DATA SPACES SUPPORT CENTRE

Paper | October 2023

1st collaborative discussion paper: Why data spaces? A business and user's perspective

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Publisher

Data Spaces Support Centre (DSSC)
c/o Fraunhofer-Gesellschaft zur Förderung
der angewandten Forschung e. V.
Hansastr. 27c
80686 Munich
Germany

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Funded by the European Union

The Data Spaces Support Center receives funding from the European Union Digital Europe Programme under grant agreement n° 101083412:

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This discussion paper reflects outcomes of several workshops, interviews, individual and collective feedback sessions with the **Strategic Stakeholder Forum** members and the DSSC team.

*Distribution: This discussion paper is intended for internal distribution within the DSSC **Network of Stakeholders***

DATA SPACES SUPPORT CENTRE

Content

1 Motivation and scope

This is the first collaborative discussion paper produced by Data Spaces Support Centre (DSSC) in collaboration with its Strategic Stakeholder Forum (SSF). The main target audience of this paper are organisations and initiatives enabling or implementing data spaces, and for the recommendations also the DSSC team.

The Data Spaces Support Centre (DSSC) is a key implementation action of the **European Data Strategy** delivered through the **Digital Europe Programme** (DEP). One of the objectives of the DSSC is to accelerate the deployment, scale and adoption of data spaces in Europe (and beyond). By fostering the development of the Common European Data Spaces DSSC contributes to realising the vision for a genuine European single market for data.

The promotion of data spaces and the engagement of users are important tasks to achieve this objective, not only for the DSSC but also for many other European and national initiatives preparing or deploying Data Spaces, many of them part of the **Community of Practice** (CoP) or the overall **Network of Stakeholders** (NoS) of DSSC.

One of the community groups of the DSSC is the so-called **Strategic Stakeholder Forum** (SSF), a think-and-do-tank that supports the DSSC in delivering its objectives. The organisations part of the SSF have expertise on the topic and their organisations act as enablers, promoters, or users of data spaces. Some of the organisations in the SSF are also leading or contributing to setting up and deploying data spaces. DSSC in collaboration with the SSF has planned the production of several papers, on one hand to continuously position the data spaces and the DSSC in the European landscape, and to also to provide regular recommendations on impact, evolution of common assets or/and identification of new challenges and gaps. Co-creating papers is also a mechanism to establish a dialog and common understanding among the different stakeholders working in this area.

We identified and discussed different topics to address and decided on the topic of “Why data spaces: a business and user’s perspective”. Why?

Coming back to the promotion of Data Spaces, as part of that endeavour we are facing many challenges and receiving recurrent questions such as “what is a data space? and what is not? What is the difference with many other existing data sharing initiatives? Why data spaces? Why to invest? Why change? What is the value? Is there a real demand?” Thanks to the public and private investments at national and European level, and to the work developed by several European and national associations, we have today access to market projects, demonstrators and success stories that already show purpose and the value created. Access to publications on data spaces covering aspects of (business) value is growing but it is still challenging to streamline the key messages about the value for the users. For all the questions above, we have decided to focus on the “why (data space)” addressing all the other questions consequently and with a focus on the value.

In the title we also refer to the “business and users’ perspective”. Why this difference? Data spaces were born in a B2B context and still today one of the main objectives of data spaces is the competitiveness of business and industries in the digital and data economy. For this reason, the business perspective and understanding of the value for businesses is critical. The business value includes not only value for data providers or consumers, but also value for new business roles created in the market (e.g. those operating specific data space infrastructure, data space intermediaries, etc)

and the joint value created. However, already today the users of the data spaces may include individuals (natural persons), organisations of any kind (public authorities, private companies, research institutions, etc) and also (data sharing) communities. So, there is a need to have a wider user's perspective (beyond business users) and consider different types of value (individual and collective value, business, societal and environmental value).

Taking as a starting point existing bibliography (in section 6), this paper reflects on outcomes of several workshops, interviews, individual and collective feedback gathering sessions with SSF members and DSSC partners.

The paper is organised in 6 sections: what is a data space, the users, the value, a section with illustrative user stories, recommendations and recommended bibliography and references.

Editorial note: This paper is released just after the release of the Data Space Blueprint v0.5[1] and it will refer and reflect some of its parts (glossary, conceptual model, specific building blocks). We encourage any reader of this paper to access and read the Blueprint. Any discrepancies between this paper and the Blueprint should defer to the Blueprint as the authoritative source.

2 What is a data space? The context and the differentiation factors

The initial question that often arises when engaging with various stakeholders is: "**what exactly is a data space?**". Answering this question is a prerequisite before discussing the "why" aspect. To answer this question, we need to consider at least 3 aspects:

- The context where data spaces operate (a larger picture) and the differentiation factors with other existing terms and solutions.
- The definition.
- The type of stakeholder and its level of knowledge.

This chapter covers the context and definition and already states a generic value proposition for data spaces. Next chapter covers the understanding of the users and therefore the type of stakeholders involved followed by a chapter focused on the value.

There are three important pillars to understand data spaces:

- Data value, data sharing and data value chain.
- Digital ecosystems.
- Europe and the European data strategy.

Data value, data sharing and the data value chain

Data spaces are a model by which data sharing is done. *The value of data spaces, then, is made of* ***the value of data*** *and* ***the value of data sharing*** *in general. It is not possible to understand what a data space is without understanding the value of data as an asset, resource, product or service, and the value of sharing that data. Data can improve decision making, customer experience and enhance efficiency for organisations. It advances research and development and is instrumental in addressing societal challenges, too (e.g. environment, health, safety, etc.) The sharing of data fosters knowledge discovery, innovation, and collaboration, amplifying the positive effects of the data one organisation holds.* **As a type of data sharing, data spaces inherit all of the benefits of data sharing.**

Another important concept linked to the value of data is the **data value chain** that refers to the processes that data goes through from the time it is collected to the point where value is extracted from it[2]. **Data spaces enable cross-organizational data value chains**, and this is seen as an important characteristic and differentiation factor.

Data spaces can also support needs of data sharing for both primary data use (streamlining data sharing across parties that collaborate in a business process e.g for transparency, traceability, planning, etc), and **data re-use** (making data available for use cases that are not / only indirectly linked to the primary business process).

Finally, the value of data spaces is linked to the **use cases** that enables. A data space may not create much value until use cases are implemented. It is in the use cases where the realisation of data sharing takes place providing shared value to the involved participants.

The DSSC glossary and the business building blocks part of the Blueprint v0.5 provide additional insights into all these concepts.

Data spaces as part of a larger digital ecosystem

Data spaces are also linked to the concept of **digital ecosystems**. Digital ecosystems are also emerging, and definitions are diverse. Digital ecosystems are linked to the digital evolution of organisations moving from having their own IT systems to also integrating systems with others, requiring collaboration, scalability, new business models and monetization, compliance, trust in other systems, security and governance of users, systems, services and data[3]. A digital ecosystem encompasses a broad range of elements, including data, technology, processes, and interactions. It emphasises the interconnectedness of digital components within a broad context including hardware, software applications, data, networks, platforms, services, and the interactions and transactions among these components. We refer to digital ecosystems as distributed systems, self-organised, sustainable and scalable. **Data spaces are important elements of digital ecosystems** and inherit some of their characteristics.

Europe and the European data strategy

An important contextual factor of data spaces is the **European data strategy** that aims at creating a single data market for data. The **common European data spaces** were introduced in the EU data strategy and referenced in the Data Governance Act and Data Act introducing qualities or characteristics related to Interoperability, collaboration and synergies among data spaces, European values and rules, and the extended purpose beyond business value.

Definition of data spaces

Definitions of data spaces are a moving target and are technical (difficult to understand for someone who does not work in the field) and for that reason it is important that besides using a consistent definition, we provide an answer that focuses on the value associated with the particular stakeholder ("what does it mean for me? what is the potential value?). Value is also perceived differently by different stakeholders.

According to the **DSSC glossary**[4] and the conceptual model a data space is "*A distributed structure, defined by a governance framework, that enables trustworthy data transactions between participants while supporting trust and data sovereignty. A Data space is implemented by one or more infrastructures and supports one or more use cases*." Let's highlight some of the main characteristics embedded in this definition:

- Distributed (vs centralised) structure.
- Existence of a governance framework and participants that commit to that governance framework (vs customers or users).
- It enables data transactions implying trustworthiness of the data transaction, emphasising qualities of the infrastructure for data sharing such as efficiency, security, control, transparency, quality, scalability, and regulatory compliance[5].
- It enables trust amongst the participants.
- It enables data sovereignty or in other words the capability of individual or organisations to control the data and exercise their rights on the data they have (vs lack of control).

There are more definitions of data spaces. In Europe and worldwide. While the DSSC conceptual model[6] and the DSSC glossary are very solid starting points, there is a need for European and worldwide consistency and alignment in definitions, scope and characteristics.

As important as explaining what a data space is, it is to explain what a data space is not, comparing with other related terms:

- **A data space is not a digital ecosystem** although data spaces operate in digital ecosystems and enable many of its possibilities to generate value. However,
    - Not all participants of a digital ecosystem are expected to be participants of a data space, but only those that are involved in data sharing activities (and desire to do so).
    - Not all the infrastructure of a digital ecosystem will be provided by a data space, but there are some common elements.
- **A data space is not a data platform**, and a data platform is not a data space. However, organisations or communities owning and operating data platforms are very likely to become participants of Data Spaces (as data space intermediaries) offering data platform assets and functionalities to the other participants, enhancing data access and availability for data management and data integration tools. A data platform refers usually to an end-to-end software solution which allows the collection, processing, analysis and visualisation of data, normally following a centralised architecture approach.
- **A data space is not a data lake.** A data lake usually refers to a centralised repository that allows storing large amounts of structured and unstructured data.

There is also a series of differentiation factors or characteristics of data spaces compared with other data sharing solutions. Other solutions may implement some or all these characteristics, but data spaces are more suitable to implement them all:

- **Data spaces address some of the fundamental challenges and barriers for data sharing**: e.g Interoperability, trust, sovereignty, discovery, and compliance.
- **Data spaces minimise (or address) risks of data sharing**: e.g. security, concentration of power, costs…
- **Data spaces offer additional incentives for data sharing**: e.g reducing costs, providing access to new customers and partners, access to more data, collaborative value creation, and more possibilities for innovation.
- **Data spaces can operate with many different types of data**: Commercial data, personal data, open data, restricted data, research data. etc. Extending the possibilities of implementing use cases that create value with different purposes (business, research, individuals, common good)
- **Data spaces can involve a broad spectrum of participants** (directly or through intermediaries): Natural persons, and organisations of any kind (companies and businesses of any kind, public bodies, research organisations, etc)
- **Data spaces can interoperate with each other** (this is a target) within a sector and cross-sectorial.
- Data spaces (in Europe and the context of the common European data spaces) **adhere to the European rules and values.**

Section 4 of this paper elaborates on the aspect of value and the elements described above linking these valuable characteristics to the challenges and opportunities for users.

It is commonly believed that, despite the documented value of data spaces, organisations that are already sharing data and, possibly, have integrated it into their business, will be reluctant to become participants of data spaces and to change their arrangements for data sharing. They may even perceive this more as a risk of losing business or competitive advantage in the market. To address all

these cases, it will be necessary to count on a good collection of real business stories that can be used as inspiration.

We close this section by generating some recommendations:

- There is a need for consistency in the scope and common understanding of what a data space is and more importantly what is not. The DSSC conceptual model and the DSSC glossary are a very solid starting point, but there is a need for European and worldwide consistency and alignment in definitions, scope, and characteristics.
- Data spaces operate in larger digital ecosystems. It is important to place data spaces in those larger ecosystems, understand the common elements and to understand how specific use cases in a data space integrate in larger use cases part of the digital value chains. This is particularly important in the European context, where many different important digital funded programmes run in parallel.
- In many sectors digital value chains are of global or international scale (beyond Europe), with use cases involving European and non-European participants. Data Spaces contributing to these use cases and value chains require global standards, and interfaces with other regions of the world. It is of relevance to also address these scenarios.

3 The users

Who are the users of data spaces?

To provide a perspective from the users, we first need to identify those users. In the context of data spaces, **we refer to participants more than to users**. So, does it make sense to talk about the user's perspective? For the benefit of this paper, we attempt below to map data space participants into users, term that we continue using throughout the paper.

Participants can play different roles in data spaces. The DSSC conceptual model and glossary define and describe those roles. Based on those roles we can distinguish:

- On one hand the data space governance authority that is *accountable for creating, developing, operating, maintaining, and enforcing the governance framework for a* particular data space. Organisations playing this role are **not** data space users.
- On the other hand, the data rights holders, and data providers (in the more popular language the data owners), and the data recipients and the data users. These are the (**primary) users of data spaces**. Data space users encompass a diverse spectrum of individuals, communities, and organisations (businesses of any kind, public body/authorities, research institutions, academia).
- Finally, another important role that organisations can take in a data space is "data space intermediary" providing enabling services to the data space participants or to the data space governance authority (e.g identity, catalogue, etc). We could argue that data space intermediaries are data space users, and we could argue the contrary (that they are not users, but providers of specific functionality as described in the building blocks). For the benefit of this paper, we will consider them **(secondary) users of data space** because they will benefit from the participation in the data space and the specific use cases, and they also need to adhere to the governance framework of the data space.

Some examples of potential users of data spaces (including their needs to address) are:

- Policy makers that need access to data for critical decision-making.
- Big Data holders that want to extract value from their data.
- Enterprises that use data for growth and innovation, and desire to leverage data more strategically.
- Businesses in a sector that want to use data to improve their sector-specific processes.
- Service providers that develop services using shared data.
- Researchers that require access to data for excellence in research but also generate data valuable for science, public or private services.
- Research and innovation communities that need access to valuable data for innovation or to train their AI models.
- Citizens that provide unique data to optimise public services, but that can also be curious and require access to data (e.g for citizen-led research).

How to address different kinds of users when talking about data spaces?

Different users have different needs and perceive value differently, and the narrative to explain data spaces and their value needs to be adapted to them. A classification of those users will help to address them according to their needs. The following factors need to be considered:

- The **role that users play in the data space**, as explained above (data holder, data user, etc).
- **The type of user**, individuals, organisations (public body/authorities, research institutions, academia, for-profit or non-for-profit businesses, etc) and communities, (normally represented by an organisation but representing collective interests).
- **The digital and data maturity of the user**, and the maturity of the sector where they normally operate.

In addition to these three factors another important aspect to consider is the **background** and **the role that the person** we are interfacing with plays in the organisation: Within the same organisation business people, legal people and technical people will describe and perceive the value of data spaces differently (e.g legal people will value compliance, technical people interoperability, security, standards, etc, and business people aspects such as innovation, market and customer growth, and business value overall).

Some initial conclusions and critical factors associated to the diversity of users and their needs in a data space are:

The diversity of users highlights the **importance and complexity of community management in data spaces** as a relevant function.

- **The need for strategies and tools to recruit users in a data space**, adapting narratives to their needs and to the perception of the value that participation in the data space could offer. Some tools that could support this:
    - A variety of user stories (as the ones illustrated in section 5 of this paper) classified to match different types of users and use case
    - A modular value proposition adapted to different user types (considering role in data spaces, type of user, digital and data maturity, and the profile of the main interlocutor).
- **The need for strategies to retain users**: organisations or individuals already part of a data space (already users) will need to perceive ongoing value directly through their participation in use cases, or indirectly by participating in other activities organised in the framework of the data space (other services provided by the data space e.g. training, experimentation, etc). Incentives for setting-up or participating in use cases, the identification of additional services to be provided by the data space to the users and ongoing monitoring of the perceived value are important activities to be developed in a data space.

4 The value

In the realm of data spaces, **value** takes on various dimensions, reflecting the diverse perspectives of those involved. Different users perceive this value very differently (depending on the type of organisation, role they play, their digital and data maturity, and other factors). The value of a data space will depend on the capacity of its participants to generate individual and collective value (shaped through the realisation of use cases).

If we look at the individual value of organisations, business value is often associated with tangible outcomes and benefits that directly impact an organisation's financial performance, market position, capacity to achieve its objectives and/or sustainability. Other types of value exist, such as customer value, employee value, stakeholder value, Innovation value, reputation, social and environmental value, strategic or operational value, cultural and ethical value. These other types of value are meant to revert positively to the business value of the organisation. Participation in data spaces can unlock all these different dimensions of value.

The DSSC starter kit[7] already illustrated some examples of collaborative business patterns based on cost sharing (so individual reductions of costs), joint innovation (products or services only viable by collaborating and where not a single organisation has all necessary data), strengthening market position (e.g against dominant players), or greater common good.

In this section we look at the value from different perspectives:

- The challenges, obstacles or frustrations that users encounter while trying to address their needs (the pains or pain points) and the analysis on how data spaces, or the products and services offered through data spaces can act as pain relievers,
- The gains or the desired outcomes, and benefits that users seek to achieve, and on how data spaces can realise those gains (gain creator),
- The new business opportunities,
- We also address and reflect on how the European rules and values revert in value to business and users overall.

We illustrate some examples (based on a collection of input from experts working in the field and referenced literature), complemented with user stories provided by our network of stakeholders (in chapter 5). An exhaustive exercise considering all types of users (classified according to the different dimensions described in section 2) their needs and opportunities, is out of the scope of this paper.

4.1 The pains and pain relievers

Organisations and individuals are often experiencing challenges and pain points of different nature when navigating through the increasingly complex and dynamic landscape of the data economy. These pains can be classified as follows:

General (business) pains. These are pains that users encounter when dealing with data and embracing the data economy, and are related to the broader (business) context (their specific context, or challenges of the data economy overall). These challenges could be both internal (within their organisation) and external (outside their organisation). For example, economic & market conditions,

regulatory frameworks, or organisation culture may contribute to these pains. Indicative examples of these pains can be:

- Policy makers experiencing difficulties in mapping policies into specific data sources and accessing this data (access to data),
- Citizens/individuals having to register in multiple platforms for accessing services (complexity, lack of human control, consent management),
- Businesses and organisations in general (also public players):
    - Lacking personnel with the necessary skills (skills),
    - Not enough incentives not perceiving operative and strategic benefits to share their data (value and incentives),
    - Regulation and fear of non-compliance? (i.e. with regards to GDPR, DGA, Data Act, DMA, DSA) (regulation, compliance),
    - Not knowing how/where to start (guidance),
- Businesses and organisations building, deploying and maintaining AI applications not finding the right data sources or conditions to access that data (access to data).

Pains inherent from data sharing. This category focuses on obstacles and barriers that users encounter specifically when they are involved in data sharing activities. Data sharing can involve challenges related to data security, data privacy regulations, access control, data integration, or collaboration with external partners. These challenges are distinct from the broader business pains but are directly related to data exchange activities. Indicative examples of these pains can be:

- Big data holders holding heterogeneous unstructured big amounts of data to offer (access to tools and cost of data preparation/curation),
- Organisations in any of their roles also suffer from:
    - Lack of Interoperability among parties (interoperability),
    - Lack of trust among parties (trust),
    - Data permissions and content issues (IPR and data licensing),
    - Lack of data quality, biassed data or non-curated data (quality),
    - Security and cybersecurity risks (security),
    - Lack of control over the usage of their data (sovereignty).

Data space related pains. This category refers to the challenges that users face when operating within the data space environment itself. These pains are more directly tied to the mechanics and operation of a specific data space. Indicative examples of these pains are:

- Potential operators or service provides of data spaces core functionalities lacking of clear guidelines and supporting tools to guide the deployment of building blocks and to manage the data and services (guidelines).
- Citizens/individuals, not knowing or understanding data spaces, and lacking understanding on how personal data management applying human control will be integrated in data spaces (understanding and personal data management tools).
- Communities or a set of parties with a common interest (including sector organisations) that decide to create or join a data space:
    - Trusted and safe data sharing in a multi-party data sharing environment (trust and security),
    - Starting: how to overcome the initial burdens (guidance),

  - Getting operational: how to get the technology, tools, etc., on a high TRL level (market-ready technology),
  - Governance and business model: how to get a sustainable (also financially) business & governance model (guidance and funding),
  - Scaling, how to scale the data space to a very large group of users (scaling).
- Businesses and organisations in general, understanding data spaces on a tangible high-level.

Table 1 analysis on how data spaces, or the products and services offered through data spaces can act as pain relievers for the users

	Type of users	Specific challenge or barrier (pains)	How can data spaces help ? (pain relievers)	Call for action (if relevant)
General challenges	Organisations - Data users (e.g policy makers or AI companies)	Access to the data they need	Access to more FAIR data in quantity and diversity.	
	Individuals (personal data)	Complexity	Individuals will normally engage through data intermediaries in charge of reducing complexity, managing consent and allowing for human control.	More user stories and examples of data intermediaries in data spaces and citizens as users.
		Lack of human control		
		Consent management		
	Organisations that hold data	Lack of skills	Community focus. Potential skill-development services provided by the data space.	Skills developments as a service of the data space to its participants.
		Lack of incentives to share	Multiple use cases can be implemented in the same data space. User stories of sharing costs, joint innovation, etc available to support the data sharing.	Catalogue of success stories. Possibility to add sandboxing services in the data space.
		Fear to non-compliance	Compliance implemented as usage policies and legal building blocks.	
		Lack of guidance (where to start)	Community focus. Potential skill-development services provided by the data space.	Skills developments as a service of the data space to its participants.
Challenges specific to data sharing	Big data holders	Access to tools and cost of data preparation/curation	Access to service providers that offer data management and integration tools	
		Lack of interoperability	Interoperability and common standards	Choice of common standard

	Organisations in general (in several roles)	Lack of Trust	Trust framework to share data	Universal registry of credentials
		Fear to lose control on who access and uses the data and for what is used	Data access and usage control (policies)	Storage of authorization policies
		IPR and data licensing	Licensing models for different data types	Simple and open licensing models
	Organisations that act as data users	Lack of data quality. Biassed data. Lack of provenance	Implementing a minimum set of data quality standards among participants.	Data quality is a very relevant topic in general and in particular for AI. Data spaces could provide additional functionality for data quality.
Challenges specific to data spaces	Service provides of data spaces core functionalities	clear guidelines to deploy their functionality.	Blueprint	Easy and user friendly supporting assets to set up the data space
	Communities or a set of parties with a common interest	Trusted and safe data sharing in a multi-party data sharing environment	Trust framework and anchors	
		How to start and overcome the initial burdens	Community building Starter-kit Blueprint	Possibility to add sandboxing services in the data space. Specific guidance to help companies to overcome organisational, cultural and knowledge changes.
		Lack of market-ready technology	Reference implementations	With information about market readiness, versions and features
		how to get a sustainable business & governance model	Access to templates and real stories.	Business and governance templates for data spaces associated to real stories (of failure and success).
		Scaling users	Governance authority that defines and	

			implements growing and recruiting strategies.	
	Businesses and organisations in general	Understanding data spaces		Demonstrators and sandboxing. Consistent definitions and adapted narratives.

Table 1 analysis on how data spaces, or the products and services offered through data spaces can act as pain relievers for the users

A first observation is that data spaces, as described by the Blueprint v0.5, can already mitigate many of the challenges that users experience in the data economy. However, some of the existing features require additional actions to be able to address those challenges fully. For example, interoperability and common standards resolve certain issues but there is a need to choose the standards to implement; the trust framework addresses the challenges of lack of trust but there is a need for a universal registry of credentials; the access and usage control policies addresses lack of control on your data but there is a need to storage authorisation policies.

This point only emphasises the need to constantly align the roadmap of the data space Building Blocks with the user requirements.

We can also observe that there are challenges that are not directly addressed by data spaces yet (as described in the Blueprint v0.5) but will require to be addressed shortly. A good example is “data quality” (strong mechanisms to ensure data quality or data quality control.

Finally there are certain user needs that could be addressed by specific products and services that the data space offers to the participants, beyond data exchange. Those services could be offered directly by the data space or externalised to another entity. Examples are skills development, support for data transformation and sandboxing (experimentation):

- Skills development and support in data transformation could be e.g provided by a European Digital Innovation Hub (EDIHs), or any of the hubs of the Data Spaces Business Alliance. This would call for strong collaboration in between data spaces and hubs (in a wider sense of the word). Another important reflection is that data spaces can be part of the evolution of an organisation in the path to digital transformation, as data-sharing projects can represent an important step to move forward and embrace data spaces as a part of their evolution.
- Sandboxing could also be provided by existing experimentation facilities for data spaces (e.g check Data Spaces Business Alliance Hubs).

4.2 The expected gains and gain creators

When joining digital and data ecosystems, participants expect gains, direct benefits, and positive outcomes. We could summarize those benefits or expected outcomes as follows:

- Cheaper, faster and easier access to data tools and data services (e.g for big data holders with big amounts of unstructured data, or access to data services by individuals),
- Cheaper, faster and easier access to data (e.g researchers, innovators, etc),

- Increase potential for innovation and creation of new solutions (co-created by several participants, new use cases or innovators creating new products and services based on shared data). Solve problems that could not solve before (or they were too difficult or too costly),
- Fair data economy, transparency, fair distribution of value and distributed power,
- Cost savings, improved processes, and faster solutions ("do better what we already do"),
- New business opportunities (e.g opening existing products and services to new markets, new customers, etc) (new markets and customers). Build new collaborations and be able to compete in the market with big players,
- Valorisation and monetisation of data,
- Climate and user-friendly solutions.

The value of data spaces can also be perceived as gain creators associated with those expected benefits. The table below addresses the value of data spaces, expressed sometimes as a product or service offered by the data space, and also identifies potential calls for action to either give more visibility to those valuable elements, or to develop them further.

Gain (expected benefit or outcome)	How data spaces act as gain creators (also perceived as product and services)	Call for action (if needed)
Cheaper, faster, and easier access to data tools and data services	Service providers offering data tools and services become part of the data space (business opportunity based on the large amount of data providers and consumers) Data spaces supporting the realisation of the full data value chain	"Recruitment" of data space intermediaries that can offer the required tools and services under the governance framework of the data space. Up-to-date with new technologies for data management and integration.
Cheaper, faster and easier access to data	Increasing data availability and access across a broader range of data providers Common Standards Data discovery and publications services.	Ongoing recruitment of relevant data providers. Realisation of the Interoperability between data spaces
Potential for innovation and creation of new solutions **Solve problems that could not be solved (easily) before**	Data that is scattered among different organisations can be pulled together to create new services or to solve problems. Co-creation and open innovation. Support in use case development	Testing and experimentation environments for innovators in data spaces. Sandboxes Tools for co-creation of collaborative business patterns
Fair data economy, transparency, fair distribution of value and distributed power.	Governance framework Compliance with European rules and values Co-creation and open innovation. Support in use case development	Tools for co-creation of collaborative business patterns

Cost savings, improved processes, and faster solutions	Faster and cheaper access to data Faster and cheaper access to data services and tools Collaborative business patterns and use cases based on data sharing to achieve this. Interoperability Negotiation of contracts for sharing Data exchange mechanisms	Availability of reliable, easy to use, robust & certified building blocks.
New business opportunities (new markets, new customers, new collaborations)	Interoperability of data spaces Community management	Realisation of the interoperability of data spaces
Valorisation and monetisation of data	Data Spaces scale up the value and profit out of data by bringing new business models and use cases due to the data sharing Marketplace	Catalogue of user and business stories
Climate and user-friendly solutions		Benchmark energy consumption or efficiency of services provided by the data space. Innovative green solutions for data management and integration (e.g from research projects)

Table 2 analysis on how data spaces, or the products and services offered through data spaces can act as gain greators for the users

We can observe that in the majority of expected benefits and gains, data spaces (as specified in the Blueprint v0.5) can act as gain creators, or a path to achieve the objectives. However, in the majority of the cases the realisation of certain capabilities and data space strategies are crucial for success, For example, the realisation of interoperability between data spaces seems to be a crucial element. Another important element is the ongoing recruitment of data providers and data service providers, in particular those offering the latest technologies for data management and integration (cheaper and energy friendly).

As it happened with the services described in chapter 4.1, there are certain elements still not part of data spaces that could enhance the benefit for the users, in particular the usage of test-beds or sandboxes seems to be an important element for value creation, in particular in the path to create new innovations. The availability of tools for use-case co-creation and the existence of a catalogue of user and business stories are also important elements in the value creation of a data space.

4.3 The new business opportunities

By entering a data space, users are expected to have a significant edge over their competitors. Surprisingly, many organisations and businesses are actively hindering data sharing practices by promoting data silos and discouraging collaboration. This is because they might be unaware of the business and societal value derived from their participation in data spaces, or because of an already well-established overall positioning in the market that they don't wish to disrupt. The Common European Data Spaces, create a favourable environment to move forward and shift from the traditional "don't share data unless necessary" mindset to a "must share data unless restricted" approach. Data space users can anticipate a wide range of both direct and indirect business opportunities:

Direct business opportunities can include:

- Market Growth: Data space users are likely to experience increased market share and growth, thanks to the expanded data-sharing capabilities.
- Diversification: The ability to access and share various datasets (open, closed, research, etc.) opens doors to new roles and business opportunities within the market.
- Revenue Streams: Users can unlock new revenue streams through the creation of innovative products and services. This can include selling valuable datasets, evolving AI services (trained with richer datasets) and developing cross-sectorial services focused on personal data management. Diversified monetization models including subscriptions, transaction fees, member fees/donations, freemium/premium services, and one-off payments can be applied for revenue generation.
- Expanded Customer Base: Access to Data Spaces often means access to new customer channels and marketplaces, facilitating business growth.
- Innovative Business Models: Users can explore innovative business models, including cross-border and collaborative models tailored to specific use cases.
- Cost Savings: Data Space technical infrastructure can lead to cost savings, enhancing overall profitability.

From the other hand, indirect business opportunities incorporate:

- Enhanced Branding and Reputation: Active participation in data spaces can enhance an organisation's branding and reputation as a trusted data-sharing entity.
- Operational Efficiency: Data sharing through data spaces can streamline operations, optimize supply chains, and lead to better decision-making and market/organizational insights, resulting in increased efficiency.
- Strategic Partnerships: Engaging with other data space users and stakeholders can foster valuable strategic partnerships, community-building, and access to public funding and collaborative schemes.
- New Business Avenues: Knowledge and expertise gained within Data Spaces can open doors to entirely new business opportunities, as organisations tap into emerging trends and technologies.

The key to unlocking these opportunities lies in adapting to the evolving regulatory & market environment. Staying compliant and agile in response to changing regulations & market demands will be essential for data space users to maximize their business potential.

4.4 The European values as value for the users

Data spaces are envisioned as data sharing environments where data can flow within and across sectors. This means that data spaces will comply with relevant EU legislative frameworks, especially personal data protection and competition law, and will be founded on values mentioned in art. 2 of the Treaty on European Union such as human dignity, freedom and equality[12].

Specific EU values are enshrined both in the technical and governance aspects of the data spaces. From the technical perspective, freedom as a value is being realized by providing high-level technical interoperability standards, both within a data space or data spaces' ecosystem, enabling the effortless connection and communication between different systems. By establishing transparent governance framework based on neutral, non-discriminatory standards, parties interested in participating in the data space can enjoy an unbiased treatment, regardless of their country of origin or other characteristics that are irrelevant in the particular data space context.

EU values are promoted by different categories of data spaces' users:

- **Individuals** – data spaces enhance the natural persons' autonomy in the context of personal data protection, in particular rights resulting from the GDPR (e.g. data portability). At the same time, they should ensure non-discriminatory and transparent procedures regarding the access to data – both those concerning natural persons and resulting from their activity[13].
- *Example: Through a more effective portability of energy data, individuals are better placed to save energy and select the best provider for their situation. In doing so, they may also contribute to local optimisation and support decarbonisation.*
- **Businesses** – data spaces may contribute to the development of the European Single Market freedoms by establishing a more level playing field in the data economy. By increasing data availability and access across a broader range of companies, data spaces have the potential to reduce the concentration of market power of Big Tech firms that currently control ''a large part of the world's data''[14]. Facilitating data sharing on the basis of mutual trust and benefit will help entrepreneurs to increase their productivity and the quality of their products and services, contributing to Europe's competitiveness.
- *Example: In the case of business-to-business (B2B) relationships, the Data Act proposal regulates unfair data-related contractual terms imposed on a micro, small or medium-sized enterprise. This approach will equalize the competitive advantage of larger companies and help SMEs and start-ups use data on fair terms.*
- **Public authorities** - thanks to sectoral data aggregated in particular data spaces, public administration can create better evidence-based policies, that is required by the transparency rules and principles of the democratic rule of law.
    - *Example: According to the EHDS regulation proposal, certain public institutions are allowed to obtain an access to electronic health data for a longer period and on a recurring basis. This may be the case not only in specific circumstances in times of crisis but also to provide scientific evidence and technical support for Union policies on a regular basis[15].*

4.5 Value for the individuals/citizens and societal value

Data spaces do not only offer benefits for users but have the potential to benefit individuals and society at large. Individuals are often at the source of the data value chain and they constitute essential key nodes in the production of data. Therefore, it is fair that the added value produced by data sharing should benefit society at large.

- **Advancing science and open innovation**

Data spaces for research promote the advancement of science and open Innovation. By minimizing unnecessary frictions inherent in data exchange processes (e.g., transaction costs) that would normally act as disincentives to share data, more data is made available. As a key infrastructure for research, data spaces will allow researchers to tackle the ''societal, climate and environment-related challenges'' and make societies as a whole ''healthier, more prosperous and more sustainable[14]. Considerable beneficial synergies can also be derived by access to a cross-sector pool of data and by making data spaces interoperable. Using different data sets will allow the identification and formulation of new research questions – by, for example, exploring correlations between different variables (data) originating from different data spaces (e.g., how the area where you live affects your chances of incurring a specific disease). Moreover, the data held by academic institutions will also offer new revenues opportunities, further increasing funding allocated to research activities.

- **Development of data-driven applications benefiting individuals**

The European Health Data Space will not only empower individuals by giving them greater access and control over their health data in a secure and trustworthy environment, but it will also contribute to improving the quality of healthcare services and the production of devices offering a ''more efficient, higher-quality, safer and more personalized care'' experience[16]. In addition, access of medical professionals to a large pool of personal health data will improve the ''understanding, risk identification and prevention of diseases[17].

5 User and business stories

This chapter offers a collection of user stories crafted from authentic experiences, insights gained from pilots and interactions with users who have embarked on a journey to harness the potential of data spaces. The ambition of these user stories is to share light on the value extracted by user participation within Data Spaces through real-life examples from various industry verticals. The narrative follows the main elements of chapter 4, and captures multiple aspects that can be used to extract meaningful conclusions on the value extracted by individuals, businesses or communities through participating in a Data Spaces, including: user needs, challenges, successes, and the value they find, all while introducing next steps.

5.1 Auditing the carbon capture supply chain

The biggest challenge in this story is the complexity of the supply chain involved in the production of solidified carbon. Different actors and organizations are involved in the various stages, such as biomass collection, transportation, chemical transformation, and distribution. Ensuring transparency and integrity throughout this multi-participant process can be difficult, and breaches of integrity can occur. This complex process involves multiple participants, from biomass providers to energy providers, logistics companies, and pyrolysis plants. Each step in the supply chain requires verification and assurance to ensure that the process is carried out correctly and that the resulting assets are genuine. It is also required to consider the regulation challenges and high level of investment. And all this requires data sharing amongst various participants, so that's why it is a good example of a data space concept.

This example of data space operates within the context of carbon capture supply chains and the need for reliable monitoring and verification. Carbon capture is a crucial aspect of mitigating climate change by capturing and storing carbon emissions from industrial processes. It addresses several challenges due to the complexity and vulnerability of these supply chains, as well as the need for trust, transparency, and auditability.

This user story encompasses various stakeholders that play a significant role in the process flow:

- Biomass Provider as Data Provider Role who provides the quantity of biomass produced that is published in its context broker.
- Biochar Plant as Data Consumer Role who retrieves the data about biomass and verifies the integrity through the blockchain service.
- Independent Lab Analysis as Data Provider Role who validates the claims made by the Biochar Plant and publishes the data in its context broker.
- Sequester who takes over the biochar and acts as Data Provider Role generating data regarding the storage location, method, and duration, which is ingested through its context broker. It also creates the Emission Certificate and non-fungible token (NFT) on the blockchain

This data space provides an ecosystem which allows a shared audit trail among all participants involved in producing and sequestering stable solid carbon from carbon-rich waste biomass. This schema can be replicated in a vast number of new potential stakeholders in various sectors, ranging from waste management to carbon offsetting enterprises.

For biomass producers, the data space offers new revenue opportunities by enabling the utilisation of carbon-rich waste biomass and participating in the carbon market through the sale of carbon certificates. Transformation plants benefit from enhanced operational efficiency and resource optimization, while carbon storage sites ensure secure and monitored storage of stable solid carbon. Transportation providers benefit from improved logistics and supply chain visibility, reducing costs and enhancing operational efficiency. It has been estimated that a minimum 30% revenue increase for all participants in the data space by maximising biomass utilisation, improving operational efficiency, carbon credit trading, and optimising supply chains.

As next steps, scaling to a larger number of participants and expanding to other domains are in the roadmap. Technically, the data space should be enriched with other authentication channels to improve the usability and incorporate human interaction.

This experiment of data space has been developed under the scope of the i4Trust project by following organisations: Fabourgh Numerique, act4Carbon, Jaden, iExec, WBNode, Lab Automation Network.

The combination of the FIWARE Data Space Connector, Context Broker, Smart Data Models and the iShare technology stack have been the technological baseline for the experiment.

5.2 Data for policy: Tackling mercury pollution at global scale

Context & Background

Mercury is a highly toxic naturally occurring element affecting humans and the environment.

It can enter the environment through natural processes, such as volcanic activity, forest fires, and the ocean emissions. However, anthropogenic emissions, including those from artisanal and small-scale gold mining, coal combustion, industrial production, and waste incineration, have significantly augmented its presence since the previous century as they can accumulate in the environment for

extended periods. Mercury undergoes complex chemical transformations cycling between different forms including gas and liquid states within the air, water, soil and biota. Notably, it bioaccumulates in aquatic organisms, progressively concentrating (biomagnificate) as it ascends the food chain, ultimately affecting humans. The potential for climate change to remobilize its cycle introduces complexity into the assessment and understanding of future changes.

According to the World Health Organisation[18] mercury is one of the top ten chemicals of major public health concern and poses a threat to unborn and early life children.

The Minamata Convention on Mercury, adopted in 2013, is a global treaty to protect human health and the environment from the adverse effects of mercury. This global treaty requires monitoring, impact assessment and effectiveness evaluation, among others.

GEO and GOS4M

The Group on Earth Observation (GEO)[19] is an Intergovernmental organisation of more than 100 Members and in excess of 100 Participating Organisations committed to improve the availability, access and use of Earth observations (EO) for the benefit of society. The GEO work program[20] defines

the GEO Flagship activities characterised by the provision of reliable services in response to defined policy mandates from international organisations, conventions, agreements or other bodies.

The Global Observation System for Mercury GOS^{4}M is a GEO Flagship aimed to support the Minamata Convention Secretariat, the UN Environment and all Nations to fulfil the Conferences of Parties decisions e.g. related to the Effectiveness Evaluation of the convention. GOS^{4}M is federating data collected in monitoring network on mercury (Hg) and mercury pollution, and developing services and tools aimed to simulate scenarios on mercury at global scale in order to provide robust data-based frameworks for decision makers.

The GOS^{4}M Knowledge Hub (GOS^{4}M-KH) is an operational integrated multi-model and multi-domain computational platform (Figure 1) where **scientists, decision-makers and citizens can discover, analyse and understand information for characterizing the linkages between impacts and effect of mercury contamination on Earth system and human health** at different geographical and temporal scales. The GOS^{4}M-KH provides information on the processes and pathways that mercury undergoes in the environment, from its release into the atmosphere or water to its eventual deposition, transformation, and accumulation in different environmental compartments. Long- term trends of macro-indicators can be analysed to assess the effectiveness of measures on medium-long term time periods and eventually estimate associated socio-economic costs.

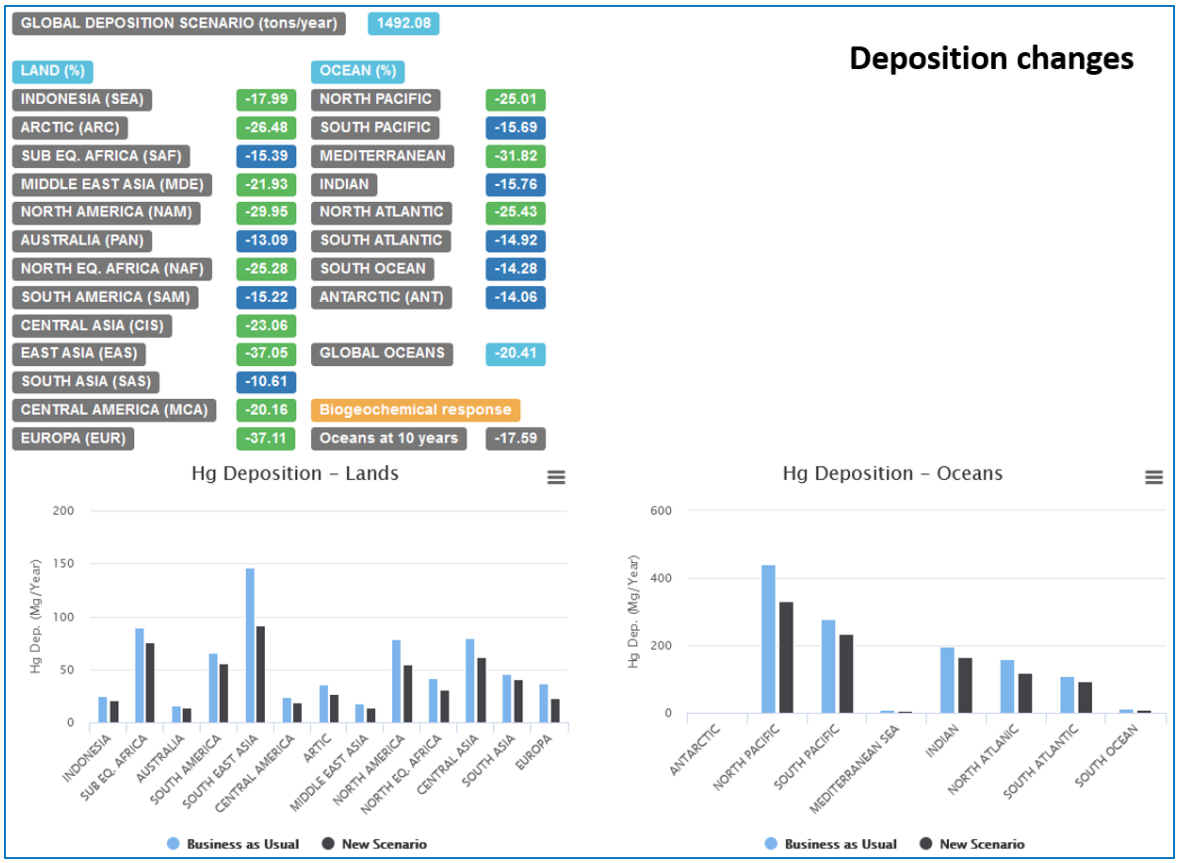

*Figure 1 The GOS4M-KH (**GOS4M-KH**) includes applications to: i) browse & select anthropogenic emission data by Country and Industrial Sector; ii) discover and download dataset on Hg concentration in air, water and biota as well ancillary parameters; iii) evaluate changes in deposition patterns & trends over land and oceans, long-term trends of Hg concentrations in oceans and marine*

biota; and iv) evaluate cost-effective strategies, including investment costs, aiming to achieve a given risk mitigation target.

Pains

- Despite the developments of user-friendly tools by the GOS^{4}M-KH, global agreements to provide mercury measurements needed to feed and validate the models are not always fulfilled by all nations e.g. when funding programs are discontinued.
- The data sharing culture is still compromised in cases by scientists who may fear that their research is undermined if the data is openly shared prior or even after publications.
- Data sharing requires a lot of investment in data and metadata preparation prior to sharing, with quality standards well defined so measurements are comparable across the global network and the scientific community can make use of it.
- Ancillary datasets needed for fulfilment of the convention are in fragmented silos. e.g socio-economic and health data needed for analysis of cost scenarios or human health risk modules.

Gains

- Current mercury monitoring infrastructures federated across the world could benefit from well-defined data spaces business models that will ensure the continuity of the provision of measurements and datasets needed for the Evaluation and effectiveness of the policy programs. This may include financing from different sources e.g., trust funds, member states' contributions or climate finances to support developing countries in the provision of data.
- Data spaces and the tools enabled by them should offer clear metrics to incentivise rewards to the different user groups of the GOS^{4}M. For example, this may include an increase in attribution to researchers due to availability of high-quality metadata that identifies authors, data licensing, terms of use and uniqueness of data sets via means of DOI or by providing evidence of increased data usage. Policy makers should be able to track the effectiveness of their targets and adjust the policy accordingly by using high-quality and trusted data.
- Data spaces should reduce the level of investment needed by data providers prior to sharing. The adoption of well-defined standards for data and metadata access, licensing terms and operating procedures will minimise the learning curve and maximise the data sharing culture while maintaining data sovereignty. The accessibility of key cross-disciplinary datasets needed for the development of GOS^{4}M socio-economic and health risk modules should be provided by alignment and interoperability across sectorial and thematic data spaces e.g., Green Deal, Finance, and Health.

The GREAT project, preparatory action for the Green Deal Data Space, assessed the GOS^{4}M initiative as part of their reference use cases to gather insights and requirements for its design at the technical, business and governance levels. GOS^{4}M data and the knowledge hub insights are key to fulfilling the European Green Deal's strategic actions, particularly the Zero Pollution Action Plan. The presence of GOS^{4}M in the context of data spaces will strengthen Europe's leadership at the policy level and its influence in international policy programs such as the Minamata Convention on Mercury.

5.3 Data for policy: Tackling mercury pollution at global scale

Let's share Matilda's story as described by the DS4Skills project, the preparatory action for the Data Space for Skills, to illustrate a use case of a skills data space. Matilda, a seasoned UX designer at

DigiFutUX, is keen on staying ahead of the curve in the fast-paced technological landscape. Her boss, Francesco, supports her professional development and introduces her to the EU-DUNE skills data space's use case. This portal is dedicated to digital upskilling for employees. Francesco grants Matilda a training budget to explore options on EU-DUNE, where she finds an array of services:

- InfraTrust, a Personal Data Intermediary, helps her control and share her data.
- SkillProfiX, a skills assessment tool to define her skills profile, next career move and skills gap.
- SDAI, a skills AI tool to match her with relevant training recommendations.
- FindTraining and YourTraining, training catalogues that list various training opportunities.
- IntelliAITraining, one of the training organisations listed in the catalog.

Matilda gets access to quick and personalised learning recommendations through the interconnection of all these services, enabled by her Personal Data Intermediary InfraTrust. She's interested in one of IntelliAITraining's offers.

Anita, a sales representative at IntelliAITraining, can see in her EU-DUNE account that Matilda is interested in one course and contacts her. After they exchange, Matilda decides to enrol in the training and, thanks to InfraTrust, shares her complete profile with IntelliAITraining's LMS to register.

This story shows the value of such a human-centric skills data space:

To an individual:

- I can easily find and use tools to assess my skills and receive career/learning recommendations (smoother experience).
- I can easily share a comprehensive professional profile (including formal and informal skills, experiences, interests, preferences, etc.) with relevant stakeholders (e.g., finding a job faster).
- I can control how my data is used and shared (agency and self-determination).

To a training organisation:

- I can access the precise profile of a person's skills and track skill acquisition to offer the right training at the right time (*targeted service provision, higher return on investment, target leads and sales*).

To an employer:

- I can provide my employees with tailored training to fulfill my objectives and retain talents (*high-quality employment and talent retention*).

To an edtech/hrtech provider:

- I can improve my services based on comprehensive datasets and can combine my services with others to form more powerful products (*innovation and higher sales*).

To provide personalised and lifelong learning services to people and organisations with ways to identify which skills are needed, design the right training, forecast recruitments, identify skills gaps,

and upskill their workforce, we need connected data. This data can be personal data about people's profiles (skills, hobbies, personality, experiences, preferences, etc) and non-personal data (job offers, training offers, skills ontologies, skills needed, etc).

This data is today scattered across many organisations, big/small, public/private, (training organisations, universities, schools, employment agencies, employers, institutions, EdTechs, HRtechs, job boards, training catalogues, etc).

To interconnect them, we need people and organisations to be able to control and share their data. In such use cases, the Personal Data Intermediary is an essential mechanism and role to allow people to control and share their data independently across the data space. Data space use cases, which combine data providers and service providers to produce recommendations, analytics, and dashboards, can help these stakeholders tackle those challenges.

As a real-life example, **Prometheus-X**, a Data Space Governance Authority, gathers hundreds of organisations in the EU (infrastructure providers, skills & education stakeholders, and other sectoral data spaces) to fund and develop common open source building blocks for human-centric data sharing (identity management, consent management, contract management, interoperability management, decentralised AI training & processing, anonymisation, etc). These building blocks are then operated by trusted Personal Data Intermediaries, used by stakeholders to implement use cases.

Thirty **such data space use cases** in the skills domain are being deployed across the continent with a **first one running in France** with the following organisations: Grande Ecole du Numérique (end user and data provider), Région Ile-de-France (end user and data provider), Inokufu (service and data provider), HeadAI (service provider), Jobready (service and data provider), Orientoi (service and data provider), Visions (Personal Data Intermediary). Other domains, such as the tourism and mobility sector, are also starting to design use cases thanks to these Prometheus-X building blocks and trusted intermediaries.

6 Summary and recommendations

Throughout this paper we have explored the concept of data spaces, delving into their context, differentiation factors, and potential implications for various stakeholders. Data spaces are placed within the broader framework of digital ecosystems and align with the European data strategy. Their definition encompasses distributed structures, governance frameworks, trustworthiness in data transactions and data sovereignty. Key distinctions include their ability to address challenges and mitigate risks in data sharing, provide incentives, and engage a very diverse range of participants in data ecosystems.

The paper has also tapped into understanding who the users of data spaces are, exploring their diverse roles and needs within these environments. Data space participants encompass a range of stakeholders, including data rights holders, data providers, data recipients, data users and data space intermediaries. Understanding the unique needs and perspectives of these users is crucial for effectively explaining the concept of data spaces and their value proposition. Users vary in terms of their organisational type, digital/data maturity, and sector of operation. Additionally, the backgrounds and roles of individuals within organisations play a significant role in shaping their perception of data spaces.

The paper has also addressed the multifaceted concept of value within data spaces. It acknowledges that perceived value varies depending on users' roles, organisational types, digital and data maturity and more. It explores the individual and collective value generated by data spaces, focusing on tangible and intangible benefits such as business value, customer value, innovation, reputation, and more. It also examines challenges, or "pain points," that users face and how data spaces can alleviate these challenges. It emphasises the importance of aligning data space building blocks with user requirements and identifies areas where additional actions are needed. Additionally, it discusses the expected gains and gain creators within data spaces, including direct and indirect business opportunities. Lastly, it explores how European values, such as freedom, transparency, and equality, are integrated into data spaces and how these values benefit individuals and society.

A chapter with illustrative user stories is also part of this paper, making visible challenges and opportunities in very diverse sectors and scenarios with a large diversity of users and purposes. While these stories have not been analysed, they follow a common pattern (who are the users, what are their needs, how data spaces help them) and illustrate many of the aspects reflected in the document and can be considered as the embryo of a larger repository of user and business stories of value for the community.

As a result of the discussions that enabled the creation of this paper, and the conclusions of some of its chapters, a list of recommendations is proposed.

These recommendations aim at lowering barriers when engaging users in data spaces and at increasing the value of their participation in data spaces. They may be critical success factors that need to be addressed by DSSC. Further dialog within DSSC and with its Network of Stakeholder is needed to validate these recommendations and transform them into realistic actions:

- **Consistency and alignment in definitions, scope, and characteristics**: Definitions remain important. Stakeholders, both within Europe and worldwide, must work together to establish consistency and alignment in data space definitions, scope, and characteristics. This ensures a

common understanding and facilitates collaboration. Building upon the DSSC conceptual model and glossary, stakeholders should work towards harmonisng definitions and characteristics of data spaces.

- **User-centric narratives and adaptable value propositions**: Develop narratives that cater to different user types, considering their roles in data spaces, digital maturity, and specific needs. Modular value propositions should be crafted for various user profiles. Acting on this recommendation will be valuable for data space initiatives, to recruit participants.
- **Community management:** Acknowledge the complexity of user diversity within data spaces. Deploy strong community management strategies to effectively engage, enlist, and maintain users. Execute approaches to maintain existing users by consistently delivering value through their participation in use cases and the provision of additional services within the data space framework. Develop a methodology to continuously extract value considering market trends, offer and demand. Implementing this recommendation will prove valuable for data space initiatives and enhance the value for all participants.
- **Global standards and interfaces:** Given the global nature of digital value chains in many sectors (e.g logistics, manufacturing), it is imperative to develop global standards and interfaces with regions outside Europe to ensure seamless participation in international digital ecosystems.
- **Common repository of user and business stories**: Collect and share real business success stories that highlight the benefits of data spaces. Acting on this recommendation will be valuable for data space initiatives, (potential) participants and policy makers.
- **Testbeds / Sandboxes**: Incorporate testbeds or sandboxing facilities into data spaces to facilitate innovation and experimentation, fostering new value creation, and enhancing data maturity of organisations. Acting on this recommendation will be valuable for participants in data spaces.
- **Enhance gain creation in data spaces:** Continuously work on realising capabilities and strategies within data spaces that are crucial for success, such as synergy between data spaces, the recruitment of data providers and the offering the latest data management and integration technologies.
- **Promotion of EU values**: Highlight EU values such as freedom, transparency, non-discrimination, and human dignity in the technical and governance aspects of data spaces to benefit individuals, businesses, and society. In connection with EU values and regulations it is necessary to develop mechanisms for ensuring **data quality and data quality control**, as this is a crucial element in value creation. Acting on this recommendation will be valuable for data space initiatives.
- **Integration of skills development and "data transformation" support services** as part of the data space portfolio of services, in-house or establish strong collaboration with existing structures (e.g EDIHs or Data Spaces Business Alliance Hubs). Acting on this recommendation will be valuable for data space initiatives and participants.

The Data Spaces Support Centre in collaboration with the Strategic Stakeholder Forum is called to review these recommendations and transform them, when relevant, into actions or specific outcomes.

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