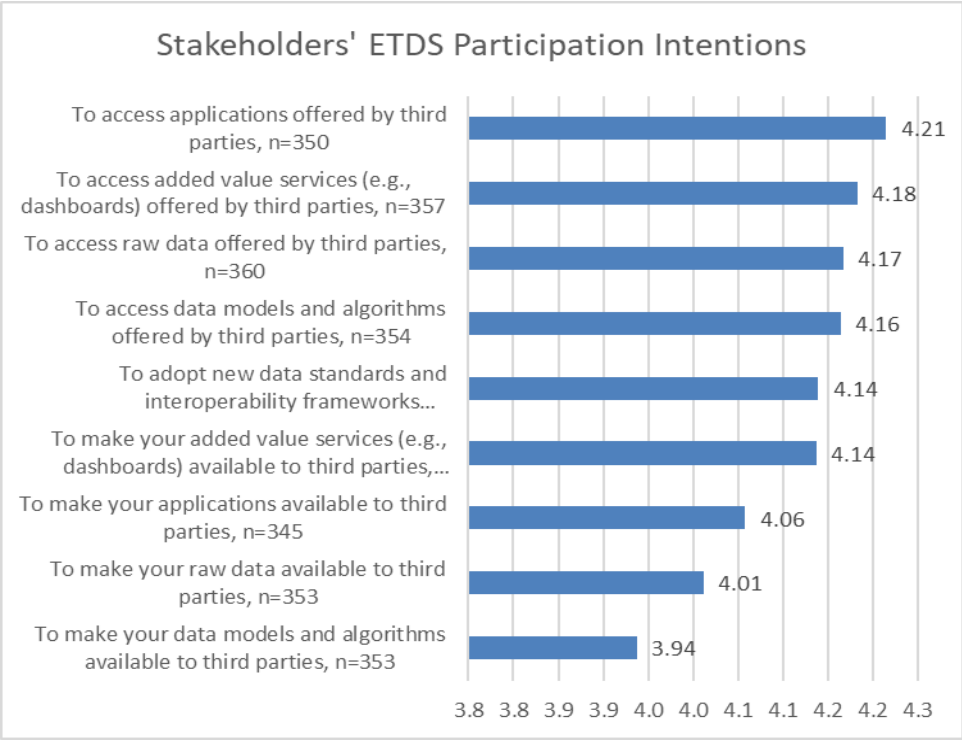


Figure 20 *European tourism stakeholder ETDS participation intentions*

Following the widespread consultations with tourism industry stakeholders, a roadmap for the ETDS deployment has been developed (see **Figure 21**). In line with OpenDEI[67] and concepts from the BDVA[68], the recommended actions should be supported along five activity streams within the suggested time frame. The suggested activity streams are not mutually exclusive and must be implemented in parallel.

[67] OpenDei 2021: Design Principles for Data Spaces. Retrieved in October 2023 from: https://h2020-demeter.eu/wp-content/uploads/2021/05/Position-paper-design-principles-for-data-spaces.pdf

[68] BDVA November 2020: Towards a European-governed Data Sharing Space, Enabling data exchange and unlocking AI potential. BDVA Position Paper v2. Retrieved in October 2023 from: https://www.bdva.eu/sites/default/files/BDVA%20DataSharingSpaces%20PositionPaper%20V2_2020_Final.pdf

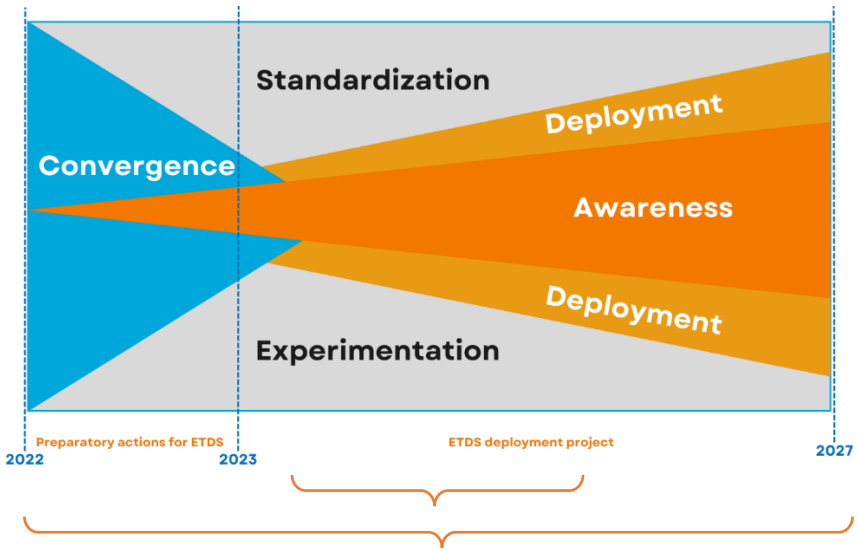


Figure 21 *Roadmap for the development of the ETDS: activities and timeframe*

(Source: OpenDei 2021: Design Principles for Data Spaces. Retrieved in October 2023 from: https://h2020-demeter.eu/wp-content/uploads/2021/05/Position-paper-design-principles-for-data-spaces.pdf)

8.1 Convergence

The phase of convergence brings together two main streams of input: first, the systematic review of data initiatives, policy, and legislative frameworks and, second, the stakeholders' perceptions, resources, skills and expertise. The following steps are recommended:

1. A systemic review of **the European data initiatives, policy and legislative framework** for data access and use at the local, regional, national and European levels from the tourism sector and beyond. These efforts allow for determining the use cases and identifying important touchpoints between the ETDS and the other sectorial data spaces (e.g., culture, mobility, etc.). The latter are essential for establishing connections and building the future pan-European data space. This activity has already been undertaken partially by the two CSAs. The analysis and the status quo have been presented in the preceding sections of this Blueprint: Sections 3.1 and 4.2.
2. Review of the **stakeholders' perceptions, resources, skills and expertise,** which should highlight the potential costs and challenges associated with joining the ETDS. In order to achieve long-term sustainability, the ETDS must consider switching costs, which must be overcome. Different users (data holders, data consumers, data space intermediaries, etc.) will have different needs, which must be addressed within the ETDS when creating a deployment strategy. The foreseen costs may include:
   - **Procedural switching costs** – uncertainties related to the economic risks associated with joining the ETDS; evaluation, set-up and learning costs.
   - **Financial switching costs** associated with the direct monetary loss (e.g., fees and investment in the ETDS infrastructure and training) or the loss of other (non-monetary) benefits (e.g., performance costs).

- **Relational switching costs** may include the loss of relationships on a personal or brand level (e.g., partnerships, common projects).

These costs could be overcome by:

- clear and transparent **communication of the relative advantage** (value proposition) of the ETDS;
- improved **technical functionality** and network externalities compared to existing tourism data products/services currently in use by European tourism stakeholders;
- **expert support and education** for the new and existing ETDS members (e.g., trainings, online and on-site workshops, training materials); and
- transparent **governance structure** and flexible governing approaches**.**

3. **Establishment of the governance structure,** including organisational, data governance and business model frameworks described in **Chapter 4** and **Chapter 6**. Upon agreement on the optimal governance structure, decisions must be made about the composition of the governing bodies at every level regarding their responsibilities, eligibility and the selection process.
4. Systematic **review** and development of the optimal technical solutions in line with ETDS design principles.

Recommendation 4: Continuous monitoring of the ETDS environment (data, legal system, stakeholder needs, technology)

- The analysis of the data space environment, legal framework, stakeholders' needs and technological solutions should be periodically reviewed across all the stages of the ETDS development and deployment.
- The analysis should be performed by a designated body within the ETDS.
- The methodology presented in the preceding sections of the Blueprint can be adopted and scaled.

8.2 Deployment

The ETDS must build upon the output of the convergence stage. The critical first step is the establishment of a solid **governance structure and funding mechanisms**. **Figure 22** below shows that among European tourism stakeholders (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey Questionnaire)**, it is of relatively minor importance whether the ETDS governing body is newly created or an already established organisation, though there is a negligible preference towards the formation of a new legal entity for the purpose. However, the insights from a widespread consultation with tourism stakeholders indicate a strong preference for **the public, non-profit form of the ETDS governing body,** which is at least partially sustained through public funds (see **Figure 18** and **Figure 19** in **Chapter 4**).

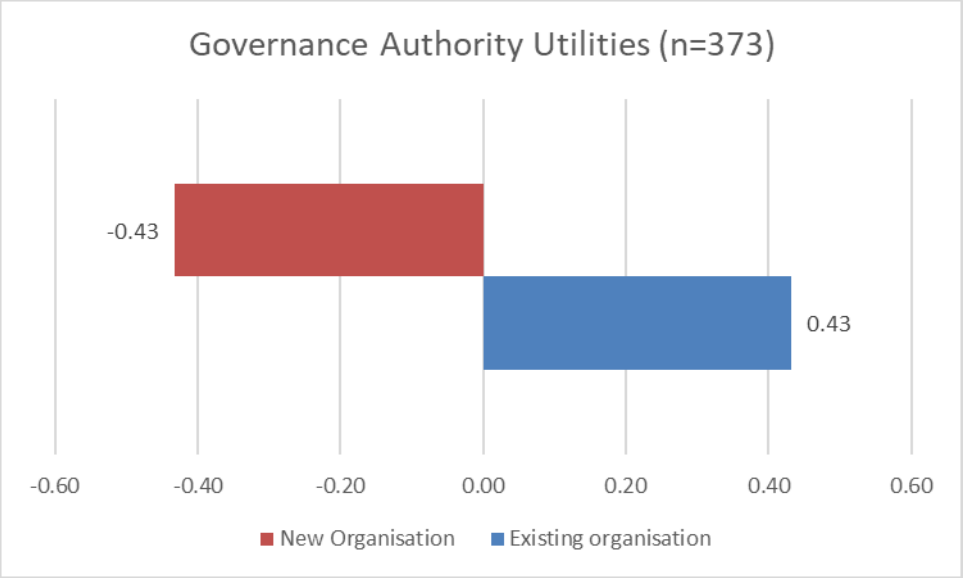


Figure 22 *European tourism stakeholder preferences on new vs. existing ETDS governing authority*

The ETDS must create additional value via network externalities. In essence, the more ETDS users there are, the more potential benefit there is for others to use the ETDS. Therefore, deployment strategies and EU policy should consider making **onboarding** as easy as possible and **reducing the costs** for participating as much as possible to create a critical mass of participants (particularly data holders and intermediaries). For this reason, the ETDS deployment must address a few considerations which will influence adoption:

- **Organisational,** such as social capital and skillsets of ETDS users. The readiness of organisations to capture the value of data and hence, to maximise the potential of data spaces depends on having appropriately skilled employees. This issue involves two dimensions.

  (1) Education and training of the existing employees. Education and training **services** have frequently been mentioned as facilitators for the successful adoption and use of the ETDS.

  Solution: The ETDS should support the development of a strategic skills development plan for ETDS stakeholders and provide training and training materials for users with different roles and skill levels.

  (2) The **struggle to attract tech talent** is evident globally and affects all economic sectors. However, the tourism sector is particularly challenged as most technological professionals, such as mathematicians, engineers, architects, or programmers, do not recognise the tourism sector as a viable option when developing their professional careers.

  Solution: It is necessary to develop an "**employer branding strategy**" in which the different stakeholders (public sector, private companies, and academia) work together to convince these technological professionals that the tourism sector presents great opportunities for professional development. Otherwise, the rest of the initiatives, which are intensive in time and resources, such as the design and delivery of education and training programs or the design of reskilling or upskilling

strategies customised to the tourism sector's needs, may fail since the participating professionals may leave the tourism sector.

- **External considerations**, such as governmental support, pressure from competitors and partners and synergies with the external initiatives.

  (1) Having the necessary technological talent internally in the public sector and overall support of the public sector is especially important due to the role that it has also played as "**glue" with the private sector**, made up mainly of SMEs that operate in destinations. Therefore, efforts to gain public sector support may act as a driving force that would accelerate the adoption of the ETDS.

  The public sector, which has traditionally had professionals accustomed to creating, analysing, and publishing statistical and econometric data sources, deserves special mention. These professionals primarily take part in reskilling and upskilling activities to be able to deal with the new trends associated with data analysis. However, conversely, the public sector continues to suffer from a lack of flexibility, and in this case, it is clearly manifested in its difficulty in hiring technological profiles. Even in those cases in which the analytical know-how necessary to interact with the future ETDS is acquired through outsourcing processes (typically subcontracting), these processes are slow and time-consuming. This deprives the tourism sector of the agility that would be desirable for positioning itself as an active agent and driver of innovation.

  Solution: Thee ETDS must ensure support and involvement of the governmental institutions at different levels along all stages of the ETDS design and deployment.

  (2) The roadmap also calls for the **prioritisation of compatibility** with other sectoral data spaces. In particular, the efforts of the preparatory actions CSAs have determined that connectivity and compatibility with the mobility, cultural heritage, green deal and energy data spaces would generate significant value for ETDS users.

The deployment of the ETDS must also be in line with and synergised **with** the myriad initiatives that answer the calls for the **Transition Pathway for Tourism and the European Strategy** for Data, which are in parallel development. These initiatives include:

(1) The Data Space Support Centre
(2) The EU Tourism Data Competence Center
(3) National and Regional Tourism Data Space initiatives
(4) Code of Conduct for Data Sharing in Tourism
(5) Smart European Capital of Tourism/Intelligent Cities
(6) EU Tourism Dashboard
(7) European Digital Innovation Hubs (EDIH)
(8) Enterprise Europe Network Sector Group Tourism (SGT)

In order to deploy the ETDS, it is imperative to adhere to the key design principles: trust, data sovereignty, federation, participatory governance, interoperability, flexibility, security and quality control, and openness. These principles address the existing mistrust toward data sharing while allowing access to data products located in any member state of the

European Union. The architectures currently being developed by Gaia-X, IDSA, FIWARE and the DSSC will allow the common pillars of data spaces in Europe to be established, not forgetting SIMPL initiative that will provide the middleware for their deployment.

However, the particularities of the ETDS, with the high involvement of SMEs, the responsible handling of personal data and the necessary public-private collaborations imply considering stricter governance aspects than in other data spaces, while facilitating their access and use for organisations of smaller size and with smaller budgets. Data intermediaries and service brokers will also play an essential role in these ecosystems.

The analysis of different use cases has generated important insights to define the ETDS. However, since tourism is a complex industry and the concept of data spaces is still evolving, implementing future use cases will allow adaptations in light of new information and gather best practices for the ETDS.

Important priorities for a minimum viable ETDS include:

- **Lowering the cost of data access** by creating a competitive data marketplace should be a core objective of the ETDS.
- The ETDS should **enable open data models** (suited to public administrations and other actors) while also **enabling data monetisation** by private actors.
- **Provide use case description** templates that follow a standardised structure to collect relevant use cases that are intended to be addressed by ETDS participants.

8.2.1 ETDS deployment process

This section outlines the ideal process of defining and implementing the ETDS from the technical point of view. It includes two different approaches: theoretical and pragmatic, and it is recommended to follow the two approaches in parallel, the theoretical strategy to implement a formal onboarding process providing trust, and a pragmatic approach to start implementing real use cases as soon as possible. Eventually, both approaches will converge.

8.2.1.1 Theoretical ETDS deployment roadmap

The following steps define the roadmap to define and deploy a “generic” data space, along with some specific steps where requirements from the Tourism sector can be added.

It is very important to note that this is a technical roadmap, which means that the organisational aspects of the data space are not taken into account. For example, the first step is to establish the ETDS governance authority, such as a tourism-specific EDIC created by the European Parliament.

1. Define the data space mission statement
2. Define use cases
3. Define and create the data space governance authority.

4. Define the data governance framework or Rulebook.
    a. Compliance process (from the technical perspective)
        i. Mandatory and optional criteria
        ii. Tourism Sector-specific criteria
    b. Define data models needed to implement the compliance processes
        i. Generic models to describe Data products, natural and legal persons, services, contracts and so on
        ii. Tourism specific data models
5. Operationalise the on-boarding process.
    a. Define and deploy the on-boarding services.
6. Deploy the needed data intermediaries:
    a. Catalogue
    b. Identity provider(s)
        i. For natural and legal persons
    c. Personal data intermediaries
    d. Logging service
        i. Observability and audit
7. Define and deploy the standard "connector" for the data space, with the following features:
    a. Secure identification and authorisation
    b. Secure data transfer
    c. Data sovereignty enforcement

A detailed analysis of the recommendations regarding the main data spaces issues is included in **Chapter 5.5**.

8.2.1.2 Data space deployments in practice

The previous roadmap defines the theoretical roadmap to deploy a tourism data space. However, some of the data spaces already in place have been defined and developed following a more pragmatic approach, based on incremental technology adoption, not the theorical roadmap.

These are some of the characteristics of these data spaces:

- Some of them do not follow a well-defined onboarding process.
- The connector technology plays a central role from a technological point of view, and the governance framework or Rulebook elements are not addressed in the initial phase.
- The data space has been defined around a use case with a small and "closed" set of companies with a common business case or belonging to a supply-chain. Then, other companies have joined the data space.

- Some of the intermediaries have not been deployed, like for example the catalogue or the logging/audit service.

8.3 Awareness

Creating awareness about the ETDS and communicating the long-term vision and the expected benefits of participating in the data space are crucial to engaging and maintaining a critical mass of ETDS users. During the wide consultations with European tourism experts lack of understanding for how the ETDS works, a clear goal of the project and expected benefits were emphasized as the most critical barriers for joining the data space initiative.

Importantly, the successful ETDS deployment and further scaling up requires not only a well-developed technical solution and governance framework, but also a strong communication strategy for promoting the benefits and addressing the insecurities of the diverse ETDS stakeholders. Furthermore, the rate upon which the tourism sector will adopt ETDS will be based upon:

- **Relative advantage** – the extent to which the ETDS is a "better" solution for accessing and sharing data. The ETDS can provide a number of benefits to the stakeholders. Based on the affordances described in **Figure 20**, the ETDS will accelerate the **digitalisation of European tourism** and allow stakeholders, particularly SMEs, to **access and use** versatile **data** to inform management decisions. Thus, the ETDS will enable increasing **competitiveness,** boosting the relevance of offerings and **personalising value propositions**. Apart from the technical know-how, the ETDS will serve as a **knowledge exchange** and **relationship-building platform**. For Smart and Sustainable Tourism Destinations, the ETDS will represent an **ecosystem of common services** that deploy its own and third-party applications, integrate third-party operations, and interoperate bidirectionally with data from other data spaces and third-party applications. These are summarised in a value proposition in **Figure 23**.

ETDS Value Propositions

Digital sovereignty	Access to data beyond tourism	Trusted collaboration space	One-stop shop for multiple solutions
Participatory development and governance	Easy access to data	Performance benchmarking and innovation	Cost reduction

Figure 23 *ETDS value propositions*

- **Communication** - apart from defining these advantages, special efforts need to be made to convey them to heterogeneous tourism stakeholders. The communication strategy must focus on a multiplicity of the skills, roles, needs, and perceived benefits that ETDS provides to different actors in the data space.
- **Compatibility** – how consistent is the ETDS with existing practices, values, and expectations of potential users.
- **Complexity** – the more transparent, easy to use and intuitive ETDS is the more likely it will be adopted.
- **Trialability** – applications, potential, and benefits of ETDS should be tested on a limited scale before they can be scaled up to Europe-wide solutions. It is during these pilot use cases the solutions for all the building blocks and the optimal combination of stakeholders must be verified.
- **Observability** – the use and benefits of using the EDTS must be visible to European Tourism Stakeholders.

8.4 Standardisation

Standardisation is critical for the widespread deployment of the ETDS given the versatile reality of data forms, types and modes of data collection. The ETDS Rulebook should define these standards. The latter must ensure interoperability and connectivity with other sectorial data spaces. Appropriateness and applicability of the standards must be continuously evaluated in line with market trends and technological developments. Fortunately, there is currently strong interest and goodwill among tourism stakeholders (see **Appendix A: ETDS Design Experiment and Validation Survey Methodology** and **Appendix B: ETDS Design Experiment and Validation Survey Questionnaire**) regarding the adoption of new interoperability standards, as shown in **Figure 24** below.

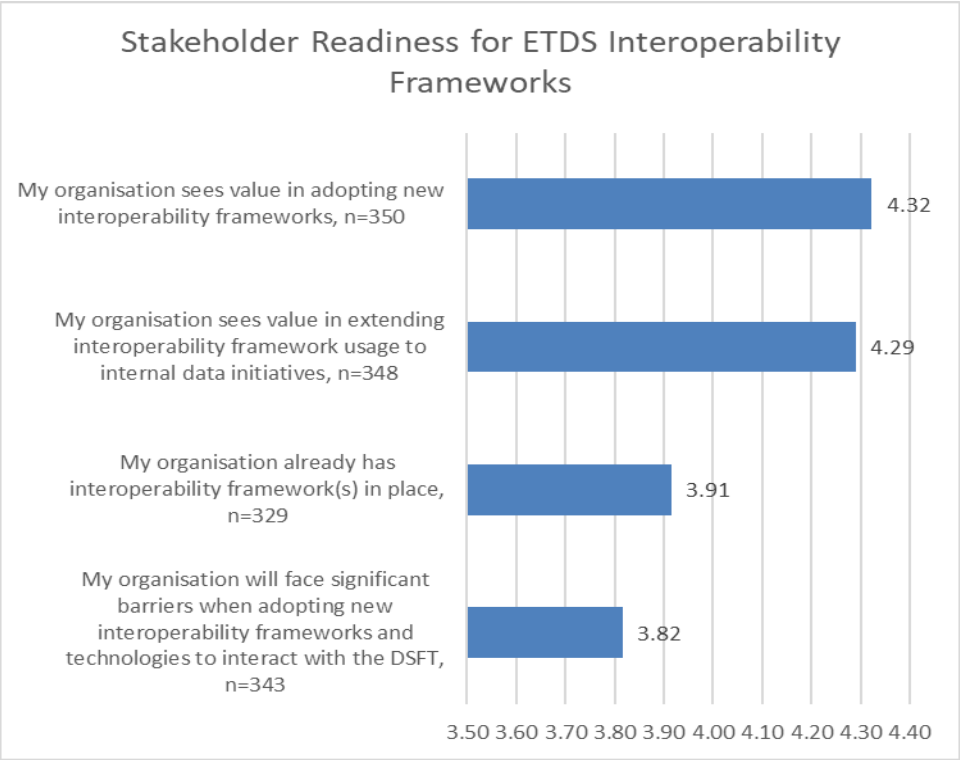


Figure 24 *Stakeholder readiness for ETDS interoperability frameworks*

8.5 Experimentation

A successful and sustainable data space must be treated as a dynamic system that adapts in response to environmental and technological trends and evolving users' needs. The ETDS has to keep up the experimentation spirit to continuously identify and test promising use cases and explore market capabilities for business innovation. Indeed, one of the stated goals of the ETDS is to foster innovation within the European tourism sector. The opportunity of creating new use cases and adding experimentation sandboxes should not be neglected.

APPENDIX A: ETDS DESIGN EXPERIMENT AND VALIDATION SURVEY METHODOLOGY

Based on the findings obtained from preliminary activities of the CSAs (e.g., stakeholder workshops, interviews, online questionnaires, desk research identifying potential ETDS technical building blocks), a research activity was conducted in order to identify the ETDS's ideal business models and governance models. An experiment was conducted to assess the desirability of different ETDS design option combinations using conjoint analysis, which is an advanced quantitative technique (Green, Krieger & Wind, 2001) to understand how users would value the individual features of the ETDS. The part-worth utility, or preference score, as well as the relative importance of ETDS "feature" was estimated using statistical analysis. Understanding stakeholders' reactions to the feasible business models, governance models, and technical specifications was used to determine the most desirable combination of characteristics for the ETDS among European tourism stakeholders and guide further recommendations.

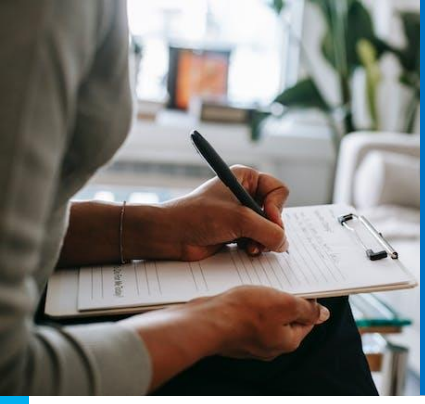
The complete questionnaire is presented below. Between August 31 and September 20, 2023, the questionnaire was distributed to 271 tourism stakeholder organisations that previously volunteered to participate in this study, of which 153 responded (56.5% response rate). Questionnaire links were also distributed using the social media of both CSAs, which yielded an additional 246 responses. Finally, an additional 260 responses, specifically from European tourism SMEs, were collected through collaboration with the online panel company OvationMR. After data cleaning and validation, a total of 392 responses were retained for analysis.

As reported in **Table 8** below, the sample (n=392) is representative of European tourism stakeholders based on operational scope, organisation type, and number of employees.

Table 8 *Organisation type, scope, and size of ETDS design experiment sample, n=392*

		Organisation Type*							
		Priv.E.	**Priv.A.**	**DMO**	**PPP**	**GOV**	**RES**	**NGO**	**Total**
Organisation Scope	Multinational	9.1%	3.8%	2.5%	1.1%	1.1%	3.0%	1.1%	21.7%
	National	22.8%	6.9%	5.8%	3.8%	3.0%	1.9%	0.3%	44.5%
	Regional	7.4%	1.6%	2.2%	3.0%	0.0%	0.3%	0.5%	15.1%
	Local	8.5%	1.6%	2.2%	1.6%	4.1%	0.3%	0.3%	18.7%
	Total	**47.8%**	**14.0%**	**12.6%**	**9.6%**	**8.2%**	**5.5%**	**2.2%**	**100.0%**
Number of Employees	1	1.6%	0.3%	0.0%	0.3%	0.0%	0.3%	0.0%	2.5%
	2-9	3.3%	1.1%	0.3%	0.0%	0.0%	0.3%	1.1%	6.0%
	10-49	9.3%	2.7%	3.0%	2.5%	1.9%	0.8%	0.0%	20.3%
	50-99	15.7%	4.4%	2.5%	3.0%	3.0%	0.3%	0.3%	29.1%
	100-499	16.5%	5.5%	5.8%	3.8%	2.5%	1.6%	0.3%	36.0%
	500+	0.5%	0.0%	0.3%	0.0%	0.8%	0.3%	0.3%	2.2%
	Total	**0.8%**	**0.0%**	**0.8%**	**0.0%**	**0.0%**	**1.9%**	**0.3%**	**3.8%**

*Note: Priv.E.= Private enterprise, Priv.A.= Private association representing tourism stakeholders, DMO = Public administration or governmental body managing tourism, PPP = Public-private partnership organisation in tourism, GOV = Local, regional, or national government authority, RES = Research institute/University, NGO = non-governmental organisation



APPENDIX B: ETDS DESIGN EXPERIMENT AND VALIDATION SURVEY QUESTIONNAIRE

Thank you for accepting the invitation to participate in this survey.

The European Union has commissioned our consortium to undertake Preparatory Actions for the Data Space for Tourism. Our goal is to create the Blueprint for a secure and trusted Data Space for Tourism that enables all tourism organisations to share and access data as easily as possible. The Data Space for Tourism is taking a "bottom-up" approach to meeting stakeholder needs. Therefore, we invite you to share your opinions on data space issues by completing this survey by **September 20, 2023**.

This survey will take approximately 15 minutes for you to complete.

The data you provide will not be shared with third parties and will be treated in accordance with the GDPR. Please do not hesitate to reach out to us at dsft@modul.ac.at in case you have any questions.

Best regards,

Consortium Partners: Modul University Vienna, City Destinations Alliance, European Travel Commission, and ForwardKeys

Consent:

I have reviewed the Participant Information Sheet for this project, and I agree to participate in this study.

Definitions: What is a Data Space?

Before you proceed with the questions, we want to clarify the key concepts related to the Data Space for Tourism project.

Data space is a **decentralised** system that enables easier data asset sharing among a network of different organisations, such as SMEs, public authorities, private enterprises, NGOs, and research institutes. Data spaces usually provide both organisational and technological resources for participants.

A **governing body** creates the standards, policies, and practices that define how the data space operates and how decisions are made. It provides a structure for the management of the data space and outlines the roles, responsibilities, and accountabilities of

participants. A key principle of data spaces is that shared data assets remain under the control of the original "data holder".

In terms of **technology**, data spaces use open-source standards to implement mechanisms of trust, security, and connectivity among participants in order to control external "data user" access to the data.

A few examples of how the Data Space for Tourism can create value for the European tourism sector are as follows:

- **Fostering transnational tourism cooperation** by combining various data sources and providing an overview of the multi-destination travel patterns of tourists within Europe.
- **Enhancing residents' sentiment** by enabling an exchange of information to facilitate the understanding of tourism performance both from business and local residents' perspectives.
- **Optimising the European tourism sector's response in crisis situations** by expediting the exchange of crucial data among stakeholders, aiding in the dissemination of accurate information while minimising misinformation.
- **Empowering travellers' journeys** by using shared data to develop advanced recommendation systems.

For more information about data spaces and related concepts, please review the Data Spaces Support Centre glossary. More information about data space requirements and use cases for the European tourism sector can be found on the DSFT project website.

Instructions

Based on previous work conducted by this project, a number of different design options for the future Data Space for Tourism (DSFT) have been identified. The following questions ask you to rate the importance of different potential features of the DSFT and to indicate your preferences among different combinations of features.

How much do you agree or disagree with each of the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not sure/not applicable
The DSFT governing body should include a group responsible for **strategic decisions.**						
The DSFT governing body should include a group responsible for **tactical and operational decisions.**						
The DSFT governing body should include a group responsible for **maintenance and innovation**						

The DSFT governing body should include a group responsible for **member accession and certification**	
The DSFT governing body should include a group responsible for **technical support, implementation, and training**	
The DSFT governing body should include a group responsible for **communication and education**.	
The DSFT governing body should be composed of representatives of organisations participating in the DSFT	

Please rate the following **Revenue** options in terms of how desirable they are.

	Not desirable	Somewhat Desirable	Very Desirable	Extremely Desirable
DSFT participants will be charged **membership fees** (e.g., monthly or annual subscription fees).				
DSFT participants will be charged **connection fees** (one-time charges related to initial access to DSFT services).				
DSFT participants will be charged **transaction fees** (e.g., flat per-use charges or commissions from data sales transactions).				

Please rate the following **Main Funding Model** options in terms of how desirable they are.

	Not desirable	Somewhat Desirable	Very Desirable	Extremely Desirable
The DSFT will be **publicly funded** (funded by government or public sector sources).				
The DSFT will be **privately funded** (funded by private investors for returns or ownership stakes).				
The DSFT will be **collaboratively funded** (stakeholders contribute data and resources in exchange for access, creating a shared funding pool).				

Please rate the following **Governing Body** options in terms of how desirable they are.

	Not desirable	Somewhat Desirable	Very Desirable	Extremely Desirable
The DSFT will be governed by an **already existing** organisation.				
The DSFT will be governed by a **newly established** organisation.				

Please rate the following **Legal Status** options in terms of how desirable they are.

	Not desirable	Somewhat Desirable	Very Desirable	Extremely Desirable
The DSFT governing body will be a **private, non-profit** organisation.				
The DSFT governing body will be a **private, for-profit** organisation.				
The DSFT governing body will be a **public** organisation.				

If two DSFT designs were acceptable in all other ways, how important would this difference be to you?

	Not Important	Somewhat Important	Very Desi Important	Extremely Important
The DSFT will be governed by an **already existing** organisation. ---instead of--- The DSFT will be governed by a **newly established** organisation.				
The DSFT governing body will be a **private, non-profit** organisation. ---instead of--- The DSFT governing body will be a **public** organisation.				
The DSFT will be **publicly funded** (funded by government or public sector sources). ---instead of--- The DSFT will be **collaboratively funded** (stakeholders contribute data and resources in exchange for access, creating a shared funding pool).				
DSFT participants will be charged **membership fees** (e.g., monthly or annual subscription fees). ---instead of--- DSFT participants will be charged **transaction fees** (e.g., flat per-use charges or commissions from data sales transactions).				

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT will be **collaboratively funded** (stakeholders contribute data and resources in exchange for access, creating a shared funding pool). The DSFT governing body will be a **public** organisation.	or	The DSFT will be **privately funded** (funded by private investors for returns or ownership stakes). The DSFT governing body will be a **private, non-profit** organisation.

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT governing body will be a **private, for-profit** organisation. The DSFT will be governed by an **already existing** organisation.	or	The DSFT governing body will be a **public** organisation. The DSFT will be governed by a **newly established** organisation.

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT will be governed by a **newly established** organisation. DSFT participants will be charged **transaction fees** (e.g., flat per-use charges or commissions from data sales transactions).	or	The DSFT will be governed by an **already existing** organisation. DSFT participants will be charged **connection fees** (one-time charges related to initial access to DSFT services).

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT will be **publicly funded** (funded by government or public sector sources). DSFT participants will be charged **membership fees** (e.g., monthly or annual subscription fees).	or	The DSFT will be **privately funded** (funded by private investors for returns or ownership stakes). DSFT participants will be charged **transaction fees** (e.g., flat per-use charges or commissions from data sales transactions).

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT will be **collaboratively funded** (stakeholders contribute data and resources in exchange for access, creating a shared funding pool). The DSFT will be governed by a **newly established** organisation.	or	The DSFT will be **publicly funded** (funded by government or public sector sources). The DSFT will be governed by an **already existing** organisation.

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT governing body will be a **private, for-profit** organisation. DSFT participants will be charged **connection fees** (one-time charges related to initial access to DSFT services). The DSFT will be **privately funded** (funded by private investors for returns or ownership stakes).	or	The DSFT governing body will be a **private, non-profit** organisation. DSFT participants will be charged **membership fees** (e.g., monthly or annual subscription fees). The DSFT will be **publicly funded** (funded by government or public sector sources).

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT governing body will be a **public** organisation. The DSFT will be governed by a **newly established** organisation. DSFT participants will be charged **transaction fees** (e.g., flat per-use charges or commissions from data sales transactions).	or	The DSFT governing body will be a **private, for-profit** organisation. The DSFT will be governed by an **already existing** organisation. DSFT participants will be charged **connection fees** (one-time charges related to initial access to DSFT services).

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT will be **collaboratively funded** (stakeholders contribute data and resources in exchange for access, creating a shared funding pool). DSFT participants will be charged **connection fees** (one-time charges related to initial access to DSFT services). The DSFT will be governed by a **newly established** organisation.	or	The DSFT will be **publicly funded** (funded by government or public sector sources). DSFT participants will be charged **membership fees** (e.g., monthly or annual subscription fees). The DSFT will be governed by an **already existing** organisation.

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT will be governed by a **newly established** organisation. The DSFT will be **collaboratively funded** (stakeholders contribute data and resources in exchange for access, creating a shared funding pool). The DSFT governing body will be a **public** organisation.	or	The DSFT will be governed by an **already existing** organisation. The DSFT will be **privately funded** (funded by private investors for returns or ownership stakes). The DSFT governing body will be a **private, non-profit** organisation.

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

If the DSFT design was identical in all other ways, which would you prefer?

The DSFT will be governed by an **already existing** organisation. DSFT participants will be charged **membership fees** (e.g., monthly or annual subscription fees). The DSFT governing body will be a **private, non-profit** organisation.	or	The DSFT will be governed by a **newly established** organisation. DSFT participants will be charged **transaction fees** (e.g., flat per-use charges or commissions from data sales transactions). The DSFT governing body will be a **private, for-profit** organisation.

Strongly Prefer Left	Somewhat Prefer Left	Indifferent	Somewhat Prefer Right	Strongly Prefer Right

Please share your opinions about the DSFT by answering a few additional questions.

How appealing to your organisation are each of the following **incentives** for sharing data assets via the DSFT?

	Very unappealing	Somewhat unappealing	Neither appealing nor unappealing	Somewhat appealing	Very appealing	Not sure/Not Applicable
Monetary payment based on the fair-market value of the data assets shared.						
Non-monetary exchange where data asset access is provided in return for data asset sharing.						
Statutory requirements for sharing priority data assets.						
Reduction of DSFT fees (e.g., membership, transaction, or connection fees) in return for data asset sharing.						

Interoperability is the ability of different systems, devices, applications, or products to connect and communicate with each other. How much do you agree or disagree with each of the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not sure/Not Applicable
My organisation will face **significant barriers** when adopting new interoperability frameworks and technologies to interact with the DSFT.						
My organisation sees **value in adopting** new interoperability frameworks.						
My organisation sees **value in extending** interoperability framework usage to internal data initiatives.						
My organisation **already has** interoperability framework(s) in place.						
If you are **paying attention**, please select "Disagree" for this question.						

How likely is your organisation to use the DSFT for each of the following activities?

	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely	Not sure/Not Applicable
To adopt new **data standards** and interoperability frameworks recommended by the DSFT.						
To access **raw data** offered by third parties.						
To access **data models and algorithms** offered by third parties.						
To access **added value services** (e.g., dashboards) offered by third parties.						
To access **applications** offered by third parties.						
To make your **raw data** available to third parties.						
To make your **data models and algorithms** available to third parties.						
To make your **added value services** (e.g., dashboards) available to third parties.						
To make your **applications** available to third parties.						

What do you think will be the most important keys to successfully establishing the Data Space for Tourism? What recommendations would you give the European Union for developing the Data Space for Tourism? (Optional)

Please tell us about your organisation.

Organisation type:

1 Private enterprise
2 Private association representing tourism stakeholders
3 Public administration or governmental body managing tourism
4 Public-private partnership organisation in tourism
5 Local, regional, or national government authority
6 Research institute/University
7 Non-governmental organisation
8 Other (please specify)

Scope of your organisation's actions:

1 EU-wide/multinational
2 National
3 Regional

4 Local
5 Other (please specify)

Where is your organisation headquartered?

How many full-time equivalent (FTE) employees currently work for your organisation?

Thank you very much for taking the time to complete this survey. We truly appreciate your feedback. More information about the Data Space for Tourism project is available on the DSFT project website.

APPENDIX C: CATALOGUE OF KEY EU-LEVEL POLICIES AND REGULATIONS

POLICY & REGULATION	DESCRIPTION
EUROPEAN STRATEGY FOR DATA	*The European strategy for data aims at creating a single market for data that will ensure Europe's global competitiveness and data sovereignty. Creating a single market for data will allow it to flow freely within the EU and across sectors for the benefit of businesses, researchers, and public administrations. The strategy contributes to a comprehensive approach to the data economy that aims to increase the use of, and demand for, data and data-enabled products and services throughout the Single Market.*
COMMON EUROPEAN DATA SPACE	*Common European data spaces will ensure that more data becomes available for use in the economy and society while keeping the companies and individuals who generate the data in control.*
DATA GOVERNANCE ACT (DGA)	*A key pillar of the European strategy for data is the Data Governance Act, which aims to increase trust in data sharing, strengthen mechanisms to increase data availability and overcome technical obstacles to data reuse.* *The Data Governance Act will also support the set-up and development of common European data spaces in strategic domains, involving both private and public players in sectors such as tourism, health, environment, energy, agriculture, mobility, finance, manufacturing, public administration, and skills.* *The Data Governance Act entered into force on June 23, 2022, and, following a 15-month grace period, will be applicable from September 2023.*
DATA ACT	*The Data Act should ensure fairness in the digital environment, stimulate a competitive data market, open opportunities for data-driven innovation and make data more accessible for all. It will lead to new, innovative services and more competitive prices for aftermarket services and repairs of connected objects.*
GENERAL DATA PROTECTION REGULATION	*The General Data Protection Regulation (GDPR) sets the minimum standards for data protection across the European Union (EU) member states. Although implemented by the EU, it applies to organisations anywhere in the case that they target or collect data related to EU citizens. Through this piece of legislation, the EU aims to take a firm stance on privacy and security with regard to the collection, processing, and sharing of personal data at a time when an increasing amount of people make use of cloud services.*

POLICY & REGULATION	DESCRIPTION
E-PRIVACY DIRECTIVE & PRIVACY REGULATION	*The E-privacy Directive was implemented in 2002 and amended in 2009. It is most commonly known as the "Cookie Law", as it resulted in the requirement of providing consent to the collection of cookies. The law supplements the GDPR in dealing with the confidentiality of electronic communication, though the scope of the GDPR is limited to personal data, and the E-privacy directive includes non-personal data. The E-privacy Regulation is set to replace the E-privacy Directive, although approval has been delayed, and it is yet to be put into effect.*
CODE OF CONDUCT ON DATA SHARING IN TOURISM	*The goals of the Code of Conduct for Data Sharing in Tourism are to:* *Build trust between relevant tourism stakeholders and provide strategic support on how to capitalise on mutually beneficial data-sharing partnerships in the tourism industry.* *Foster data sharing in the tourism sector within the EU while contributing to an EU-wide architecture for data exchange by supporting a set of common principles and guidelines for relevant tourism stakeholders.* *Foster in the tourism sector, the EU's global endeavours to gradually create, with the implementation of the 2020 European data strategy, a genuine single market for data.* *Ensure a level playing field whereby the public and private sectors and relevant stakeholders have equal chances and opportunities in the use and sharing of data in tourism, notably by supporting a set of principles on data exchanges.*
THE OPEN DATA DIRECTIVE	*The Open Data Directive regulates the reuse of publicly/available information held by the public sector. However, the public sector also holds vast amounts of protected data (e.g., personal data and commercially confidential data) that cannot be reused as open data but that could be reused under specific EU or national legislation. A wealth of knowledge can be extracted from such data without compromising its protected nature, and the DGA provides rules and safeguards to facilitate such reuse whenever it is possible under other legislation.* *On January 20, 2023, the EC published a list of high-value datasets that public sector bodies will have to make available for reuse, free of charge, within 16 months.*

POLICY & REGULATION	DESCRIPTION
THE DIGITAL SERVICES ACT	*The Digital Services Act aims to foster innovation, growth and competitiveness and facilitates the scaling up of smaller platforms, SMEs and start-ups. The responsibilities of users, platforms, and public authorities are rebalanced according to European values, placing citizens at the centre. The rules are designed to:* ▪ *Better protect consumers and their fundamental rights online,* ▪ *Establish powerful transparency and a clear accountability framework for online platforms, and* ▪ *Foster innovation, growth and competitiveness within the single market*
DIGITAL MARKETS ACT	*The Digital Markets Act (DMA) establishes a set of narrowly defined objective criteria for qualifying a large online platform as a so-called "gatekeeper". This allows the DMA to remain well-targeted to the problem that it aims to tackle regarding large, systemic online platforms.*
NIS2 DIRECTIVE	*The Network and Information Systems Directive (NIS2 Directive) or Directive (EU) 2022/2555 is an EU legislation aimed at improving the security and resilience of network and information systems in the EU. It establishes requirements for the management of cybersecurity risks, including the identification of critical infrastructure, risk management measures, and incident reporting. The NIS2 is an update to the NIS Directive that expands its scope to include new sectors and services, introduces harmonised security requirements for operators of essential services and digital service providers, enhances cooperation and information sharing, and introduces stronger enforcement measures and sanctions for non-compliance.*
REGULATION ON THE FREE FLOW OF NON-PERSONAL DATA	*Regulation (EU) 2018/1807 on the free flow of non-personal data aims to remove barriers to the free flow of non-personal data within the EU. It applies to all non-personal data stored or processed electronically, regardless of the sector. The Commission has published informative guidance to offer businesses greater clarity on how to manage data across borders.*
EUROPEAN INTEROPERABILITY FRAMEWORK (EIF)	*The European Interoperability Framework (EIF) is issued by the European Commission and offers principles and recommendations to improve the quality, accessibility, and efficiency of public services while promoting innovation and competitiveness within the EU. The EIF has been updated several times since its initial publication in 2004 to reflect changes in technology and to respond to new challenges and opportunities. A full text on the EIF is available here.*

POLICY & REGULATION	DESCRIPTION
FRAMEWORK FOR THE FREE FLOW OF NON-PERSONAL DATA	*The Regulation on the Free Flow of Non-Personal Data seeks to promote the development of the European data economy by removing restrictions on the location of data storage and processing. The regulation allows businesses to store and process data anywhere within the EU rather than having to keep it within the borders of individual member states.*

APPENDIX D: CATALOGUE OF RELEVANT EU-LEVEL PROGRAMMES AND RESOURCES

PROGRAMMES, INITIATIVES & RESOURCES	DESCRIPTION
DIGITAL EUROPE PROGRAMME	*The Digital Europe Programme aims to bring digital technology to businesses, citizens and public administrations. The Digital Europe Programme will provide strategic funding to answer these challenges, supporting projects in five key capacity areas: supercomputing, artificial intelligence, cybersecurity, advanced digital skills, and ensuring a wide use of digital technologies across the economy and society, including through Digital Innovation Hubs.*
EUROPEAN DIGITAL IDENTITY FRAMEWORK	*The Framework for a European Digital Identity is an initiative by the European Commission aimed at creating a secure and interoperable digital identity for EU citizens, residents, and businesses. The framework was introduced in June 2021 and is part of the European Commission's broader vision of a European Digital Single Market. The European Digital Identity Framework is established on Regulation (EU) 2021/694. The regulation aims to enable individuals and businesses to easily and securely access online services, regardless of their country of origin.*
COMMUNICATION "TOWARDS A COMMON EUROPEAN DATA SPACE"	*With this Communication, the Commission proposes a package of measures as a key step towards a common data space in the EU - a seamless digital area with a scale that will enable the development of new products and services based on data.*
GUIDANCE ON SHARING PRIVATE SECTOR DATA IN THE EUROPEAN DATA ECONOMY	*Drawing from the principles identified in the communication "Towards a Common European Data Space", this Staff Working Document aims to provide a toolbox for companies that are data holders, data users, or both. For this purpose, it contains a How To guide on legal, business, and technical aspects of data sharing that can be used in practice when considering and preparing data transfers between companies coming from the same or different sectors.*

APPENDIX E: CATALOGUE OF RELEVANT EU-LEVEL STRUCTURES

STRUCTURES	DESCRIPTION
DATA SPACES BUSINESS ALLIANCE (DSBA)	*The Data Spaces Business Alliance (DSBA) is an initiative that unites industry players to realise a data-driven future in which organisations and individuals can unlock the full value of their data. It is formed by are Gaia-X European Association for Data and Cloud AISBL, the Big Data Value Association (BDVA), FIWARE Foundation, and the International Data Spaces Association (IDSA).*
EUROPEAN DATA INNOVATION BOARD (EDIB)	*A group of experts that work together to facilitate the sharing of best practices, particularly on data intermediation, data altruism and the use of public data that cannot be made available as open data, as well as on the prioritisation of cross-sectoral interoperability standards. This group is expected to advise and support the European Commission on data sharing within the Union. More details are specified in the Data Governance Act (Chapter VI).*
EUROPEAN DATA PROTECTION BOARD (EDPB)	*The European Data Protection Board (EDPB) is an independent body that provides guidance and recommendations on the implementation of data protection rules in the EU. It has issued numerous guidelines on various topics, such as data subject rights, transparency, and the use of cookies. EDPB is also responsible for resolving disputes between national supervisory authorities.*

The DSSC has started a collaborative process with the different beneficiaries of European-funded initiatives responsible for the preparatory actions for various sectorial data spaces (e.g., mobility, health, finance, agriculture, cultural heritage, green deal, energy, media, etc.). The DSSC's primary objective is to lead the co-creation of the DSSC Data Spaces Blueprint in collaboration with the relevant initiatives and stakeholders of the European sectorial data spaces. Importantly, the two tourism CSAs are actively contributing to the DSSC by offering their expertise to ensure that the Data Spaces Blueprint incorporates the specific requirements of the tourism industry.

According to the DSSC, the Data Space Blueprint is ***"...a consistent, coherent and comprehensive set of guidelines*** *to support the implementation, deployment and maintenance of data spaces. The blueprint contains the* ***conceptual model of data space, data space building blocks, and recommended selection of standards, specifications and reference implementations*** *identified in the data space technology landscape."*[69]

Figure 25 offers a graphical representation of the current scope of the DSSC Data Space Blueprint. The first official version (v0.5) of this general data space blueprint was released in September 2023. As can be seen in **Figure 25**, this version encompasses a multifaceted array of components.

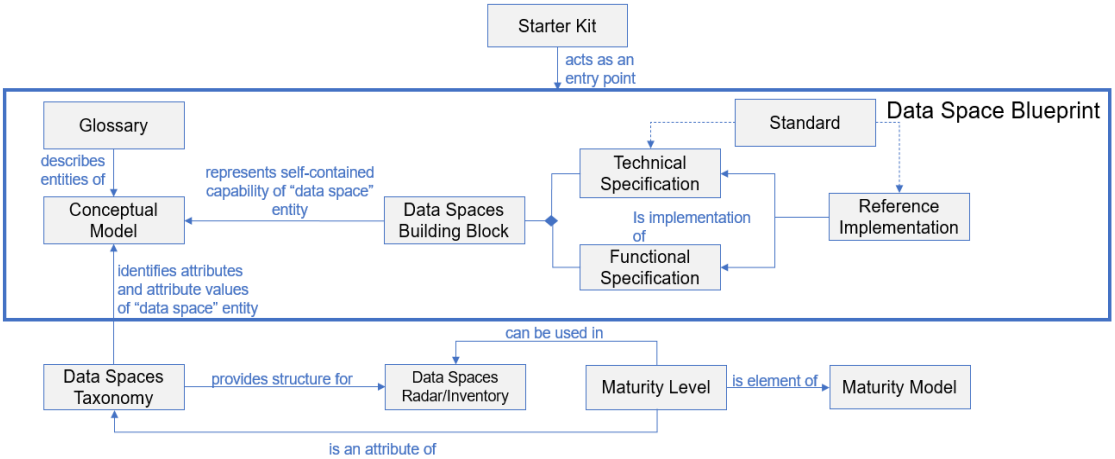


Figure 25 *Scope of the DSSC blueprint*

(Source: Data Spaces Support Centre 2023, Data Spaces Blueprint | Version 0.5 | September 2023. Retrieved in October 2023 from: https://dssc.eu/space/BPE/179175433/Data+Spaces+Blueprint+%7C+Version+0.5+%7C+September+2023)

[69] Data Spaces Support Centre 2023: Data Spaces Blueprint | Version 0.5 | September 2023. Retrieved in October 2023 from: https://dssc.eu/space/BPE/179175433/Data+Spaces+Blueprint+%7C+Version+0.5+%7C+September+2023

The DSSC blueprint remains under development and **Figure 26** provides a visual representation of the differences between the content already included in version 0.5 (highlighted in green colour) and the additional elements planned for version 1.0 (highlighted in orange colour).

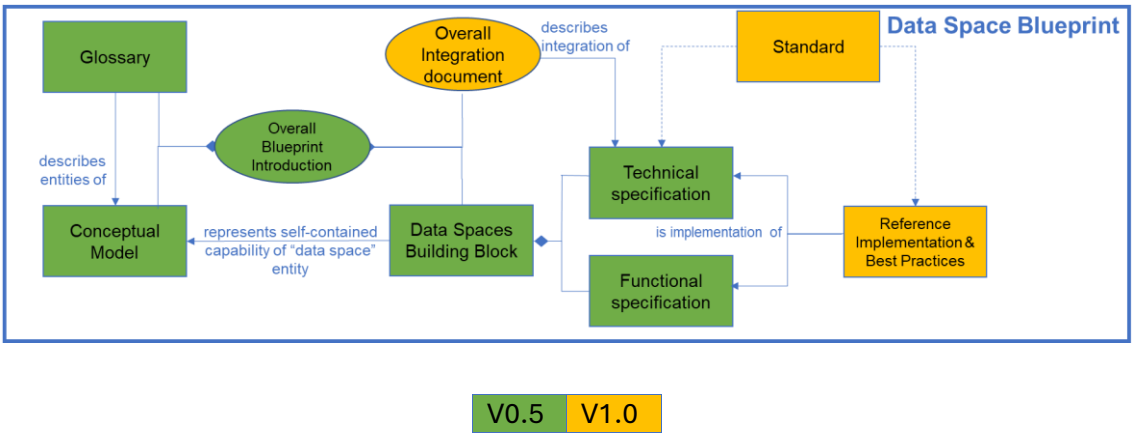


Figure 26 *Scope of the Blueprint version 0.5 and 1.0*

(Source: Data Spaces Support Centre 2023: Data Spaces Blueprint | Version 0.5 | September 2023. Retrieved in September 2023 from: https://dssc.eu/space/BPE/179175433/Data+Spaces+Blueprint+%7C+Version+0.5+%7C+September+2023)

The DSSC Data Space blueprint contains detailed information about the data space roles and concepts along with the technical, governance, business and legal building blocks and their implementations in real data space deployments. However, this blueprint does not address the specific characteristics and modules required for specific sectors, such as tourism. Furthermore, the DSSC Blueprint presently does not incorporate a participant journey perspective, which outlines the steps and experiences organisations go through when engaging with a data space. These details are needed before offering guidance to ETDS participants (i.e., data providers, intermediaries and consumers). Therefore, the present ETDS Blueprint endeavours to complement the general DSSC Data Space Blueprint by offering specific guidelines, conceptual models, building blocks and specifications that are tailored to the particular needs and requirements of the tourism sector.

In this context, there are two documents produced by the DSSC that serve as references for the ETDS Blueprint:

- **Glossary 2.0**[70]: This glossary establishes a consistent and coherent terminology for DSSC communication and publications. Beyond the DSSC, this glossary also supports information sharing and co-development between the different data space initiatives and people involved and working with the DSSC. We hope that terminology from the

[70] Data Spaces Support Centre 2023: DSSC Glossary | Version 2.0 | September 2023. Retrieved in October 2023 from: https://dssc.eu/space/Glossary/176553985/DSSC+Glossary+%7C+Version+2.0+%7C+September+2023

glossary naturally spreads to the community of practice around data spaces, and we hope to get feedback and change requests from the community when needed.

- **Conceptual model Level 1**[71]: The conceptual model of data spaces provides a set of well-defined concepts and relationships between them, as well as a set of terms to refer to them. By relying on the conceptual model, the authors of the data spaces blueprint and the broader community of practice can clearly express data space related topics. **Figure 27** shows the DSSC conceptual model Level 1, which contains the basic terminology and key concepts of the data space environments. A description of its main elements can be found on the DSSC website[72].

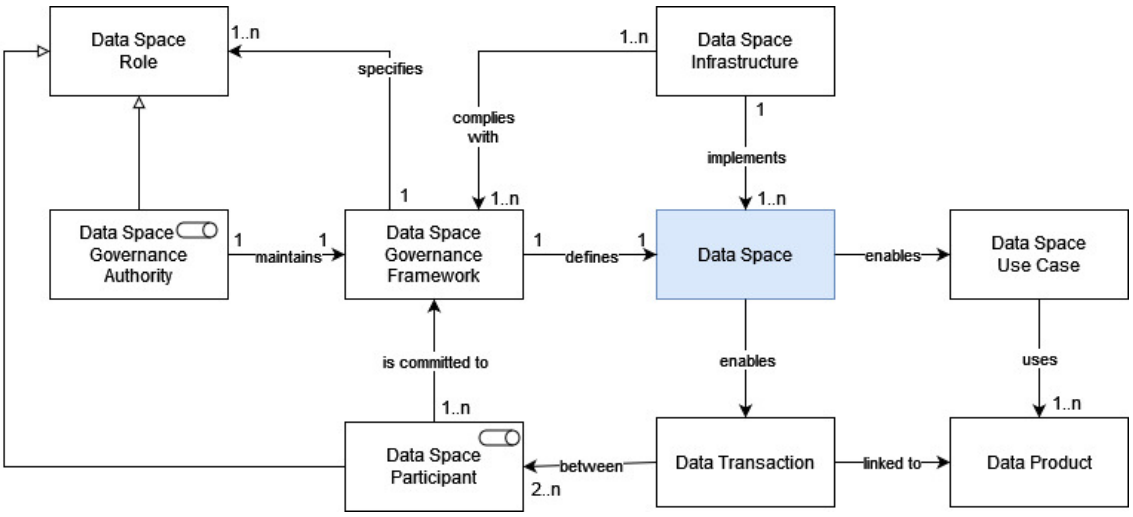


Figure 27 *Conceptual model Level 1*

(Source: Data Spaces Support Centre 2023: Conceptual Model of Data Spaces. Retrieved in October 2023 from: https://dssc.eu/space/CME/176554182/Conceptual+Model+of+Data+Spaces+%7C+Version+0.5+%7C+September+2023)

[71] Data Spaces Support Centre 2023, Conceptual Model of Data Spaces. Retrieved in October 2023 from: https://dssc.eu/space/CME/176554182/Conceptual+Model+of+Data+Spaces+%7C+Version+0.5+%7C+September+2023#Conceptual-Model-Level-1

[72] Data Spaces Support Centre 2023, Conceptual Model of Data Spaces. Retrieved in October 2023 from: https://dssc.eu/space/CME/176554182/Conceptual+Model+of+Data+Spaces+%7C+Version+0.5+%7C+September+2023

APPENDIX G: IDSA

The IDSA is an organisation that promotes secure and sovereign data sharing, and it provides the Rulebook 2.0 as a foundational guideline for data spaces. The IDS Data Space Protocol, Eclipse Data Space Connector, and FIWARE Connector are technical components that facilitate data exchange within the IDS ecosystem. According to the IDSA Rulebook 2.0, the foundational concepts of a data space, shown in **Figure 28**, are the following: (i) establishing trust, (ii) data discoverability, (iii) data contract negotiation, (iv) data sharing & usage, (v) observability, (vi) vocabularies and semantic models. Additional elements that support these main functions of a data space are also represented as optional.

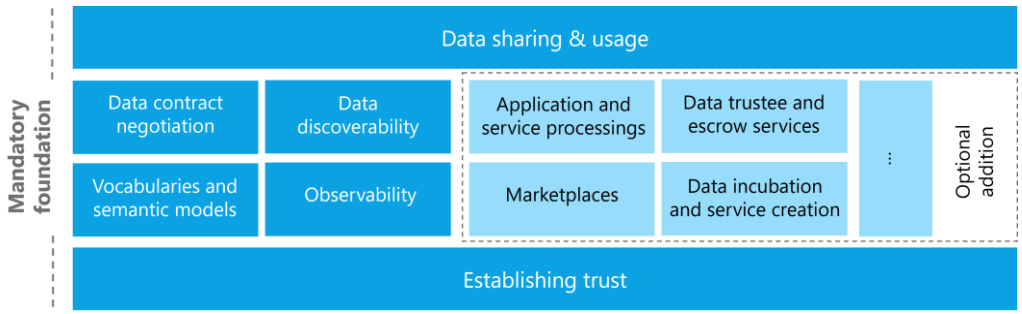


Figure 28 *Foundational concepts in Data Spaces according to the IDSA Rulebook 2.0*

The IDS data space protocol is a set of specifications designed to facilitate interoperable data sharing between entities governed by usage control and based on Web technologies. These specifications define the schemas and protocols required for entities to publish data, negotiate usage agreements, and access data as part of a federation of technical systems termed a dataspace. The Dataspace Protocol defines how this metadata is provisioned:

- How data assets are deployed as DCAT Catalogues and usage control is expressed as ODRL Policies.
- How contract agreements that govern data usage are syntactically expressed and electronically negotiated.
- How data assets are accessed using data transfer protocols.

These specifications build on protocols located in the ISO OSI model (ISO/IEC 7498-1:1994)[73] layers, like HTTPS. The purpose of this specification is to define interactions between systems independent of such protocols but describing how to implement it in an

[73] ISO/IEC 7498-1:1994, 2000: Information technology: Open Systems Interconnection: Basic Reference Model: The Basic Model. Retrieved in October 2023 from: https://www.iso.org/standard/20269.html

unambiguous and extensible way. To do so, the messages that are exchanged during the process are described in this specification and the states and their transitions are specified as state machines, based on the key terms and concepts of a data space.

Apart from that, IDSA includes the vocabulary provider for sector data models, playing a pivotal role in fostering standardisation, interoperability, and common understanding within a specific industry or sector. This contributes to better data quality, integration, collaboration and compliance, ultimately facilitating data sharing and interoperability among organisations within that sector.

Gaia-X aims to create a federated and open data infrastructure based on European values regarding data and cloud sovereignty. The mission of Gaia-X is to design and implement a data sharing architecture that consists of common standards for data sharing, best practices, tools, and governance mechanisms.[74] From the technical point of view, Gaia-X aims to connect the data and infrastructure ecosystems and relies on three conceptual pillars (see **Figure 29**).

- **Gaia-X Compliance**: Decentralised services to enable objective and measurable trust.
- **Data Spaces/Federations**: Interoperable and portable (cross-)sectoral datasets and services.
- **Data Exchange**: Anchored contract rules for access and data usage.

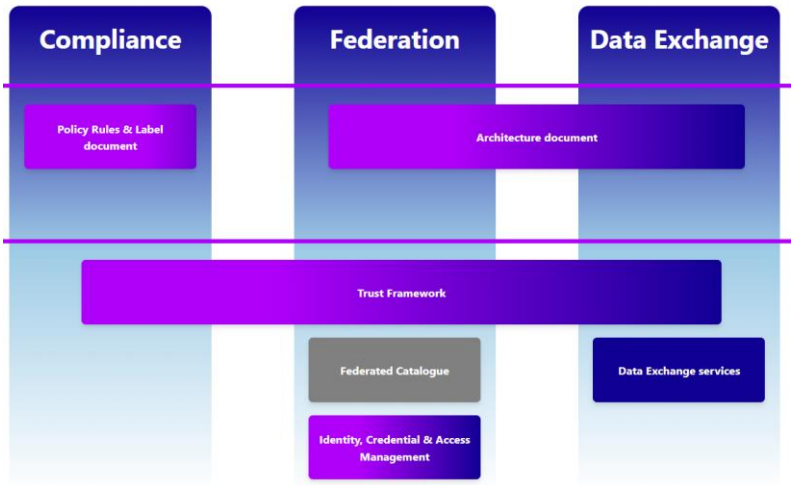


Figure 29 *Conceptual pillars of Gaia-X for connecting the data and infrastructure ecosystems*

In concrete terms, for each of these pillars, there are three types of deliverables: functional specifications, technical specifications and software.

The **Gaia-X European Association for Data and Cloud AISBL** is an international non-profit association founded to develop the technical framework and operate the Gaia-X Federation services. In the context of Gaia-X, Gaia-X AISBL plays the role of the data space governance authority defining the data space governance framework for the Gaia-X based data spaces. This data space governance framework corresponds with the Gaia-X Compliance pillar. Gaia-X compliance rules are split into two main subsystems:

[74] Gaia-X. Retrieved in October 2023 from: https://gaia-x.eu/what-is-gaia-x/about-gaia-x/

1. The **Trust Framework** verifies the existence and veracity of any service's characteristics. The mandatory criteria are the following:
   a) serialisation format and syntax;
   b) cryptographic signature validation and validation of the keypair associated identity;
   c) attribute value consistency; and
   d) attribute veracity verification.
2. The **Policy Rules and Label Document** is optional and allows to verify adherence to rulesets that fulfil specific market needs.

Based on three levels of compliance, further Gaia-X Labels can be created to fit new needs, in particular using extension profiles for country and **domain specific requirements**. Extension profiles can also leverage the labelling criteria by adding and defining on-top requirements for particular purposes. To ensure the impact and consistency of Gaia-X Labels, new labels and extensions have to be authorised by the Gaia-X Association's Board of Directors. An additional subsystem can be added to include some sector specific rules and policies, as is shown in **Figure 30**. Therefore, this model would allow the ETDS to add any specific criteria valid for tourism stakeholders.

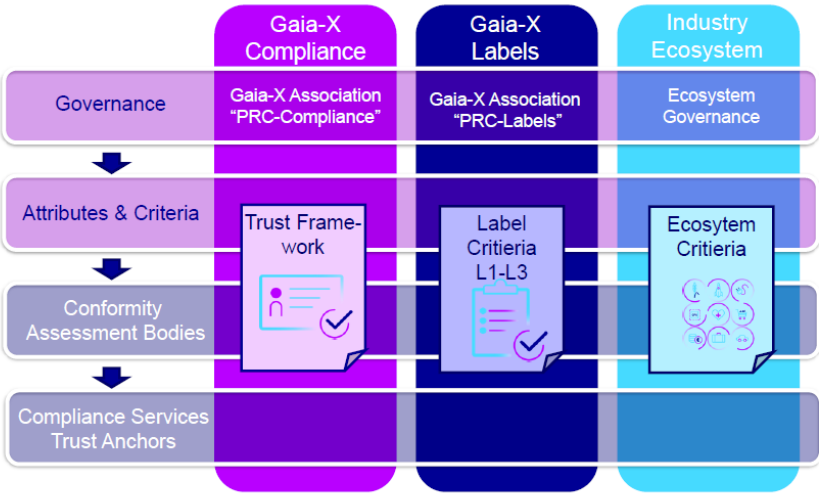


Figure 30 *Gaia-X compliance model*

The current version of the **Policy Rules & Label Document** contains criteria only for cloud providers. Gaia-X anticipates that additional rules will be defined for the participants in data spaces and data sharing ecosystems. This is currently work-in-progress, and relevant objectives and guidelines will be elaborated and provided in a future version.

Other concepts of the Gaia-X framework are also key to understanding the overall data spaces ecosystem:

- **Clearing house:** Within the data governance framework, it serves as a pivotal component for operationalising data management (see **Figure 31**). It involves a Participant and Trust Anchor Registry, a compliance service and a notarisation service.

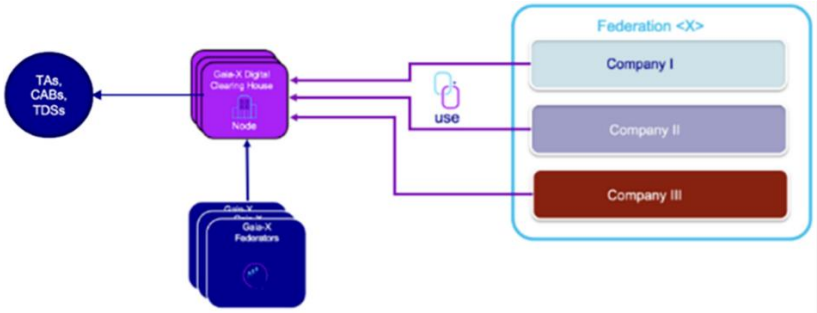


Figure 31 *GXDCH Gaia-X Digital Clearing House diagram*

Gaia-X Hub Austria2022: The Digital Clearing Houses. Retrieved in October 2023 from: https://www.gaia-x.at/en/application/gaia-x-the-digital-clearing-houses/

- **Data Space Entity**: In Gaia-X, a "Data Space Entity" refers to an organisation or entity that participates in the Gaia-X ecosystem. These entities can be businesses, public organisations, or other stakeholders that share and manage data within the Gaia-X infrastructure. The idea is to provide a standardised way for various organisations to participate in data sharing and collaboration.
- **Decentralised Identity (SSI)**: SSI stands for "Self-Sovereign Identity". It is a digital identity model that empowers individuals to have control over their own identities without the need for a central authority. In Gaia-X, SSI principles are used to ensure that each entity within the ecosystem can have secure, self-managed digital identities, enhancing data security and privacy.
- **Verifiable Credentials**: Verifiable credentials are a key component of SSI. These are digital statements that attest to the truth of certain claims. In Gaia-X, verifiable credentials are used for self-descriptions of entities, allowing them to prove their identity and attributes without revealing unnecessary personal information during data interactions.
- **Data Transfer Architecture**: Gaia-X includes a data transfer architecture that governs how data is exchanged between Data Space Entities. It encompasses mechanisms for contract negotiation, personal data management, and secure, standardised data transfer protocols to ensure privacy, security, and interoperability.
- **Catalogue Federation Technology**: This technology is used to create a unified, federated catalogue of available data and services across different entities within the Gaia-X ecosystem. It allows Data Space Entities to discover, access, and utilise resources and data assets across the network easily.
- **Observability (Logging Service)**: Observability refers to the capability to monitor, log, and analyse system activities and performance. In Gaia-X, a logging service is used to provide transparency and visibility into the data-sharing processes, ensuring that the ecosystem is operating securely and efficiently. This is crucial for compliance, auditing, and issue resolution.

Gaia-X has recently announced the adoption of the Eclipse Data Space Connector Technology. Eclipse Data Space Connector technology is a part of the Gaia-X ecosystem, designed to facilitate data exchange between different entities. It ensures that data can be shared and accessed securely and in a standardised way, aligning with the goals of Gaia-X for data sovereignty and control.

APPENDIX I: SOLID

The SOLID protocol is already in use by governmental bodies such as the Flemish and Swedish governments and some major companies in order to provide an interconnected digital landscape.

The protocol is based on PODS leveraging the technology to uphold data sovereignty (ownership) and interoperability in digital spaces. The set of solutions was implemented by the pivotal player, Digita[75].

Existing projects confirm that the technology has made advances and is being deployed. For example, Netwerk Digitaal Erfgoed (NDE) – Netherlands enables heritage institutions to securely store, share, publish and visualise objects semantically by leveraging chosen ontologies. Publiq – Flanders, a subsidiary of the Department of Culture, Youth and Media, has projects focused on digital transformation, allowing the development of a culture profile to offer recommendations on cultural activities by using Solid Pods. Media Consortium – Wallonia & Brussels initiate a federated preference engine preserving individual privacy but facilitating personalised media and cultural experiences. The application of a Solid Data Vault to end-users for seamless access to media operators and granular data sharing is an example of preserving privacy while sharing data at the same time. The referenced architecture can be seen in **Figure 32** below. The example is applied to Culture & Media, but the transformation to Tourism should be possible.

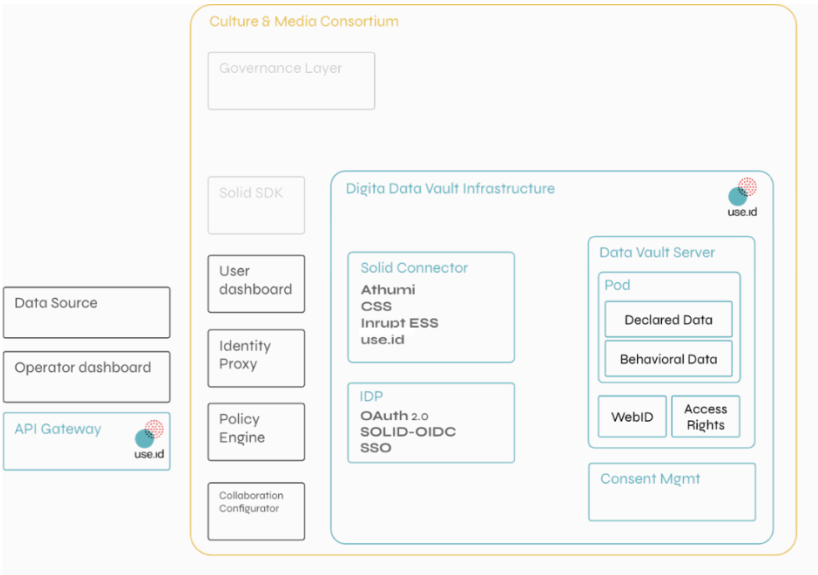


Figure 32 *Solid Data Vault reference architecture*

[75] Digita. Retrieved in October 2023 from: https://www.digita.ai/