

D4.2: Input provided to the work of the Data Spaces Support Centre

Final Version



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About DS4Skills

The Data Space for Skills (DS4Skills) is a 13-months project aiming to prepare the ground for the development of an open and trusted European Data Space for Skills that supports sharing and accessing skills data, and engage with the broad community of skills stakeholders.

DS4Skills aims to identify relevant data sources for the skills data space based on stakeholders' needs and propose conceptual approaches for the future deployment of the European Data Space for Skills.

Project consortium

The DS4Skills consortium brings together 10 full partners and 4 associated partners with solid experience in data ecosystem and community building, a wide network of stakeholders from diverse backgrounds, including researchers, training providers, companies, and associations representing industry and data ecosystems.

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List of acronyms and abbreviations

This table provides a list of abbreviations and acronyms that are used in this report. It is not meant to provide an exhaustive list of all the terms related to the subject of this study.

Term	Definition
ADE	Adecco
API	Application Programming Interface
CCIS	Chamber of Commerce and Industry of Slovenia
CoP	DSSC Community of Practice
B2B2C	Business to business to consumer
BB	Building Block
BLOFT	Business, Legal, Operational, Functional, and Technical
DA-E	Data Act Proposal
DE	DIGITALEUROPE
DGA	Data Governance Act
DS	data space
DSA	Digital Services Act
DSSC	Data Spaces Support Centre
DSSC BP draft	Data Spaces Support Centre Blueprint v0.5 for public consultation
DS4SSCC	Data Space for Smart and Sustainable Cities and Communities
DS4Skills	Data Space for Skills
EBDVF	European Big Data Value Forum
eIDAS	Electronic Identification, Authentication and trust Services
ESCO	European Skills, Competences, Qualifications and Occupations
GDPR	General Data Protection Regulation
HAI	Headai
ICoBC	International Council on Badges and Credentials
IDSA	The International Data Spaces Association
ISCO-08	International Standard Classification of Occupations, Index of Occupational Titles
MDG	MyData Global
PDI	Personal Data Intermediary
PSD2	2nd Payment Services Directive
SSF	Strategic Stakeholder Forum
TG	DSSC Thematic Group
UoK	University of Koblenz
VIS	Visions
WP	Work Package

1. Executive Summary

1.1. Introduction

The purpose of this document is to provide a report on the collaboration between DS4Skills and the Data Space Support Centre (DSSC). The fulfilment of the workplan devised during the project kick-off, the collaboration between the two projects, DSSC and DS4Skills, and the relation with DS4Skills tasks and work packages, most notably the creation of a blueprint for the Skills data space, are detailed herein. The bulk of the work was centred around aligning the creation of the DS4Skills blueprint with the generic approach of DSSC. Within the scope of WP4, “Collaboration with the Data Spaces Support Centre and alignment with the European Data Spaces Technical Framework”, an analysis of relevant previous work on dataspaces was conducted to gain insights into best practices and approaches for designing dataspaces. Furthermore, an analysis of standards and other information identified in the platform's inventory was carried out to inform and guide both DSSC and DS4Skills regarding the relevance of specific approaches in designing the DS4Skills blueprint.

Given the objectives and primary focuses of both projects, collaboration was undertaken to achieve mutual benefits. DSSC received guidance on sector-specific needs and design approaches, with a particular emphasis on human-centricity. In return, DS4Skills not only benefited from materials published by DSSC but also gained access to a diverse range of experts working within the DSSC project.

Therefore, this document serves as a report on the collaboration with DSSC and the activities conducted within DS4Skills, all aimed at reinforcing and integrating generic data space design approaches into the development of a blueprint for the European Data Space for Skills.

1.2. Objectives

This report aims to provide a comprehensive overview of the collaborative activities between the DSSC and DS4Skills, the analysis of key DSSC documents, the examination of skills data space initiatives, and the outcomes of interviews conducted for WP3 Blueprint development.

The general objective is to inform the ongoing development of the DS4Skills blueprint and provide valuable feedback for the refinement of DSSC assets. The specific objectives are defined as follows:

- Enumerate collaborative activities between the DSSC and DS4Skills in a chronological manner: This provides a clear timeline of the collaboration, helping to understand how the relationship and project evolved over time. It also aids in identifying key milestones and understanding the sequence of events.
- Provide results of the analysis of the documentation supplied by the DSSC: The analysis of these key documents helps to understand the foundational

concepts and guidelines provided by the DSSC. This is crucial for aligning the DS4Skills blueprint with the DSSC's vision and framework.

- Provide feedback to the DSSC based on the analysis of their assets: The analysis of DSSC assets not only informs the development of the DS4Skills blueprint, but also provides valuable feedback to the DSSC. This feedback can be used to improve future releases of their assets, ensuring they continue to meet the evolving needs of the community. This objective aligns with the collaborative spirit of the project and reinforces the mutual benefits of the partnership between DSSC and DS4Skills.
- Analyse documents from relevant organizations, most notably DSBA members, OpenDEI, and Sitra. The goal of this analysis was like that of the DSSC documents - to understand their relevance and contribution to the DS4Skills blueprint. This helped ensure that the blueprint incorporated a broad range of insights from various sources, further enriching its development.
- Conduct an analysis of the WP2 Inventory: The analysis of these initiatives provides insights into existing practices and standards in the field. This is essential for ensuring that the both the DS4Skills blueprint and the DSSC are informed by current trends and best practices.

1.3. Methodological approach

The methodological approach, shown in Figure 1, has been devised to fulfil the objectives of *WP4 DSSC Collaboration*, which is in the central point of alignment between DS4Skills work packages, DSSC and publications of other organisations relevant for the skills dataspace.

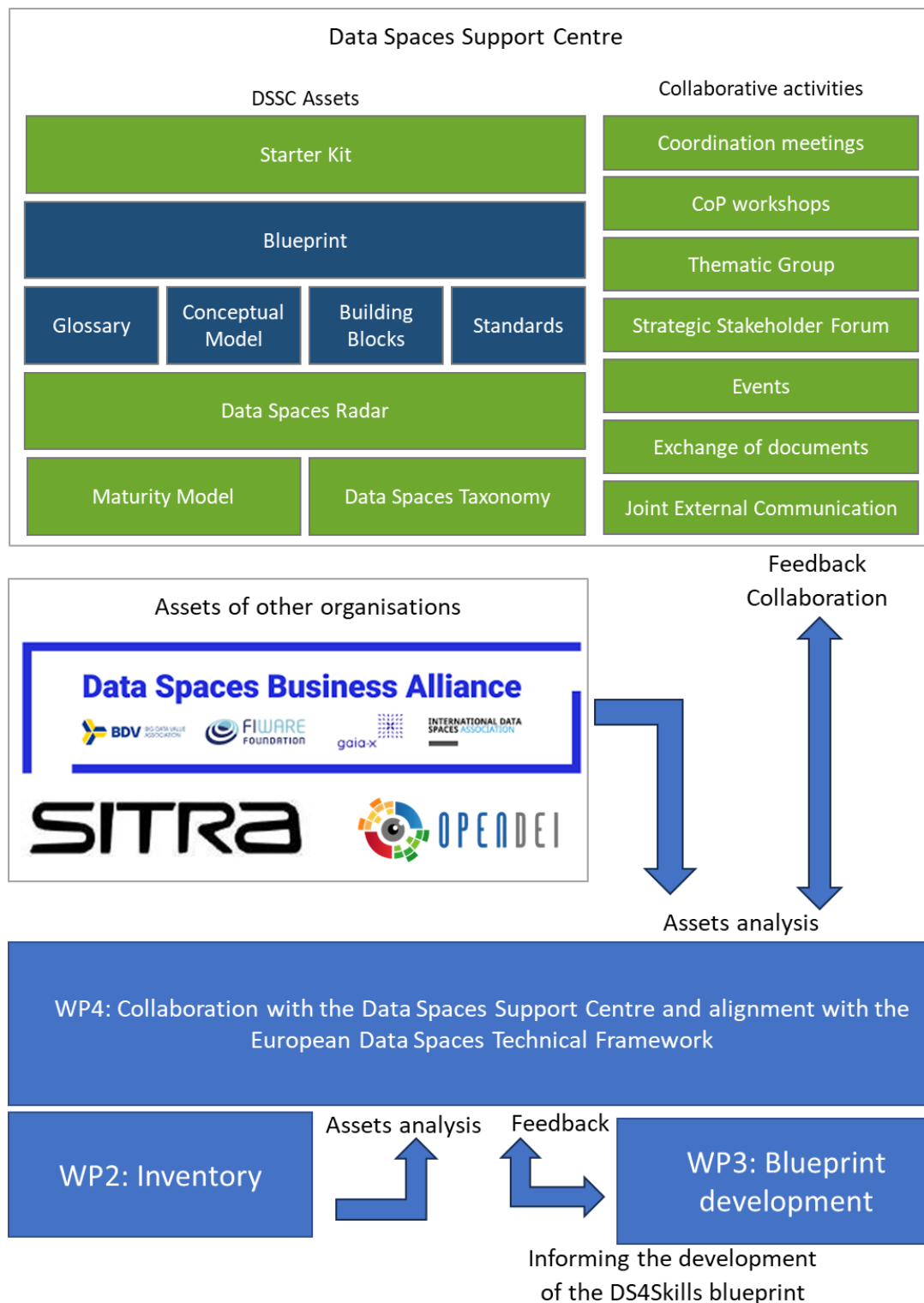


Figure 1: WP4 methodological approach

Collaboration with the DSSC. This section follows the methodology defined in D4.1, “Rulebook: Collaboration with the Data Spaces Support Centre” and reported completely in this report.

Analysis of relevant assets. This section has been developed with the aim of informing the development of the DS4Skills blueprint and providing feedback to DSSC where relevant.

1.4. Results

As per the planned objectives, the following results of the collaboration between DS4Skills and the Data Space Support Centre (DSSC) have been achieved:

- The alignment of the blueprint for the data space for skills with the DSSC considering common building blocks and interoperability, and feedback provided to the DSSC on this basis.
- The alignment of data governance models, business models and strategies for running data spaces with the DSSC.
- The collaboration with the DSSC on common cross cutting issues: blueprint, building blocks, toolboxes, standards, interoperability protocols.
- The analysis of good practices, approaches, and standards for designing dataspace.
- Results of the analysis of the most pertinent documentation supplied by the DSSC, specifically the "Starter kit for dataspace designers" and "Data Spaces Blueprint 0.5 for public consultation".

1.5. Conclusions

The efforts to establish collaboration and alignment between DS4Skills and the Data Space Support Centre (DSSC) generated several positive mutual contributions between the two projects. Examples include custom support from DSSC for sectorial dataspace CSAs and the informative analysis of DS4Skills Inventory, shaping the direction of both projects. In the end, a satisfactory alignment between the blueprints was achieved. However, the fact that the projects were running parallel posed challenges in achieving alignment. In light of this, it is important to underscore that that ongoing alignment is crucial as both blueprints are dynamic, continuously evolving documents adapting to changing needs and insights.

2. Report about collaboration with the DSSC

During the project kick-off, DS4Skills and DS4SSCC established a Rulebook for Collaboration with the Data Spaces Support Centre (DSSC), outlining the structure, timelines, activities, and crucial deliverables pertaining to their joint efforts.

This collaboration involves formal engagements such as coordination meetings, workshops, document sharing, and coordinated external communication.

While the Rulebook for collaboration initially outlined only monthly meetings with the DSSC Relationship Manager, in practice, the Relationship Manager also actively engaged in DS4Skills' weekly *WP4 DSSC Collaboration* meetings and the monthly meetings of the DS4Skills consortium. Furthermore, the DSSC Relationship Manager actively advocated for DS4Skills ideas and content within DSSC.

Throughout this period, the DSSC provided several important documents, with the most pertinent ones including:

- Two consecutive versions of the Starter Kit for Data Space Designers.
- Multiple iterations of the DSSC glossary.
- Data Space Blueprint Snippets, followed by a draft version of the DSSC Blueprint in July 2023 and the "Blueprint 0.5 for public consultation" (DSSC BP draft) in September 2023.

Conversely, DS4Skills contributed valuable input to the DSSC's efforts by providing:

- Intake interview information and the Data Spaces Impact survey.
- Active participation in the work of the DSSC CoP and Thematic groups through presentations, discussions, and contributions to brainstorming workshops (using Mural).
- Feedback on the analysis of key documents and recommendations for improvement, including the Starter Kit, Glossary, and Blueprint.
- Insights into findings, needs, and requirements specific to the Skills data space, particularly emphasizing human-centricity and Personal Data Intermediaries.
- A comprehensive analysis of a list of standards and specifications for the Skills data space.
- A proposal for a unified approach to sector-specific platform inventories.

While *WP4 DSSC Collaboration* serves as the primary hub for collaboration, information exchange with the DSSC project holds relevance for other work packages. Consequently, close coordination with WP and task leaders across all DS4Skills activities was essential to seamlessly integrate their work into a comprehensive DS4Skills blueprint.

2.1. Coordination meetings

The table below provides a list of coordination meetings with the DSSC Relationship manager and the main results of each meeting. In addition to meetings provided in the table below, the DSSC Relationship Manager attended the majority of DS4Skill weekly *WP4 DSSC Collaboration* meetings.

Meeting date	Meeting title	Meeting summary and DS4Skills contribution
16 November 2022	DS4Skills/WP4: Coordination with DSSC	Agreement on establishment of a review process D4.1 Rulebook; alignment on future coordination/cooperation with DSSC.
8 December 2022	DS4Skills: New DSSC Relationship manager introduction	TNO introduced new contact
8 December 2022	"Human-centricity into data spaces", perspectives from MDG & DS4Skills & DSSC	MDG talked about what human-centricity might mean in the scope of data spaces and their architecture design.
8 December 2022	DS4Skills/WP4: Coordination with DSSC	An action: to prepare an overview of events/workshops etc. that may be organized with DSSC or disseminated through DSSC. DSSC to receive invites to internal project activities.
20 December 2022	DS4Skills: DSSC alignment monthly	Joint agreement to share the list of topics for upcoming monthly meetings; monthly alignment meeting between DS4Skills and DSSC.
25 January 2023	DS4Skills/WP4: DSSC alignment monthly	A request was made to get a procedure to provide DS4Skills specific contribution to the DSSC glossary.
22 February 2023	DS4Skills/WP4 and DSSC meeting	Discussion with DSSC Relationship Manager on business models.
9 May 2023	DS4Skills/WP4: DSSC alignment monthly	Reviewed the membership in DSSC's thematic groups; agreed on the process to provide DSSC' sector-specific blueprints; consensus made for partners to become members of 9 DSSC BB Expert groups
5 June 2023	Personal Data Intermediaries in the DSSC building blocks	VIS presented the materials prepared.
12 June 2023	Meeting with DSSC on Legal topics	DSSC provided input for legal building blocks.
28 June 2023	DS4Skills/WP4: DSSC alignment monthly	

25 August 2023	Alignment on the technical building blocks	Discussed how to draft a reference architecture for DS4Skills based on the technical building blocks identified. Although the DSSC did not have specific guidelines for this (yet), the DSSC pointed towards the parts of the DSSC blueprint (Data Spaces Protocol, dependencies sections of all DSSC building blocks) that could serve as inspiration.
28 August 2023	Discussion on reuse of insights from paper on "A Reference System Architecture with Data Sovereignty for Human-Centric Data Ecosystems" (Scheider, S., Lauf, F., Möller, F., & et al., 2023)	Via the Technical TG DS4Skills has been put in contact with Simon Scheider from Fraunhofer, author of the paper.
27 September 2023	DS4Skills/WP4: DSSC alignment monthly	Agreement on the partners Contribution to the DSSC's strategic plan for the future Data Spaces in Europe; DSSC relationship manager to be present at the DS4Skills workshop session at EBDVF, 25. 10. 2023; CCIS to review the DSSC Blueprint 5.0 - access being granted

Table 1: Meetings with DSSC

2.2. Workshops

Initially, DS4Skills representatives were intended to join the DSSC Community of Practice (CoP), a collective of individuals and organizations orchestrated by the DSSC to collaboratively develop and implement data space initiatives across various sectors. The CoP's primary objective is to create and utilize the blueprint and building blocks that constitute data spaces.

As of the beginning of 2023, responding to feedback from data space initiatives and their sector-specific requirements, the DSSC established several new working groups, beyond the original CoP.

These groups, in addition to the CoP, are dedicated to knowledge sharing, best practices dissemination, and the co-creation of new knowledge:

- The "Governance of Data Spaces" Thematic Group focuses on governance and legal challenges within Data Spaces.
- The "Business of Data Spaces" Thematic Group addresses business-related challenges in Data Spaces.

- The "Technology of Data Spaces" Thematic Group centres on technology and technical challenges in Data Spaces.

Furthermore, specific Expert Groups with permanent memberships were formed, with DS4Skills project members participating in:

- DSSC expert group on the Business of Data Spaces.
- DSSC expert group on governance.

Additionally, representatives of DE attended the DSSC Strategic Stakeholder Forum, where the DSSC invited coordinators of all sectorial data spaces preparatory actions.

Finally, DS4Skills representatives attended several events organized by the DSSC project.

2.2.1. CoP workshops

DS4Skills has attended monthly Community of Practice (CoP) workshops. Invitations to monthly DSSC CoP meetings were received 1 month in advance. Most CoP workshops revolved around the presentation of materials prepared by DSSC, including new snippets or the blueprint. From the outset, these workshops also included the collection of feedback and guidance for DSSC, often facilitated through group collaboration within the online platform.

The objective was to gain insights from DSSC and other data space initiatives across different sectors. Simultaneously, the aim was to present the work and receive constructive feedback. During the regular *WP4 DSSC Collaboration* meetings, the content and next actions of each CoP were presented, along with the identification of crucial information for *WP3 Blueprint development* and the assignment of additional dissemination responsibilities to *WP3 Blueprint development* partners. Certain CoP monthly meetings demanded more engagement and activities than dissemination through regular *WP4 DSSC Collaboration* meetings. These activities are documented in the table below.

Event date	Event summary and activities
18 January 2023	DCCS presented business models and governance.
22 February 2023	DSSC presented the inventory.
26 April 2023	Data Space Survey results presentation (ecosystem, development stage), introduction of thematic and expert groups and DSSC confluence platform presentation.
24 May 2023	Presentation of CoP initiatives and the creation of paper "Why data spaces".
28 June 2023	A new naming for the technical building blocks within the dataspace was introduced. New BB snippets announced, partners agreed during dissemination on the plan to review them. There was an open space in Governance Expert Group, VIS applied for it after dissemination.
19 July 2023	The presentation of ex-ante evaluation report findings.

Event date	Event summary and activities
23 August 2023	An opportunity to share (a summary of) blueprints in order get feedback from the DSSC experts was given and DS4Skills have agreed to send blueprint; partners agreed on the plan to review the <i>DSSC BP draft</i> .
4 October 2023	The process leading to Blueprint v.1.0 was outlined, the future of expert groups (revamped in October in November) was presented as well as the future priorities of DSSC. Feedback to DSSC a) <i>DSSC BP draft</i> should remain publicly available for a reference and b) each new blueprint version should contain what is the difference from previous version. Follow up with <i>WP3 Blueprint development</i> on referencing

Table 2: List of CoP workshops

2.2.2. Thematic groups

After the thematic groups (TG) were introduced in a CoP workshop, partners reached a consensus on the designated representative for each thematic group. The guiding principle was to ensure that there would be no thematic group meeting without DS4Skills active participation.

During weekly *WP4 DSSC Collaboration* meetings, DS4Skills covered the content and upcoming actions of each thematic group meeting. This included identifying crucial information for *WP3 Blueprint development* and assigning responsibility for further dissemination to *WP3 Blueprint development* partners. For specific meetings that required more involvement and activities beyond dissemination, the same principle as in CoP workshops was adhered. These activities are documented in tables below for reference.

2.2.2.1. Technology Thematic Group

The “Technology of Data Spaces” TG brings together experts, professionals and researchers interested in technology and technical challenges in Data Spaces with the main objective of sharing knowledge, sharing best practices, and identifying and co-creating new knowledge.

Most of the meetings adhered to the following structure: 1) DSSC presented the results from the previous event; 2) Data space initiatives shared their experiences and work; 3) Brainstorming sessions were conducted on various blueprint components; 4) Conclusions and next steps were outlined. The following table centres on DS4Skills' participation and the insights that were incorporated into *D3.2 DS4Skills Blueprint*.

Event date	Event summary and activities
4 May 2023	The work of DSSC was presented including main chapters for each BB, which helped <i>WP3 Blueprint development</i> defining the BB template.
25 May 2023	During the meeting, a collection of standards and technologies was presented, which subsequently inspired DS4Skills to compile a list of standards used by 99 skills initiatives. DS4Skills then shared this

Event date	Event summary and activities
	list with DSSC on 4 th of July. Furthermore, a brainstorming session on interoperability and federation BBs took place.
15 June 2023	The Energy data space shared their experiences and work. The insights were valuable in guiding DS4Skills for <i>D3.2 DS4Skills Blueprint</i> in making design choices for the reference architecture model, especially when incorporating elements from DSSC's blueprint, BB taxonomy, conceptual model. TNO and HAI prepared a document that was discussed on a separate <i>WP3 Blueprint development</i> meeting and used in <i>D3.2 DS4Skills Blueprint</i> . Additionally, DS4Skills actively took part in a brainstorming session related to data sovereignty and trust BBs.
6 July 2023	DS4Skills shared their experiences and work on technical building blocks. Furthermore, DS4Skills participated actively in a brainstorming session focused on data value creation BBs.
27 July 2023	DS4Skills played an active role in a brainstorming session centred on the conceptual model.
7 September 2023	The meeting included the presentation of the Glossary, followed by a brainstorming session. In addition, DS4Skills offered online feedback on the Glossary.
5 October 2023	DSSC Blueprint v0.5 final was presented. Feedback was provided to DSSC, suggesting that differences between versions should be documented, and that version <i>DSSC BP draft</i> should remain accessible to the public.

Table 3: List of DSSC Technology thematic groups meetings

2.2.2.2. Business Thematic Group

The “Business of Data Spaces” TG brings together experts, professionals and researchers interested in business challenges in Data Spaces with the main objective of sharing knowledge, sharing best practices and identifying and co-creating new knowledge.

The following table centres on DS4Skills' participation and the insights that were incorporated into *D3.2 DS4Skills Blueprint*.

Event date	Event summary and activities
9 May 2023	DS4Skills actively engaged in a brainstorming session focused on determining the topics that the Business Thematic Group (TG) should address. This included exploring participant expectations, identifying open questions related to business topics, and discerning the types of business questions that data space initiatives need to address.
6 June 2023	DS4Skills actively participated in a brainstorming session conducted through the online platform, which centred around the development of the first draft of business building blocks.

Event date	Event summary and activities
28 June 2023	A presentation was delivered by DS4Skills during the panel discussion, covering the participant business journey, along with the identified building blocks. The presentation facilitated the opportunity to participate in a business expert group.
1 September 2023	<i>DSSC BP draft</i> presented. This presentation introduced new business blocks and new definitions, which were subsequently incorporated into D3.2 DS4Skills Blueprint.
10 October 2023	0.5 final version presented. The main differences in description, omitted sub-classes and conceptual model for data space intermediaries. Data space intermediary BB is moved from governance to business area.

Table 4: List of DSSC Business thematic groups meetings

2.2.2.3. Governance Thematic Group

The “Governance of Data Spaces” TG brings together experts, professionals and researchers interested in governance and legal challenges in Data Spaces with the main objective of sharing knowledge, sharing best practices, and identifying and co-creating new knowledge.

The following table centres on DS4Skills' participation and the insights that were incorporated into *D3.2 DS4Skills Blueprint*.

Event date	Event summary and activities
8 May 2023	DS4Skills took part in an open-ended discussion addressing the governance challenges encountered by sectoral data spaces. The participants were divided into groups to identify the primary governance challenges.
19 June 2023	DS4Skills actively engaged in a brainstorming session conducted via the online platform, focusing on the creation of the initial drafts for Governance & Legal BB candidates. This led to a subsequent meeting on July 12 th when VIS presented the concept of a personal data intermediary and definitions of data space, data space ecosystem.
7 August 2023	DS4Skills actively participated in an online brainstorming session to identify governance challenges and elements based on various use cases.
11 September 2023	VIS presented the DS4Skills project with a specific focus on the Personal Data Intermediary (PDI).

Table 5: List of DSSC Governance thematic groups meetings Expert groups

2.2.2.4. DSSC Expert Group for Business of Data Spaces

The expert group comprises a select group of individuals primarily affiliated with the DSSC, specializing in business-related topics and the formulation of blueprint business building blocks. The presence of external members in this group is limited.

Ines Vlahović (CCIS) serves as the representative from DS4Skills within this expert group.

Within this expert group, the primary focus lies on the development of four key blueprint building blocks. Importantly, feedback from all Data Spaces is considered, and DS4Skills has made contributions, particularly in the areas of business models and the development of use cases.

The following table centres on DS4Skills' participation in business expert group.

Event date	Event title	Event summary
13 September 2023	DSSC Business Expert group	Tour de table; followed by the discussion on how to incorporate the feedback received by public consultation and discussion on few topics.
13 September 2023 forward	Commenting BB directly on confluence	The engagement was through inline comments on confluence, where commenting and modifications were happening each day. DS4Skills participated in reading and adding the comments.

Table 6: List of DSSC Business thematic groups meetings

Collaborating within the expert group has yielded significant advantages for DS4Skills. Notably, it provides early access to crucial information about changes and the direction of the Blueprint, which in turn assists in making informed decisions regarding the DS4Skills Blueprint.

Some key examples of valuable information shared with *WP3 Blueprint development* as a result of this collaboration include:

- DS4Skills gained insights that the DSSC is concentrating solely on the business model of the data space itself, rather than the business models of its individual participants.
- DS4Skills was informed that the *DSSC BP draft* version of the conceptual model will maintain its structure. This information allowed DS4Skills to align its efforts accordingly.
- DS4Skills received updates about the migration of Personal Data Intermediary (PDI) to the business building block (BB) category, along with the clarification that a data space intermediary is not a service but considered a service provider.
- The latest definition of a data product was shared, aiding in the distinction between data products and use cases.

2.2.2.5. DSSC Expert Group for Governance of Data Spaces

The expert group comprises a select group of individuals primarily affiliated with the DSSC, specializing in governance-related topics and the formulation of blueprint governance building blocks. The presence of external members in this group is limited.

Matthias De Bièvre (VIS) serves as the representative from DS4Skills within this expert group.

Within this expert group, the primary focus lies on the development of three key blueprint building blocks. Importantly, feedback from all Data Spaces is considered, and DS4Skills has made contributions, particularly in the areas of personal data sharing and personal data intermediaries.

DS4Skills mainly contributed its vision and proposals about the different levels of data space governance (data space level, data space use case level, data space participant level). DSSC was not addressing the data space use case level at first. Through DS4Skills input this level is now addressed in the DSSC Blueprint. The details and differences between the levels are detailed into the Chapter “Governance of the Data Space” in *D3.2 DS4Skills Blueprint*.

Main inputs from DS4Skills into DSSC:

- Inclusion of PDI to ensure human-centric governance of personal data.
- Inclusion of the data space use case level of governance to address specific needs of use cases.

2.2.3. Strategic Stakeholder Forum

Meeting date	Meeting title	Meeting summary
13 October 2022	DSSC Kick-off Meeting, Brussels	In person meeting, where project partners met for the first time and officially started to work on the project
5 December 2022	DSSC Strategic Stakeholder Forum	DIGITALEUROPE, associated partner of the DSSC is attending Strategic Stakeholders forums.
24 January 2023	DSSC Plenary meeting	DIGITALEUROPE, associated partner of the DSSC is attending Strategic Stakeholders forums.
18 April 2023	DSSC Strategic Stakeholder Forum (SSF) meeting	DIGITALEUROPE, associated partner of the DSSC is attending Strategic Stakeholders forums.
30 May 2023	Strategic Stakeholder Forum, Helsinki	Attending in person event. CCIS and TNO participated and were present at the workshop on the Position Paper.

Table 7: List of DSSC Strategic Stakeholder Forum meetings

As per March 2023 the DSSC Strategic Stakeholder Forum (SSF) consists of all full partners of the DSSC by default. As the SSF is open for the participation of more organisations, the project consortium decided that DE will participate at the regular meetings.

2.2.4. Events

DSSC and DS4Skills seized each opportunity to convene and engage in constructive dialogues throughout various events. These exchanges proved invaluable for knowledge sharing, aligning strategies, and identifying common challenges and solutions. Moreover, such meetings allowed both entities to foster a collaborative environment, paving the way for the seamless integration of DS4Skills' contributions into the DSSC framework. This collaborative approach underscores the commitment to creating a well-rounded and adaptable blueprint for data spaces, accommodating various domains.

Event date	Event title	Event summary and DS4Skills contribution
23 March 2023	DSSC - Data Spaces Symposium	DE, TNO, VIS, MDG, and HAI shared insights on mastering technical data space challenges, making data spaces fully operational, creating synergies across data spaces, and providing a skills data perspective.
30 May 2023	DSSC Blueprint first presentation, Helsinki	CCIS, TNO and VIS attended; the content is now available in the form of DSSC online blueprint; the materials from first presentation only available to DSSC.
31 May 2023	DS4Skills consortium in-person meeting, Helsinki	All partners participated on the mid-term meeting to discuss the overall project progress and agreed on key action points to complete the upcoming actions.
13 June 2023	DS4Skills in-person Advisory Board meeting	DS4Skills Advisory Board members and partners (DE, MDG, ADE, CCIS) participated in the discussion of the role of skills and education data in the European market.
26 June 2023	DSSC Insight Series Webinar: Governance for Data Spaces	CCIS attended the meeting. The Tourism CSA had a very interesting presentation, their rulebook, rolebook was incorporated in the WP3 <i>Blueprint development</i> governance.

Table 8: List of events related to collaboration with DSSC.

2.3. Exchange of documents

DSSC and DS4Skills established a productive exchange of documents, emphasizing the valuable process of sharing their ongoing work and providing constructive feedback. This collaboration allowed both entities to stay informed about each other's activities, fostering an environment of shared insights and mutual support. The exchange of documents served as a dynamic platform for enhancing the

alignment of their respective initiatives and enriching the overall development of data space concepts and frameworks.

Document date	Name/Topic	Activity Summary
19 December 2022	DSSC Starter kit	Preliminary draft version received beginning of December 2022
27 February 2023	Impact survey evaluation	DSSC requested DS4Skills to assess their Impact survey before it was more widely distributed. Feedback was provided.
6 March 2023	DSSC Glossary v0.9	Contribution to the content (CCIS, MDG)
16 March 2023	DSSC Starter kit	Feedback was provided.
31 March 2023	DSSC Survey	Partners filled out the survey
February/March 2023	DS4SSCC Online inventory software	Providing the online inventory software
March 2023	Starter Kit for Data Space Designers, Version 1.0	Document received and disseminated among partners
March 2023	DSSC Glossary v1 received	First version of essential data spaces related terms, where DS4Skills project partners provided several suggestions.
6 June 2023	Business Blocks: 4 technical snippets (Identity Management, Trust Framework and trust Anchors, Access and Usage Policy enforcement, Data space Protocols)	TNO analysed currently published snippets and shared findings. For non-technical snippets other partners had a review.
9 June 2023	Conceptual model of data spaces (both Level 1 and Level 2) and glossary feedback	VIS provided feedback, usage of the content in the <i>WP3 Blueprint development</i> was considered.
13 June 2023	Business blocks: 3 new Snippets (Marketplaces & Usage Accounting, Data, Services and Offerings descriptions, Publication & Discovery)	TNO, CCIS reviewed the snippets.
23 June 2023	DSSC Survey	CCIS provided additional input.
1 July 2023	Blueprint early draft (July snapshot) available	The document was distributed among <i>WP4 DSSC Collaboration</i> partners as a summer reading to provide feedback.

Document date	Name/Topic	Activity Summary
1 July 2023	Business blocks: 6 new Snippets (BUSINESS - Collaborative Business Models, Use Case Accelerator, Data Intermediary, Data Product definition / LEGAL - Regulatory Compliance, Contractual Framework)	Partners reviewed; content was used for alignment in <i>WP3 Blueprint development D3.2 DS4Skills Blueprint</i> .
4 July 2023	Standards and specifications	DS4Skills conveyed their standards and specifications landscape to DSSC Technical TG via email.
12 July 2023	Exchange of definitions topics	VIS shared with DSSC the definitions on PDI, Operator, data ecosystem, dataspace.
31 July 2023	Building Block taxonomy paper	Partners reviewed and sent comments to DSSC; content checked for usage in <i>WP3 Blueprint development</i> .
3 August 2023	DSSC Glossary v1	Partners provided feedback with focus on PDI, Operator, data ecosystem, dataspace.
5 September	<i>DSSC BP draft</i>	Partners reviewed the document, provided comments for the DSSC and gaps to DS4Skills WP4 D4.2.

Table 9: list of exchanged documents and other materials

2.4. Joint External Communication

DSSC and DS4Skills have actively engaged in a series of joint external communication activities to disseminate insights, findings, and knowledge related to data spaces. These collaborative efforts aim to enhance awareness and understanding of data space concepts while promoting their adoption across diverse sectors.

These joint communication initiatives reflect a commitment to furthering the data space vision and facilitating its integration into various domains.

Date	Channel	Communication and dissemination activity summary
28 October 2022	Brand Identity	Agreement on consolidated logo usage during the project lifecycle
06 January 2023	News article	Publication of the “DS4Skills and DSSC collaboration to improve Data Sharing” in the DS4Skills website
11 January 2023	Resources	Publication of the Data Spaces Support Centre in the DS4Skills website

17 January 2023	News article	Publication of the kick-off meeting in Brussels of the DSSC in the DS4Skills website
January - September 2023	Social media	Public dissemination of the DSSC “Insight series” workshops on DS4Skills social media accounts (LinkedIn and Twitter)
April - September 2023	Social media	Dissemination of the DSSC Glossary series on DS4Skills social media accounts (LinkedIn and Twitter). Sharing and explanation of 5 concepts from the DSSC Glossary.
06 April 2023	Video	Inclusion of the collaboration with the DSSC in the official DS4Skills video
04 May 2023	Newsletter	Promotion of the DSSC on the 1 st DS4Skills Newsletter
14 July 2023	Video	Inclusion of the collaboration with the DSSC and other data spaces in the DS4Skills interview video with work package leaders.
19 July 2023	Newsletter	Promotion of the DSSC on the 2 nd DS4Skills Newsletter

Table 10: Communication and dissemination activities coordinated with DSSC.

3. Alignments and refinements for the Skills Data Space. Analysis of previous work and key documents

This chapter provides a holistic view on the most relevant activities that are related to the analysis of the relevant previous work including analysing the DSSC materials crucial to DS4Skills.

Throughout the chapter, three major aspects and related activities are comprehensively and systematically explored. First, the examination and analysis of the DSSC starter kit. The analysis is focused on, but not limited to, aspects such as technology and functionality. Second, an overview is provided for the most relevant and previous work conducted in the realm of data space architectures and blueprints. This research encompasses an analysis of publications from Gaia-X, FIWARE, IDSA, BDVA, OpenDEI and SITRA. It also considers aspects discussed in *WP4 DSSC Collaboration*, such as the reference architecture, blueprint, standards, interoperability, governance, and business models. Third, an in-depth analysis of the *WP2 Inventory* results is carried out, which involves an examination of the inputs from 99 initiatives within the skills domain. These results encompass semantic standards, interoperability protocols, and existing platform APIs. Finally, the analysis of the *DSSC BP draft* has been carried out.

In the upcoming chapters, concise summaries of these analyses have been compiled. The detailed analysis is available in the Annexes section.

3.1. Starter kit analysis

3.1.1. Overview of analysis

The Data Spaces Support Centre provided the interim version of the Starter Kit for Data Space Designers in December 2022. The primary objective of the Starter kit is to facilitate the design, implementation, and deployment of data spaces. Although the design on the skills data space already started before the Starter kit had been provided, an analysis on the contents of the Starter kit has been done to further shape the blueprint for the skills data space.

The Starter kit has been analysed on the following aspects to identify the relevance:

- Highlights for DS4Skills: The relevance of this Starter kit to DS4Skills is explored and high-level recommendations are provided.
- Relation to specific DS4Skills work packages and tasks: A comprehensive list of relevant Work Packages (WPs) and Tasks within DS4Skills is provided, with a focus on what task leaders should be attentive to.
- Recommendations for the Next Version of the DSSC Starter Kit: Insights and suggestions for enhancing the starter kit are offered.
- Appendix on Resource Inventories: The appendix contains, for each main chapter, a list of relevant resources for the topic elaborated in that chapter. When analysing chapters, the corresponding appendix has been considered as well.

3.1.2. Takeaways from analysis

- At the time the Starter kit was analysed, it was still in an early stage, so only high-level recommendations and refinements have been provided for the DSSC.
- For WP3 Blueprint development, the sections ‘Data Spaces Start-up Checklist’, ‘Business: Value and Models’, ‘Functionality’ and ‘Blueprinting Process’ have been considered. The sections ‘Data Spaces Start-up Checklist’ and ‘Blueprinting Process’ were used to shape the approach for drafting the blueprint for the skills data space, the ‘Business: Value and Models’ and ‘Functionality’ were used as input for the specific parts of the blueprint itself.
- The Starter kit could have provided relevant input for WP2 Inventory. However, the Starter kit was published too late during the project to include its insights into the methodology. The impact of a backwards update of the methodology would have been too large, as it implied also major changes to other deliverables, such as the online inventory. That is why it was decided to not consider these insights.

3.2. Analysis of other organisations in data spaces

3.2.1. Overview of analysis

When guidance materials were not yet available from the DSSC, apart from the Starter kit, an analysis has been done on the work of other organisations active in data spaces to provide input for the definition of the blueprint for the skills data space.

The analysis focused on existing data space architectures and blueprints by other organisations. The main sources of information have been different organisations that are active in the data spaces domain, specifically Gaia-X, Future Internet Platform (FIWARE), The International Data Spaces Association (IDSA), Big Data Value Association (BDVA), Data Spaces Business Alliance (DSBA), OpenDEI and Sitra.

In the analysis, a categorisation reflecting the blueprint topics of *D3.2 DS4Skills Blueprint* is provided (Usage scenarios, Business model, Governance model, Technical aspects, UX, Growth and roll out, Human-centricity). This approach allowed easier integration of the results of the analysis in the skills data space blueprint being developed in *WP3 Blueprint development*. For each contribution the following assessment has been provided:

- DS4Skills blueprint topics that the initiative addresses (Usage scenarios, Business model, Governance model, Technical aspects, UX, Growth and roll out, Human-centricity).
- Relevance: Not relevant/somewhat relevant/highly relevant for the DS4Skills blueprint.
- Usage: If relevant, a short explanation on how to use the information in the DS4Skills blueprint development.

3.2.2. Takeaways from analysis

The analysis of the reference materials from other organisations active in data spaces revealed that on all topics of the blueprint the other organisations provide relevant insights. However, during the project lifetime different versions of the DSSC blueprint became available, which combined the inputs from the same organisations. Both the results of this analysis and the analysis of the DSSC blueprint served as input for the blueprint of the skills data space. Given the large amount of overlap among the materials coming for these two analyses, it is very difficult to distinguish what inputs are coming exclusively from the analysis of the inputs from these organisations and which ones may overlap with the analysis of the DSSC blueprint.

3.3. WP2 Inventory results analysis

3.3.1. Overview of analysis

The results of the *WP2 Inventory* were leveraged to conduct an analysis of the implications of these findings for the design of the skills data space blueprint. This analysis was carried out when limited materials were accessible from the DSSC. To ensure an adequate foundation for the blueprint, a comprehensive analysis of the *WP2 Inventory* results was deemed necessary.

The following details of the analysis are provided for each parameter of the desk research:

- The parameter (of the methodology of D2.1 Categorisation & assessment)
- The options that were provided for the parameter
- The type of multiple choice: single or multiple options
- An interpretation of the result
- The relevance of this result for the skills data space

3.3.2. Takeaways from analysis

The main takeaways from this analysis that are considered for the blueprint of the skills data space are:

- The significance of the individual and a human-centric approach for the skills data space is emphasized because:
 - The most common stakeholders in the existing initiatives have a strong focus on individuals.
 - The most common business models in the existing initiatives include a consumer component.
 - A high number of supported use cases in the existing initiatives are oriented towards individuals.
- Looking at the diversity of existing initiatives, the skills data spaces should serve multiple purposes:
 - Both connecting existing data sources and facilitating interoperability across established data spaces.
 - Enabling the sharing of different types of data, but with a specific focus enabling the proper sharing of data containing personal elements, including measures to appropriately manage personal data.
- Given the considerable number of existing initiatives in the deployment phase, the skills data space should prioritize enabling connections and integration with these existing initiatives. Since numerous initiatives are focused on semantic interoperability, it is essential for the skills data space to support multiple semantic standards and offer tools or mechanisms for mapping these standards.

3.4. DSSC Blueprint v0.5 for public consultation analysis

3.4.1. Overview of analysis

The Data Spaces Support Centre (DSSC) released the Data Spaces Blueprint v0.5 for public consultation (*DSSC BP draft*) to support such initiatives in the future. The Blueprint is created to become the first guide accompanying the reader through the challenging journey of creation and operation of a data space. The DSSC Blueprint v0.5 for public consultation has been the main source of input for the design of the blueprint for the skills data space. *DSSC BP draft* is a comprehensive and consistent set of guidelines aiming at supporting the development of data spaces. It includes a conceptual model of data space, data space building blocks and a recommended selection of standards, specifications and reference implementations identified in the data space standards and technological landscape. All these parts have been considered as relevant for the blueprint of the skills data space.

The analysis of the *DSSC BP draft* aimed at identifying the relevance of each part of the blueprint for the DS4Skills blueprint. A comprehensive gap analysis on what to include in *D3.2 DS4Skills Blueprint* is presented. Moreover, for each part feedback has been formulated to provide back to the DSSC. The following parts of the *DSSC BP draft* have been analysed:

- Building Blocks Taxonomy
- DSSC Conceptual Model
- DSSC Glossary
- Towards Federation of Data Spaces

The analysis focused on the most relevant and important Building blocks for the skills data space, such as the governance and technical pillars. For each pillar, a gap analysis on the Blueprint has been performed. In this gap analysis, information on what is missing, what are the concrete differences between both initiatives, what are points of information convergence and divergences, and what are DS4Skills recommendations for the DSSC and how to tackle these gaps have been presented.

3.4.2. Takeaways from analysis

The main takeaways from the analysis of the *DSSC BP draft* is that good alignment has been reached between the blueprint from the DSSC and the blueprint for the skills data space due to fruitful collaboration between DS4Skills and DSSC via the means as described in Chapter 0. It is evident that the *DSSC BP draft* provided relevant input for the blueprint of the skills data space and vice-versa, the DS4Skills consortium shaped the DSSC blueprint. Specifically good alignment has been reached on the Building Blocks Taxonomy, for example:

- by adopting the technical building blocks from the DSSC blueprint in the skills data space blueprint, including specifications of extensions of these building blocks based on the specific requirements coming from the skills context.

- by applying the business model radar from the governance pillars from the DSSC blueprint for the skills data space blueprint.

In general, the *DSSC BP draft* turned out to be a useful tool to shape the blueprint for the skills data space.

4. Conclusions

This report has presented a comprehensive analysis of the collaboration between DS4Skills and the Data Space Support Centre (DSSC). The primary objective was to align the blueprint for the data space for skills with the DSSC. This alignment focused on several key aspects of blueprint development, encompassing the design process, building blocks, toolboxes, standards, interoperability, and protocols.

The collaborative efforts and alignment yielded numerous mutually beneficial contributions between the two projects. For example, the DSSC made a strategic decision to offer more customized support for sectorial dataspace CSAs through Thematic Groups and Expert Groups. This decision proved to be highly beneficial as it facilitated the process significantly. The provision of structured blueprint "knowledge snippets" and a draft blueprint were particularly helpful. Another example of a linkage between the two projects was the analysis of the DS4Skills Inventory, which was instrumental in informing both *the Blueprint* and the DSSC about sector-specific issues such as human-centricity and sectorial standards and protocols. This analysis provided valuable insights that helped shape the direction of both projects.

Ultimately, a satisfactory level of alignment has been achieved between the DS4Skills blueprint and the draft generic blueprint provided by the DSSC. At the same time, it should be noted that challenges related to alignment and collaboration arose from the parallel nature of the two projects. Therefore, it is important to emphasise that this alignment work should continue beyond the conclusion of DS4Skills. Both blueprints are dynamic, evolving documents that will continue to develop and adapt over time. The DS4Skills blueprint will continue to evolve during the DS4Skills deployment stage, while the DSSC blueprint will evolve throughout the lifespan of the DSSC project by incorporating insights from other sectorial dataspaces and by evolving generic guidance and reference implementations.

5. Recommendations

This chapter addresses recommendations for the Data Space Support Centre (DSSC) and the future establishment of similar projects.

Community building. The DS4Skills consortium found that community building was highly effective, with the Community of Practice (CoP) serving as a platform for sharing experiences and knowledge exchange. Later, the establishment of thematic groups proved invaluable in concentrating the expertise of individuals in technical, governance, and business domains.

- This effective community-building approach, through the Community of Practice and dedicated working groups, should be applied to future dataspace deployment projects.

Relationship managers. Collaboration among project stakeholders proved highly successful, also attributed to the appointment of dedicated individuals from both sides to foster seamless cooperation between projects.

- *Based on this successful experience, the DS4Skills consortium recommends adopting the same personal, single point of contact, approach for deployment projects.*

Timing of projects. The timing of preparatory actions, encompassing the DSSC and deployment projects, could have been optimized. Ideally, the DSSC should have commenced its activities earlier to ensure the availability of a preliminary generic blueprint and operational procedures for the Community of Practice and Thematic groups.

- *The DS4Skills consortium recommends carefully plan the alignment with future dataspace deployment projects.*

Working versions of DSSC deliverables. A significant shortcoming was the absence of a well-defined process for maintaining working versions of DSSC documents, particularly the DSSC blueprint and knowledge snippets before their finalization. The DS4Skills consortium had to operate with working versions primarily due to the timing constraints. The most significant issue pertained to the blueprint version 0.5, which was released for public consultation (*DSSC BP draft*). Typically, such documents remain accessible online, even after the consultation period ends. Regrettably, the DSSC decided to remove the document from online access, leaving the DS4Skills consortium with no reference to the materials employed in their work. Additionally, there was no record of changes available, making it challenging to discern the differences between versions.

- *DS4Skills consortium recommends maintaining the practice of providing working document versions, accompanied by clear disclaimers acknowledging the potential for significant changes in the final versions. For the sake of transparency and consistency, it is advisable to keep these interim versions online, along with a comprehensive change log.*

Overall, the DS4Skills consortium's experience with the Data Space Support Centre (DSSC) has led to several key recommendations for future dataspace deployment projects. These include the importance of community building through platforms like the Community of Practice and thematic groups, the effectiveness of appointing dedicated relationship managers for seamless cooperation, and the need for careful planning of project timelines. The consortium also highlighted the necessity for maintaining working versions of DSSC documents online, with clear disclaimers and change logs, to ensure transparency and consistency. These recommendations aim to optimize the effectiveness and efficiency of future dataspace projects.

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7. Annexes

7.1. Starter kit analysis

7.1.1. Section: 2. Data Spaces Start-up Checklist

This Starter kit chapter introduces a Data Spaces Start-Up Checklist, aligning with the BLOFT (Business, Legal, Operational, Functional, and Technical) framework. This checklist serves as a concise summary of all essential areas to consider in the Starter Kit. It provides a comprehensive overview of topics without delving into detailed specifics for each one.

Relation to DS4Skills

The Starter Kit's checklist aligns with various DS4Skills objectives and tasks, allowing for potential synergy and integration. It addresses topics that correspond to the project's methodology, data collection (survey, interviews), and the blueprint for the skills dataspace. This alignment facilitates the integration of checklist elements into project activities, enhancing overall project coherence and effectiveness.

In connection with specific DS4Skills tasks, the relationship with this chapter of the Starter Kit is as follows:

- **WP2 Inventory:** The checklist could have been used as a starting point for methodology in D2.1 Categorisation & assessment but it was only released after the delivery of D2.1 Categorisation & assessment. Although D2.1 Categorisation & assessment has been slightly updated based on the 6-month review, the methodology has not been changed according to this checklist, as the backwards impact would have been too large. The online inventory implementation is also based on D2.1 Categorisation & assessment, so this would imply major changes in multiple deliverables.
- **WP3 Blueprint development:** The alignment of topics in the checklist and the interviews could have been more seamless if the Starter Kit had been published earlier. Nonetheless, there is a degree of overlap in the topics addressed, showing that some key areas of consideration have been adequately covered.

7.1.2. Section: 3. Business: Value and Models

Data spaces can be considered multi-sided business models able to establish network effects between data “supply” and “demand”. Proper functioning of multi-sided business models is more an organisational than a technical challenge, as it requires efforts to achieve adoption by multiple users and organisations to create substantial value.

In the design approach proposed, business and governance models involve multiple choices that must be made in coherence by multiple organisations. For this reason,

business and governance modelling should be approached as a co-design process to develop a preparatory framework of business and governance models to assist in identifying improvement suggestions or critical assumptions. These should then be tested through explorative or validation experiments to be incorporated into the overarching design until the evaluation yields satisfactory results to commit to implementation.

DSSC introduces Business model radar as a tool that show how collaborative business models, create value through interactions among multiple organizations.

Data and organisational governance for data spaces: In the data spaces context, data governance cannot be separated from the governance of organisations and individuals. Starting from the Abrahams analysis, the following two approaches have proven helpful in the design of data spaces governance: (1) The data-sharing “use case blueprint” (Data Sharing Coalition), and (2) The templates for data space governance agreements from the Rulebook for a fair data economy (Sitra).

The Starter kit references two key documents on this topic: the SITRA Rulebook for a fair data economy (SITRA, 2022) (referenced as “SITRA Rulebook” in this chapter) and the IDSA Position Paper: New Business Models for Data Spaces Grounded in Data Sovereignty (IDSA, 2021a) (referenced as “IDSA Position Paper” in this chapter).

While the SITRA Rulebook focuses on the data economy in general, the IDSA Position Paper focuses on data spaces compliant with the IDSA Reference Architecture Model. The IDSA Position Paper draws the approach from the BMC (Business Model Canvas) provided in the SITRA Rulebook. In essence, both documents are well aligned.

Relation to DS4Skills

This chapter underscores several crucial insights relevant to DS4Skills. Firstly, data spaces inherently embody the requirements of multi-sided business models, emphasising the intricate network of stakeholders that participate in them. Secondly, the development of effective business and governance models is a complex endeavour that requires numerous strategic choices in a coherent manner, involving multiple organisations working in concert. Notably, the Starter Kit identifies the Base/X approach as a fundamental framework for both business engineering and the construction of data-driven business models. Lastly, it emphasises the inseparable connection between data governance and the broader governance of the organisations and individuals engaged within the data space ecosystem. This holistic perspective provides valuable guidance and alignment for the DS4Skills project within the evolving landscape of data spaces.

In connection with specific DS4Skills tasks, the relationship with this chapter of the Starter Kit is as follows:

- **WP2 Inventory:** The content of this chapter (for example the different business models) could have been used as options for the establishment of specific parameters in the methodology. However, the checklist was only released after the delivery of D2.1 Categorisation & assessment. Although D2.1 Categorisation & assessment has been slightly updated based on the 6-

month review, these options have not been included, as they would also imply backwards changes in data collection and the online inventory. The online inventory implementation is also based on D2.1 Categorisation & assessment, so this would imply major changes in multiple deliverables.

- **WP3 Blueprint development:** Interviews were conducted to explore the business and governance models of the skills initiatives identified. The purpose was to assess whether other business models could provide valuable insights. This process resulted in the identification of relevant business cases that contributed to the blueprint's development.
- **WP4 DSSC Collaboration:** The proposed business model approach will undergo internal alignment with *WP3 Blueprint* development, and DS4Skills will ensure alignment through its engagement with relevant DSSC expert groups.

7.1.3. Section: 4. Legal Landscape and Governance Models

This Starter kit chapter delves into the legal aspects surrounding the establishment and operation of data spaces, encompassing vital elements such as data protection, competition law, contract law, and intellectual property rights. It also explores various areas that necessitate consideration within data transactions and facilitating infrastructure, outlines tools for organisational enforcement and oversight, and provides insights into data governance roles and responsibilities.

Within the governance realm, this chapter underscores the significance of specific building blocks, including business agreements governing data sharing terms and conditions, operational agreements enforcing policies during data space operation (e.g., GDPR compliance), and organisational agreements defining governance bodies responsible for specifying compliance requirements for technology building blocks and adopting pertinent business and operational agreements.

Relation to DS4Skills

In the context of the DS4Skills project, the Starter Kit plays a pivotal role in addressing crucial considerations related to data protection. This is of vital importance as skills data belongs to real individuals. Several key areas take precedence, including substantive rights and obligations pertaining to data, data contracts, organisational dimensions encompassing business, operational, and organisational agreements, the critical aspect of techno-legal interoperability, and the overarching regulatory landscape.

Within this framework, specific building blocks emerge as particularly significant. Business agreements come to the forefront, determining the terms and conditions governing data sharing among participants and establishing the legal framework supporting contracts within the data space. Operational agreements assume a vital role in enforcing policies during data space operations, ensuring compliance with regulations such as GDPR or PSD2 in the finance sector, and fostering the adoption of cybersecurity practices. These Starter Kit topics contribute to a legal and governance foundation that should align with the DS4Skills project objectives.

In connection with specific DS4Skills tasks, the relationship with this chapter of the Starter Kit is as follows:

- **WP2 Inventory:** The legal aspects of all existing initiatives could have been assessed in the market scan using the Starter Kit Guidelines. However, these guidelines were only released after the delivery of D2.1 Categorisation & assessment. Although D2.1 Categorisation & assessment has been slightly updated based on the 6-month review, these options have not been included, as they would also imply backwards changes in data collection and the online inventory.
- **WP3 Blueprint development:** The DS4Skills blueprint should include legal considerations into the framework.
- **WP4 DSSC Collaboration:** will incorporate information pertaining to legal aspects sourced from the DSSC, ensuring that legal insights are integrated seamlessly into the project.

7.1.4. Section: 5. Functionality

Within the Functionality chapter of the Starter Kit, the fundamental principles of data spaces are elucidated. A data space serves as a distributed system that facilitates connections between data providers and consumers, with the option to leverage various third-party services. Establishing a new data space entails the consideration of essential building blocks, categorised into two types:

1. Governance building blocks, which offer templates and best practices for implementing business, operational, and organizational agreements.
2. Technical building blocks, which provide the technological foundation for ensuring interoperability, trust, and data value generation.

These "soft" intangible data infrastructures play a critical role in establishing the necessary trust framework for data space instances through standardised requirements or agreements.

Relation to DS4Skills

Efficient and interoperable data exchange assumes paramount importance, as data spaces are designed to transcend siloed organisational boundaries. Participants in data spaces often operate simultaneously across multiple spaces, necessitating identity management and robust data access and usage control mechanisms. Technical means must be provided to create trust among data space participants and enable user-controlled consent for data sharing. Moreover, data spaces should empower participants to derive value from their data-sharing endeavours. The achievement of these objectives is based on the adoption of interoperable mechanisms that facilitate the definition of terms and conditions, data service offerings, and the complete lifecycle of contracts.

In connection with specific DS4Skills tasks, the relationship with this chapter of the Starter Kit is as follows:

- **WP2 Inventory:** During the formulation of the methodology for assessing existing platforms and services, the incorporation of considerations related to key governance and technical building blocks for data spaces can enhance the comprehensiveness of the assessment.
- **WP3 Blueprint development:** Ensuring that key principles such as data space interoperability, user control, and value creation are integrated into the blueprint design. Identifying any potential missing common features for data spaces derived from the stakeholders' needs analysis.
- **WP4 DSSC Collaboration:** Reinforcing and consolidating the architectural model of core data space building blocks from a user-centric and use-case-based perspective. Contributing to the broader DSSC guidelines and best practices catalogue, particularly in the realm of standards and technical tools.

7.1.5. Section: 6. Technology

The chapter on "Technology" in the Starter Kit underscores the agnostic nature of data spaces functionality implementation, but it also emphasises that data spaces designers should be aware of available building blocks implementations. While the DSSC itself does not develop components, it plays a pivotal role in providing a comprehensive landscape of various contributions, including formal standard specifications, de-facto standard specifications, and open-source software projects and repositories.

The DSSC's objective is to create versions of the building blocks and propose "releases" of compatible technology stacks, acknowledging the evolving nature of business requirements and technology.

Interoperability assumes a critical technical aspect, as data spaces must establish a robust framework for efficient data exchange among participants, enabling the seamless decoupling of data providers and consumers while adhering to the FAIR principles (Findable, Accessible, Interoperable, and Reusable). Achieving interoperability involves adopting a common language through interoperable APIs for data exchange and the definition of compatible data models.

Mechanisms for traceability of data exchange transactions and data provenance are also essential components, although candidate standards, specifications, and implementations are currently still being compiled.

Relation to DS4Skills

In contrast to other sections, the "Technology" chapter in the Starter Kit is relatively concise and lacks specific pointers towards recommended architectures or specifications. It does not provide examples of initial implementations tailored to DS4Skills. For the DS4Skills project, it is imperative to maintain a focus on technical recommendations that are agnostic to implementation and prioritise the adoption of standards and reference architectures.

In connection with specific DS4Skills tasks, the relationship with this chapter of the Starter Kit is as follows:

- **WP2 Inventory:** Ensuring the identification of the standards utilized by the initiatives.
- **WP3 Blueprint development:** In the context of interviews, it is essential to collect information regarding the standards employed, open-source components, and technical architectures. When preparing the blueprint, it's important to ensure that it serves as a reference for key standards, open-source components, and technical architectures relevant to skills data sharing. The blueprint's implementation should maintain a technology-agnostic approach while specifying domain-specific standards, open-source components, and technical architectures. This chapter of the starter kit also points towards reference implementations and examples as valuable resources.

7.1.6. Section: 7. Blueprinting Process

The "Blueprinting process" involves a structured sequence of steps, starting with the identification of domain-specific business objectives and a thorough discussion of domain-specific requirements. It also entails the collection of existing initiatives to inform the blueprint, which consists of detailed specifications and standards for building blocks, drawing from existing best practices.

This process results in the creation of a Toolbox, which includes sample implementations, templates, instructions, and training materials. A governance process is also established to ensure transparency and consensus in decision-making, prevent lock-ins, and avoid proprietary standards.

Relation to DS4Skills

In the context of DS4Skills, the blueprinting process should be employed to identify skills-specific business objectives. Furthermore, it is crucial to engage in discussions with the DSSC concerning skills-specific requirements and building blocks. Additionally, contributing to the inventory of existing initiatives, standards, and specifications is of significant importance.

In connection with specific DS4Skills tasks, the relationship with this chapter of the Starter Kit is as follows:

- **WP3 Blueprint development:** the proposed process was followed when designing the DS4Skills blueprint. All Key aspects of a data space blueprint need to be considered: technical, business and governance.

7.1.7. Section: 8. DSSC – Supports

The DSSC offers support to dataspace initiatives, that will be aligned with its heartbeat and release cycle. It provides support to data space initiatives at various stages of maturity. This support framework encourages the exchange of knowledge and experiences among data spaces.

Key elements of support include a team of experts, a support platform, a Community of Practice (CoP), and alignment with the Network of Stakeholders. These resources facilitate access to expertise, co-creation opportunities, and engagement with a broad spectrum of stakeholders.

Relation to DS4Skills

DS4Skills benefits from access to experts, resources, and the Network of Stakeholders, providing an opportunity to actively contribute to the co-creation of blueprints and assets.

In connection with specific DS4Skills tasks, the relationship with this chapter of the Starter Kit is as follows:

- **WP3 Blueprint development:** the blueprinting process for a skills dataspace benefited from the support of expertise provided by the DSSC. There was a continuous need for close collaboration between different DS4Skills activities and the DSSC.
- **WP4 DSSC Collaboration:** This WP should follow closely the services provided by the DSSC and be proactive through participation in the CoP and other proposed activities.

7.1.8. Feedback for DSSC

In addition to the applicability of the Starter Kit to DS4Skills, project partners provided the following feedback for the DSSC to advise on needs and future developments of the Starter Kit.

7.1.8.1. Chapter: 2 Data Spaces Start-up Checklist

In the context of various preparatory initiatives for data spaces, one of their key objectives is to evaluate the progress and development status of their respective sector-specific data spaces. This evaluation will be carried out through a combination of desk research, surveys, and interviews.

DS4Skills consortium would advise the DSSC to consider expanding and enhancing the Data Spaces Start-up Checklist to facilitate those activities of preparatory actions, especially to provide them with the methodology for:

- creation of inventories of existing initiatives by using common parameters for their categorization and assessment
- in depth analysis of sectorial data space initiatives through interviews and other activities to gather domain specific requirements

The recommendation is to include sample responses to the checklist questions to offer context and inspire data space designers. This practice is currently partially implemented for the Technology section in the existing version of the checklist.

7.1.8.2. Chapter: 3 Business: Value and Models

The initial analysis performed in DS4Skills has shown that the Skills Data space will be focused on a user-centric approach. For example, matching of labour market demand and supply is one of the prominent usage scenarios in this data space domain. For this reason, it could be interesting if the next version of the Starter kit could elaborate typical win-win schemes of B2G2C that show clear advantages and added value for each stakeholder involved. The “C” in this case refers to “Citizens” (and employees) instead of “Customers”.

7.1.8.3. Chapter: 4 Legal Landscape and Governance Models

More specific information on the legal aspects of data spaces, along with references to pertinent sources, would be highly appreciated.

7.1.8.4. Chapter: 5 Functionality

Some of the general concepts behind the general architectural design of Data Spaces could be quite abstract and difficult to follow, particularly for less technical-versed audiences. It is worth considering the development of supplementary or alternative materials that can cater to a diverse range of audiences.

The functionality section would also benefit from more visual resources and supporting textual explanations, along other graphical representations of the key architectural components and their interaction.

7.1.8.5. Chapter: 6 Technology

Despite the DSSC's technology-agnostic approach, there is a suggestion to include specific references to specifications, architectures, and other resources related to data space design and implementation, such as Gaia-X, IDSA, and iShare.

In addition to the list of specifications and reference implementations proposed above, it would be interesting to provide an analysis of gaps, overlaps, and complementarities between all those solutions.

7.1.8.6. Chapter: 7 Blueprinting Process

It would be important to mention testing and validation efforts when creating new data spaces and include all stakeholders in the validation process. Although the validation process might differ between domains, at least the main minimal steps could be defined.

7.2. Analysis of other organisations in data spaces

Analysis of Gaia-X, “A federated and secure data infrastructure, [that] strives for innovation through digital sovereignty (Gaia-x, 2023).”

Blueprint topic	Relevance	Usage
Usage scenarios	Highly Relevant	Skills domain paper (Position-paper Education & Skills, (French Gaia-X Hub, 2021)) and Use Cases ¹ .
Governance model	Somewhat Relevant	Gaia-X Policy Rules (Gaia-X, 2022a): “define high level objectives safeguarding the added value and principles of the Gaia-X ecosystem”
Technical aspects	Highly Relevant	List of Gaia-X specifications ² , particularly about: Gaia-X Architecture Document (Gaia-X, 2022b): Set of description models and operating rules for decentralised cross-dataspace interoperability, Trust Framework (Gaia-X, 2022c), Data Exchange (Gaia-X, 2022d), Identity and Access Management (Gaia-X, 2022e), Cleaning Houses.
Growth and roll out	Somewhat Relevant	Gaia-X Hubs ³ among other objectives, connect and streamline existing initiatives. Clearing House: GXDCH - nodes of verification of the Gaia-X rules. It is the place to go to achieve Gaia-X compliance and become part of the Gaia-X ecosystem.

Table 11: Overview of relevant assets from Gaia-X

Analysis of Future Internet Platform (FIWARE), “A curated framework of Open Source Platform components to accelerate the development of Smart Solutions⁴”.

¹ <https://gaia-x.eu/use-cases/>

² <https://gaia-x.eu/mediatech/publications/>

³ <https://gaia-x.eu/who-we-are/hubs/>

⁴ <https://www.fiware.org/about-us/>

Blueprint topic	Relevance	Usage
Usage scenarios	Somewhat relevant	I4Trust Data Space Experiments ⁵ : Use cases for digital twin data spaces. So far in the following sectors: Smart Agrifood, Smart Cities, Smart Energy, Smart Ports, Smart Logistics, and Smart Environment.
Technical aspects	Highly relevant	Fiware for Digital Twins (FIWARE, 2021a) describes how smart applications from multiple domains can be developed based on the Digital Twin paradigm and using FIWARE software building blocks. The NGSI-LD API is proposed as an open standard API for getting access to digital twin data. Fiware for dataspaces (FIWARE, 2021b): This white paper brings a perspective on how data spaces enabling trusted and effective exchange of digital twin data between smart applications can be achieved. Furthermore, it brings the perspective on how FIWARE and IDS Reference Models can be reconciled contributing to accelerate the materialisation of Gaia-X. Smart Data Models (SDMs)⁶: Smart Data Models is a collaborative program to provide data models for digital twins and data spaces. The SDMs are free and open-licensed, multisector, based on real use cases adopting open standards, collaborative, at market speed, customisable to local needs, and compatible with linked data.

Table 12: Overview of relevant assets from FIWARE

Analysis of International Data Spaces Association (IDSA), “A secure, sovereign system of data sharing in which all participants can realize the full value of their data (International Data Spaces Association, 2023)”.

⁵ <https://i4trust.org/>

⁶ <https://smartdatamodels.org/>

Blueprint topic	Relevance	Usage
Usage scenarios	Highly relevant	Data Space Radar ⁷ displays the current and developing data space initiatives, as long as their maturity level. IDSA Data Connector Report (IDSA, 2022) describes reference use cases that can be generalised to other domains.
Business model	Highly Relevant	IDSA Position Paper: New Business Models for Data Spaces Grounded in Data Sovereignty (IDSA, 2021a) focuses on data spaces compliant with the IDSA Reference Architecture Model. The IDSA Position Paper draws its approach from the BMC provided in the SITRA Rulebook. In essence, both documents are well aligned. However, it elaborates only on some key aspects of the BMC : namely, the roles (stakeholders) and their value proposition for potential customers.
Technical aspects	Highly Relevant	IDSA Data Connector Report (IDSA, 2022): about the list of existing IDS connectors and other fundamental technologies for data spaces. IDS-RAM_4_0 ⁸ Reference Architecture Model. IDSA Position Paper - Usage Control in the IDS (IDSA, 2021b): This paper focuses on data usage control and data provenance, which are conceptual and technological solutions to cope with data sovereignty challenges. It presents three approaches researched by Fraunhofer: (1) The MDG control technologies, (2) the logic-based usage control (LUCON) and (3) Degree.
Growth and Roll out	Highly Relevant	IDSA Data Connector Report (IDSA, 2022) provides insights into current development and usage status of Data Connectors. Minimum Viable Data Space (MVDS) ⁹ is a combination of components to initiate a data space with just enough features to be usable for secure and sovereign data exchange, as specified by IDSA.

⁷ <https://internationaldataspaces.org/adopt/data-space-radar/>

⁸ https://github.com/International-Data-Spaces-Association/IDS-RAM_4_0

⁹ <https://docs.internationaldataspaces.org/knowledge-base/mvds>

Table 13: Overview of relevant assets from IDSA

Analysis of IDSA Rulebook V2: Specifically, the IDSA Rulebook V2 offers a lot of guidelines that could be applied for the data space for skills. This document centrally features a functional analysis of both the creation of a data space and the data space authority, including participant requirements and obligations. The comprehensive outline guides data space creation, while governance views on data spaces rights and obligations, including data space instances, complement this guidance. (IDSA, IDSA Rulebook, 2023a)

Blueprint topic	Relevance	Usage
Business model	Somewhat relevant	The document provides insights just in terms of “business constraints”: a data space must be compliant with IDS, follow the European values, ensure legal interoperability, and create consensual agreements.
Governance models	Somewhat relevant	The rulebook provides an overview of the regulatory framework and highlights legal requirements for compliance. It also discusses EU regulations such as the Data Governance Act (DGA), the Data Act Proposal (DA-E), the Digital Services Act (DSA) and the AI Act. Particularly important for this topic is the description of “Layers of data space governance” (“Guidelines” paragraph). The document also provides an overview of the actors involved, and their levels of responsibility in the construction, control, and operations of a data space, and in the management of data.
Growth and Roll out	Highly Relevant	Best practices in Data Space management are provided, particularly in the paragraph “Organizational Agreements” which include trust, functional requirements, and IDS Certification.

Table 14: Overview of relevant topics from IDSA Rulebook V2

Analysis of Big Data Value Association, “An industry-driven organisation with a mission to develop an innovation ecosystem that enables the data-driven digital transformation of the economy and society in Europe¹⁰.”

¹⁰ <https://www.bdva.eu/about>

Blueprint topic	Relevance	Usage
Usage scenarios	Highly relevant	i-Spaces may hold embedded Business Acceleration programs and Skills Developments to fasten new services entry onto the market.
Business model	Somewhat relevant	Towards a European-governed data sharing space (BDVA, 2020), Annex 1. Identified Challenges – Business and Organisational Challenges. i- may hold embedded Business Acceleration programs and Skills Developments to fasten new services entry onto the market.
Governance model	Somewhat relevant	Towards a European-governed data sharing space, Annex 1. Identified Challenges – Business and Organisational Challenges (BDVA, 2020). KRAKEN: A Secure, Trusted, Regulatory-Compliant, and Privacy-Preserving Data Sharing Platform (Gabrielli, S. & et al., 2022).
Technical aspects	Highly relevant	Towards a European-governed data sharing space, Annex 1. Identified Challenges – Business and Organisational Challenges: Infrastructure/Technologies of i-Space containing criteria to computing power/storage capacity, access methods as well as tools, policies, standards & certificates (BDVA, 2020). Technological Perspective of Data Governance in Data Space Ecosystems (Torre-Bastida, A.I., Gil, G., Miñón, R., & Díaz-de-A, 2022).
Growth and roll out	Highly relevant	Towards a European-governed data sharing space, Annex 1. Identified Challenges – Business and Organisational Challenges: Infrastructure/Technologies of i-Space containing criteria to computing power/Storage capacity, access methods as well as tools, policies, standards and certificates (BDVA, 2020). Data Spaces: Design, Deployment, and Future Directions, Part II Deployment (Curry, E., Scerri, S., & Tuikka, T., 2022). An Organisational Maturity Model for Data Spaces: A Data Sharing Wheel Approach, (Curry, E. & Tuikka, T., 2022).
Human centrality	Somewhat relevant	Data Spaces: Design, Deployment, and Future Directions, Page 5 Personal Data Spaces (Curry, E., Scerri, S., & Tuikka, T., 2022).

Table 15: Overview of relevant assets from BDVA

Analysis of Data Spaces Business Alliance, which “Accelerates business transformation in the data economy (DSBA, 2023).”

Blueprint topic	Relevance	Usage
Usage scenarios	Somewhat relevant	Use cases from other domains.
Technical aspects	Highly relevant	Technical Convergence Discussion Document ¹¹ is an agile paper that defines a common reference technology framework for creating data spaces. This framework is based on the technical convergence of existing architectures and models for data spaces defined by members of the Data Spaces Business Alliance.
Growth and roll out	Somewhat relevant	Cloud and edge service providers (IaaS, platform and app/data service providers)

Table 16: DSBA - overview of relevant assets

Analysis of OpenDEI, which is “Aligning Reference Architectures, Open Platforms and Large-Scale Pilots in Digitising European Industry (OpenDEI, 2023)¹².”

Blueprint topic	Relevance	Usage
Usage scenarios	Somewhat relevant	IDSA Building Blocks Catalog ¹³ , general use cases. Design Principles for Data Spaces Position Paper, Sector Specific data spaces. Sector Specific data spaces (Nagel & Lycklama, 2021)
Business model	Highly relevant	IDSA Building Blocks Catalog, Data Value Building Blocks. Design Principles for Data Spaces Position Paper, Data space Governance and Business Models (Nagel & Lycklama, 2021).
Governance model	Highly relevant	IDSA Building Blocks Catalog, Governance Building Blocks. Design Principles for Data Spaces Position Paper, Data space Governance and Business Models. Data space Governance and Business Models (Nagel & Lycklama, 2021)

¹¹ The ‘Technical Convergence Discussion Document’ is an agile paper that is continuously updated. The current version is available at <https://data-spaces-business-alliance.eu/dsba-releases-technical-convergence-discussion-document/>.

¹² <https://www.opendei.eu/>

¹³ <https://github.com/International-Data-Spaces-Association/Building-Blocks-Catalog>

Blueprint topic	Relevance	Usage
Technical aspects	Highly relevant	IDSA Building Blocks Catalog contains 12 technical building blocks according to the openDEI architecture: ○ Interoperability ○ Data sovereignty and Trust ○ Data value
Growth and roll out	Highly relevant	IDSA Building Blocks Catalog contains one operational building block.

Table 17: Overview of relevant assets from OpenDEI

Analysis of Sitra Fair Data Economy Rulebook: “The rulebook offers instructions and templates to facilitate data network building (SITRA, 2022).”

Blueprint topic	Relevance	Usage
Business model	Highly relevant	It provides pathways to draw business value from data networks and sharing frameworks. The Ecosystem Canvas and the Business and Operations Checklist are very good tools to approach business modelling for data spaces.
Governance model	Highly relevant	The ethical section provides a deep overview of the legal aspects involved in the creation of a data network. Also, the technical and security perspective provides additional information on privacy issues related to the different technological layers.
Growth and roll out		Both section 1 and section 2 provide overviews and templates to rule out the operational aspects of a data network. The improvement procedures are mainly explained from an ethical perspective but are mostly missing the technology side.
Human centricity		The rulebook enlists human-centricity as one of the main pillars in a data network architecture. It provides templates and checklist to ensure this aspect is considered while building data network guidelines and architectures.

Table 18: Overview of relevant assets from SITRA

7.3. WP2 Inventory results analysis

7.3.1. Analysis of parameters with multiple options

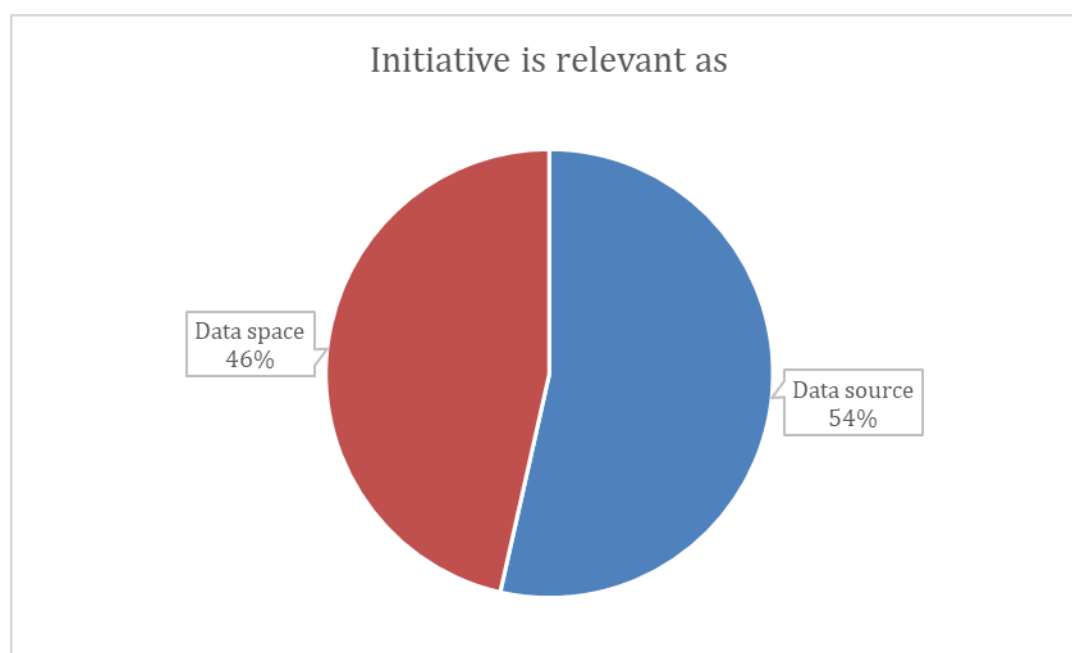


Figure 2: WP2 Inventory results on data space vs data source

Parameter	Categorisation of initiatives as 'data space' or 'data source' (or 'data app')
Multiple choice options	○ Data space ○ Data source / Data app
Type of multiple choice	Single choice
Interpretation of results	The distribution of data sources and data spaces within the initiatives is fairly balanced.
Relevance for DS4Skills	The skills data space should serve the dual purpose of connecting existing data sources and facilitating interoperability across established data spaces.

Table 19: Analysis of parameter 'data space' or 'data source'

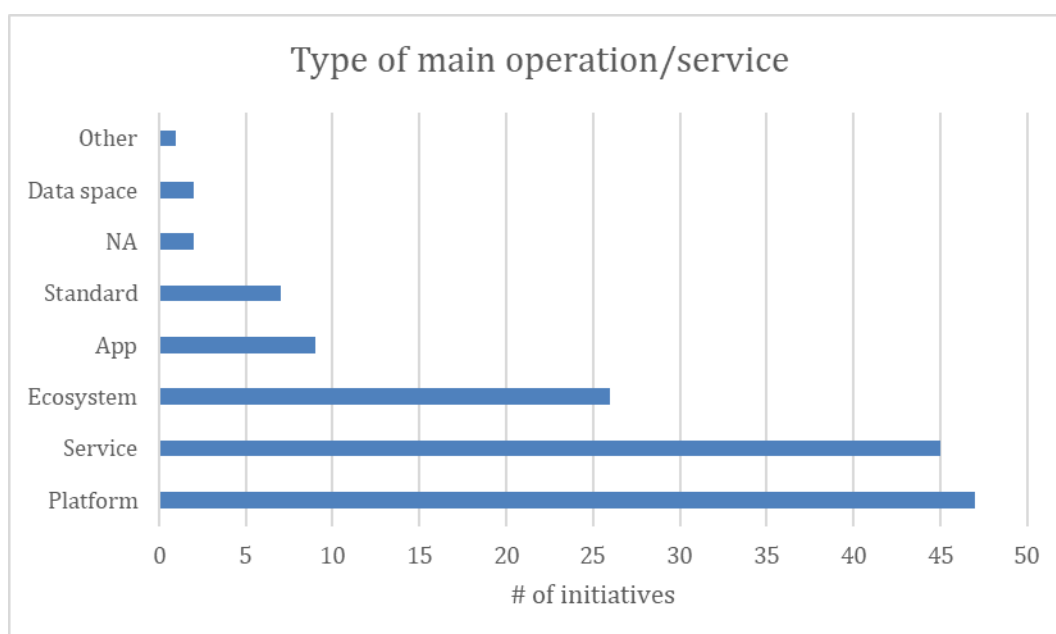


Figure 3: WP2 Inventory results on Type of main operation/service

Parameter		Type of main operation / service
Multiple options	choice	○ Platform ○ Ecosystem ○ App ○ Service ○ Data space ○ Standard ○ Other
Type of multiple choice		Multiple options
Interpretation of results		The initiatives primarily fall into the categories of platforms and services, followed by ecosystems. Apps, standards, and data spaces are also represented to a lesser extent.
Relevance for DS4Skills		The diverse range of initiatives centred around skills underscores the interactive and multifaceted nature of the skills domain. The prevalence of platforms and services highlights the need for the skills data space to facilitate the provision of data from various sources to support these interactive platforms effectively.

Table 20: Analysis on parameter Type of main operation/service

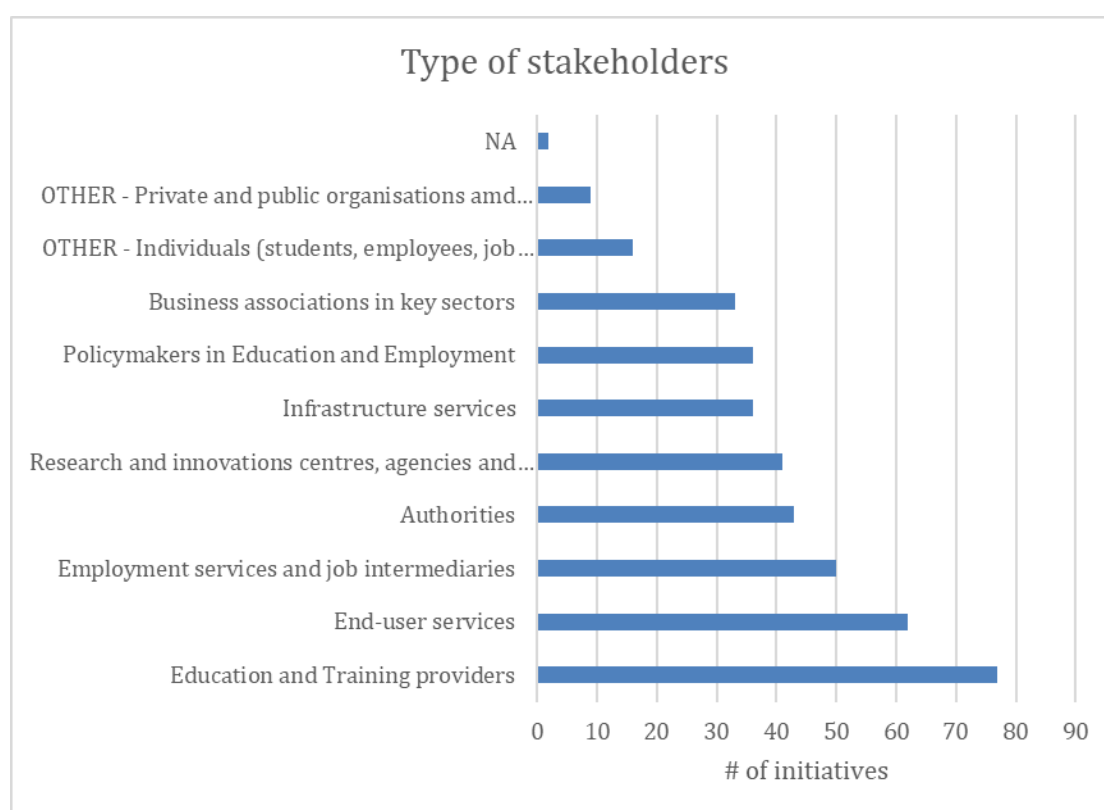


Figure 4: WP2 Inventory results on Type of stakeholder

Parameter	Type of stakeholders
Multiple choice options	○ Business associations in key sectors ○ Education and Training providers ○ Research and innovations centres, agencies and networks ○ Employment services and job intermediaries ○ End-user services: ICT, technology, analytics and data providers, solutions, operators and platform ○ Infrastructure services: ICT, technology, analytics and data providers, solutions, operators and platform ○ Authorities ○ Policymakers in Education and Employment ○ Other
Type of multiple choice	Multiple options
Interpretation of results	The most common stakeholders have a strong focus on individuals.
Relevance for DS4Skills	This highlights the significance of user-centricity in the skills data space.

Table 21: Analysis on parameter Type of stakeholders

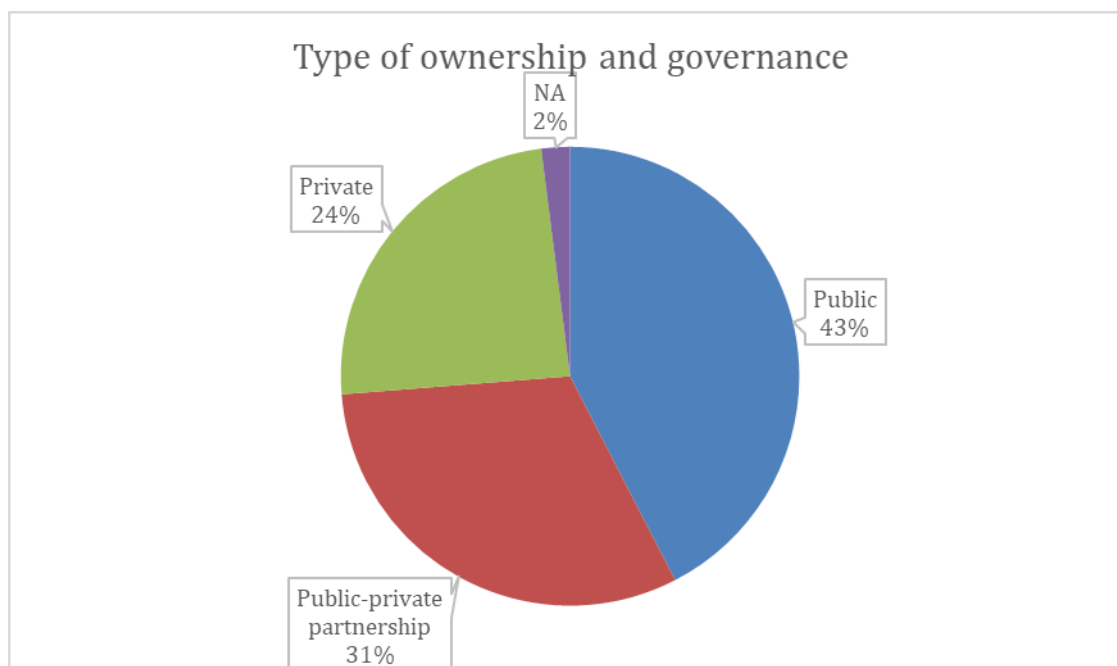


Figure 5: WP2 Inventory results on Type of ownership and governance

Parameter		Type of ownership and governance
Multiple options	choice	- Public – it is owned, governed, and controlled by one or more government bodies. - Private – When owned by a private person or entity. - Public-private-partnership – it is owned, governed, and controlled both by government bodies and private entities. - Not specified - Other
Type of multiple choice		Single option
Interpretation of results		Nearly three quarters of the initiatives involve a public component.
Relevance for DS4Skills		Public institutions should be actively engaged alongside private organizations in the design and adoption of the skills data space.

Table 22: Analysis on parameter Type of ownership and governance

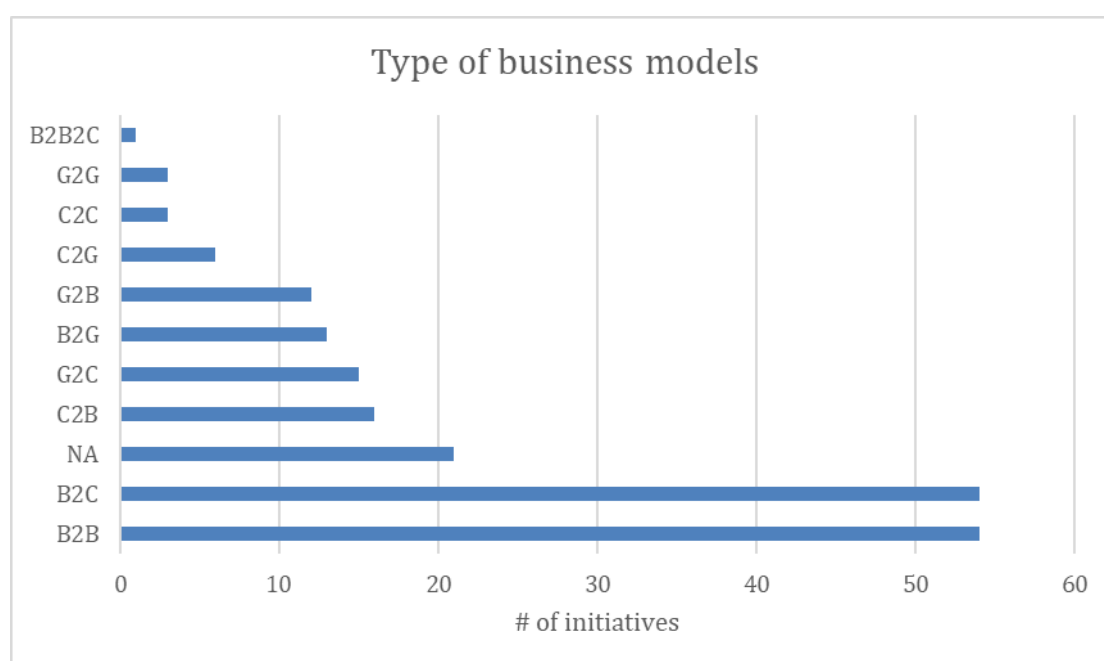


Figure 6: WP2 Inventory results on Type of business models

Parameter		Type of business models
Multiple options	choice	○ B2B ○ B2C ○ C2C ○ C2B ○ B2G ○ B2B2C ○ G2C ○ G2B ○ C2G
Type of multiple choice		Multiple options
Interpretation of results		Most of the business models of the initiatives include a consumer component.
Relevance for DS4Skills		This underscores the significance of the individual in the skills data space and highlights the necessity for a human-centric approach.

Table 23: Analysis on parameter Type of business models



Figure 7: WP2 Inventory results on Use cases for organisations' needs

Parameter	Use cases for organisations' needs
Multiple choice options	○ Manage competencies ○ Attract and recruit talent for employers ○ Develop personnel ○ Offer jobs ○ Forecast future skills needs ○ Other
Type of multiple choice	Multiple options
Interpretation of results	Organizations utilize the initiatives for all these use cases. The fact that the two most frequently identified use cases involve skills data analysis highlights the importance of skill data analysis in this context.
Relevance for DS4Skills	These use cases can be seamlessly integrated into a skills dataspace.

Table 24: Analysis on parameter Use cases for organisations' needs

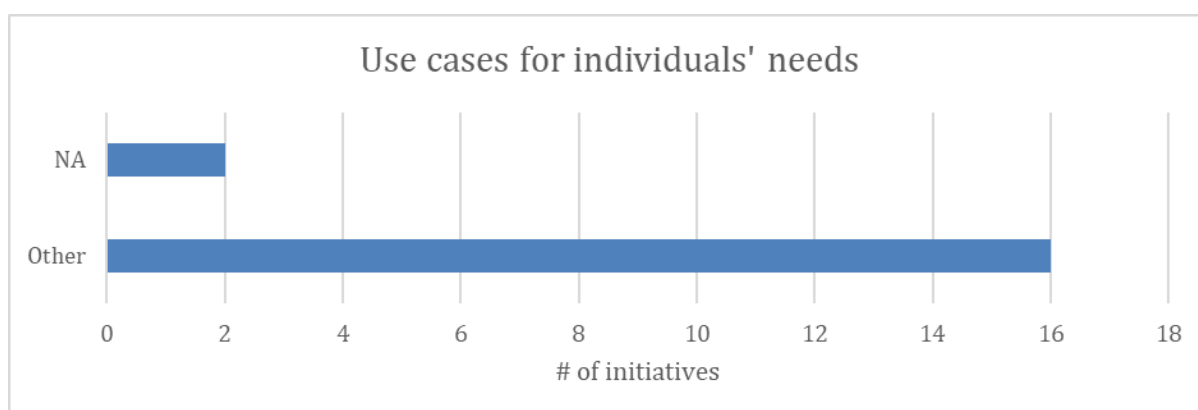


Figure 8: WP2 Inventory results on Use cases for individuals' needs

Parameter	Use cases for individuals' needs
Multiple choice options	○ Career planning and life decisions ○ Personalised lifelong learning journey ○ Upgrading and reskilling professional skills ○ Searching and applying for jobs ○ Finding learning opportunities ○ Other
Type of multiple choice	Multiple options
Interpretation of results	The individual use cases are fairly evenly distributed.
Relevance for DS4Skills	The skills data space should provide the necessary infrastructure to enable all of these use cases.

Table 25: Analysis on parameter Use cases for individuals' needs

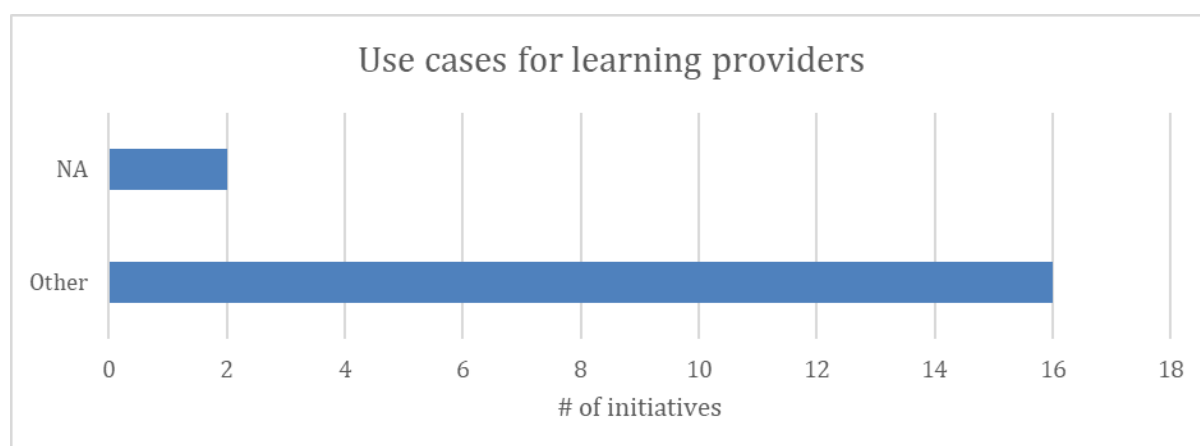


Figure 9: WP2 Inventory results on Use cases for learning providers

Parameter	Use cases for learning providers
Multiple choice options	○ Offer training and education ○ Recruit students/participants ○ Develop curriculum ○ Validate and certify skills ○ Forecast future skills demand ○ Other
Type of multiple choice	Multiple options
Interpretation of results	In contrast to the previous chart, there is a higher number of use cases oriented towards individuals rather than learning providers.
Relevance for DS4Skills	This once again highlights the predominance of individuals in a skills data space and underscores the importance of human-centricity.

Table 26: Analysis on parameter Use cases for learning providers

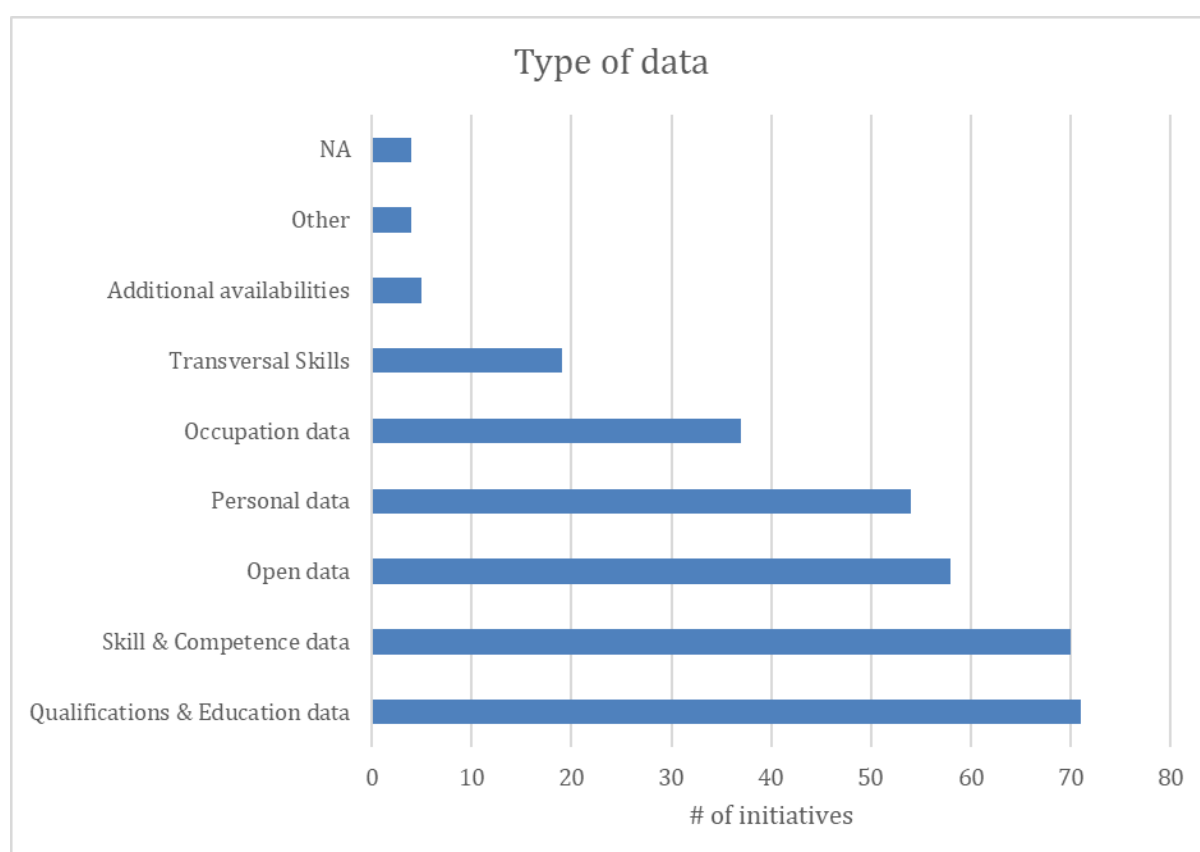


Figure 10: WP2 Inventory results on Type of data

Parameter	Type of data
Multiple choice options	○ Skill & Competence data ○ Occupation data ○ Qualifications & Education data ○ Additional availabilities ○ Transversal skills ○ Open data ○ Personal data ○ Anonymized/sensitive data ○ Other
Type of multiple choice	Multiple options
Interpretation of results	Various types of data are shared within the initiatives, with a significant emphasis on data containing personal elements, including skill and competence data, qualifications and education data, and personal data.
Relevance for DS4Skills	Given the prevalence of personal data within the skills data space, it's crucial that the blueprint's design includes measures to appropriately manage personal data.

Table 27: Analysis on parameter Type of data

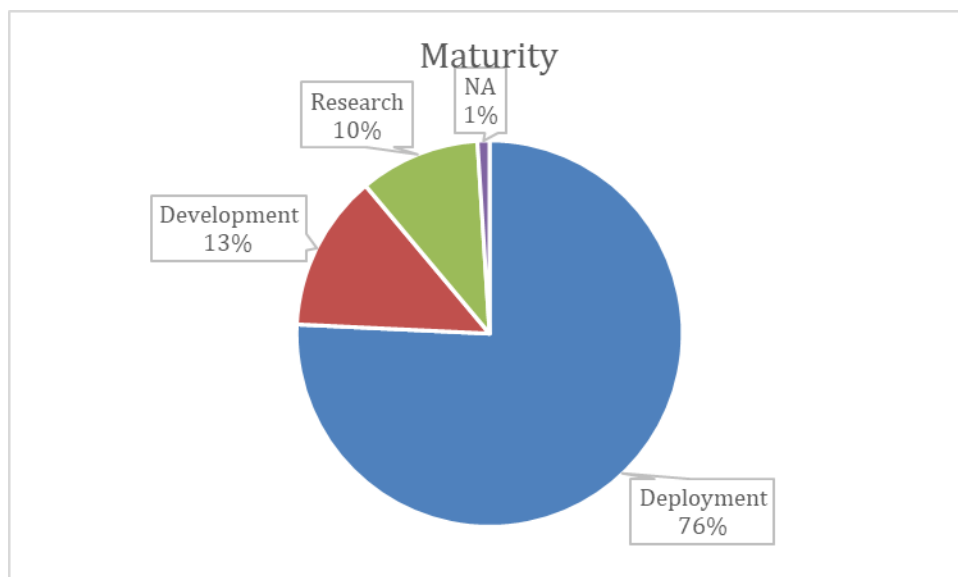


Figure 11: WP2 Inventory results on Maturity

Parameter	Maturity
Multiple choice options	○ Research ○ Development ○ Deployment
Type of multiple choice	Single option
Interpretation of results	Most initiatives are currently in the deployment phase.
Relevance for DS4Skills	Given the considerable number of initiatives in the deployment phase, the skills data space should prioritize enabling connections and integration with these existing initiatives.

Table 28: Analysis on parameter Maturity

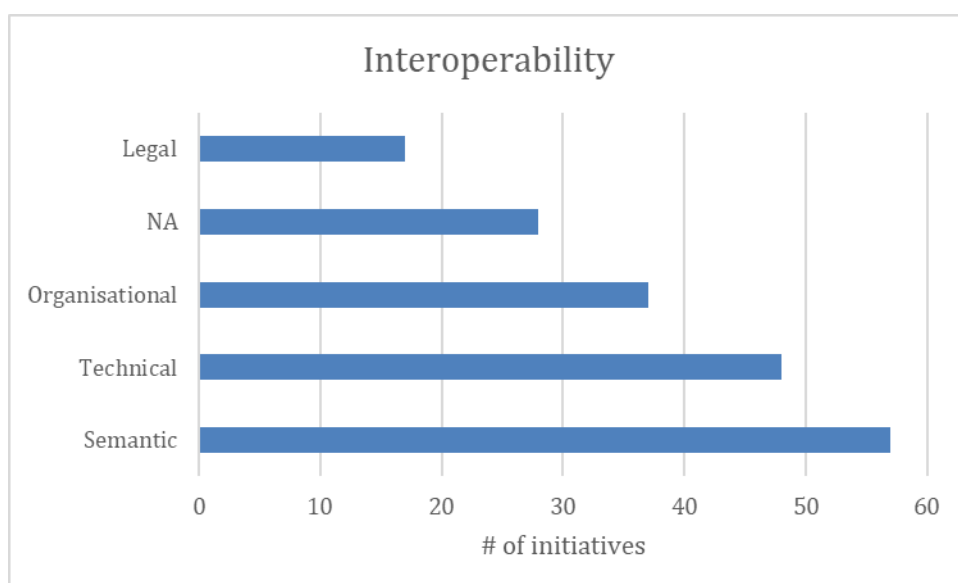


Figure 12: WP2 Inventory results on Interoperability

Parameter		Interoperability
Multiple options	choice	○ Legal ○ Organisational ○ Semantic ○ Technical ○ None
Type of choice	multiple	Multiple options
Interpretation of results	of	A significant number of initiatives are focused on semantic interoperability, and many of them are addressing multiple layers of interoperability.
Relevance for DS4Skills	for	Since numerous initiatives are focused on semantic interoperability, it's essential for the skills data space to support multiple semantic standards and offer tools or mechanisms for mapping these standards.

Table 29: Analysis on parameter Interoperability

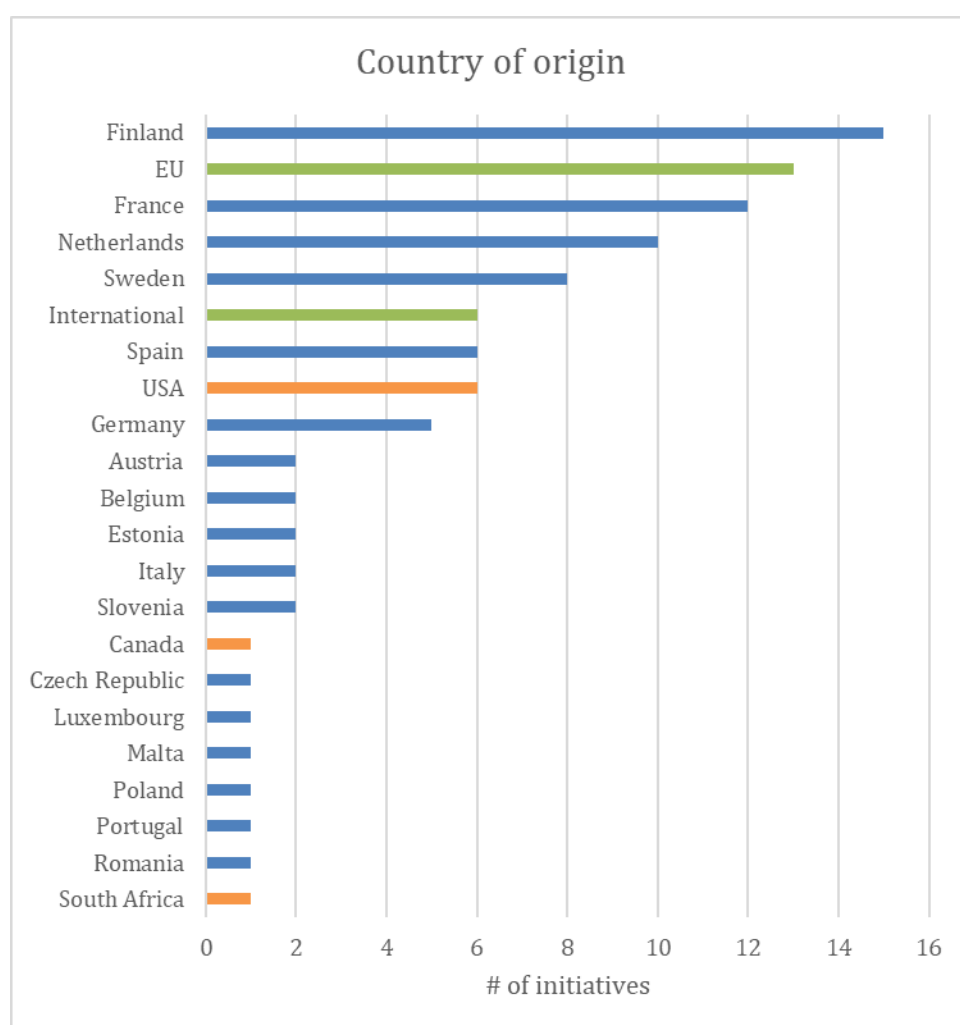


Figure 13: WP2 Inventory results on Country of origin

Parameter		Country of origin
Multiple choice options	choice	A Text type question
Type of multiple choice	multiple choice	Single option
Interpretation of results	of	The presence of skills-related initiatives in various countries, both at the national and international levels, highlights the global significance of skills data.
Relevance for DS4Skills	for	Leveraging the lessons learned from national initiatives is crucial for the development of the skills data space.

Table 30: Analysis on parameter Country of origin

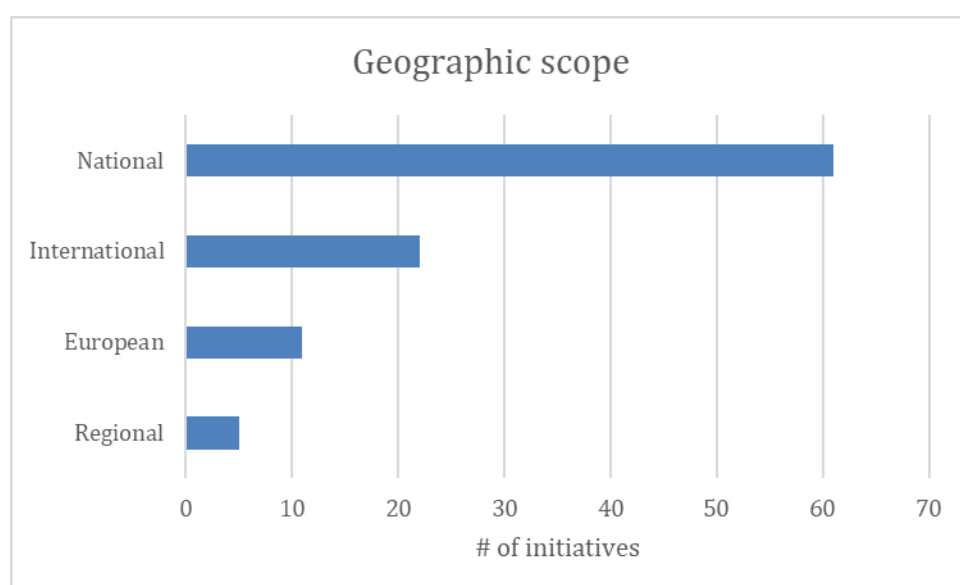


Figure 14: WP2 Inventory results on Geographic scope

Parameter	Geographic scope
Multiple choice options	○ Regional – The initiative operates at regional level. ○ National – The initiative provides a nationwide service. ○ European – The initiative operates in more than one country in Europe. ○ International – The initiative operates an international service across continents. ○ Global – The initiative provides a worldwide service. ○ Other
Type of multiple choice	Single option
Interpretation of results	Most of the initiatives operate on a national level, but there is already a lot of cross-national cooperation.
Relevance for DS4Skills	The international nature of the skills domain highlights the necessity for the skills data space to operate seamlessly across borders.

Table 31: Analysis on parameter Geographical scope

7.3.2. Analysis of standards and interoperability

Apart from the analysis of the multiple-choice points, specific attention has been paid to the free format questions about standards and interoperability. The two parameters that address standards and interoperability are:

- **Interoperability** – the multiple-choice answers to this question are already analysed in the chapter above.
- **Existing standards** and ecosystem participation.

As part of the analysis of standards, a list of commonly used standards has been provided to the DSSC. In this list for each standard has been specified:

- **The number of initiatives** from the desk research where the standard is mentioned.
- **The pillar from the DSSC blueprint** the standards applies to: Data Interoperability; Data Sovereignty and Trust; Data Value creation; Governance.
- **The building block from the DSSC blueprint** the standard applies to.
- **The short and long name** of the standard.
- **The type of specification:** EU Regulation; Formal standard spec; Industry standard body spec; Industry body spec; Industry consortia spec; Product spec.
- **The type of asset:** (Ref) implementation; Specification; Standard.

The mapping of standards and interoperability to the DSSC building blocks has been an important focus in the development of the blueprint for the skills data space. This has been provided as input for *WP3 Blueprint development* and specifically *D3.2 DS4Skills Blueprint*, where has been specified for each DSSC building block that is reused which standards are commonly used in the skills context and which reference implementations already exist.

In general, the analysis yields the following conclusions regarding standards and interoperability:

- Most initiatives employ a variety of standards, architectures, and technologies, indicating a lack of uniformity across the board.
- Evaluating the widespread adoption of standards and associated building blocks is a complex task. A more comprehensive analysis is required to gain insights into their usage. This analysis should also explore whether all DSSC building blocks are actively employed and, if not, investigate the reasons for their non-utilization.
- It is evident that certain standards and implementations are more frequently utilized. This observation suggests that some standards and implementations are more popular or applicable than others most likely:
 - as they are education/skills specific,
 - as they are generic application/service that can be used for authentication for an example,
 - as they are an EU standard.

Some examples of standards that are more frequently used among the selected initiatives include ESCO, ISCO-08, eIDAS, and Open Badges.

7.4. DSSC Blueprint v0.5 for public consultation analysis

7.4.1. Building Blocks Taxonomy

The building blocks mainly consist of two major categories: governance and technical. The governance side focuses on the business models of data spaces, its governance, and legal framework. The technical aspect is aimed at dealing with the technical agreements that individual participants and trusted data space intermediaries need to abide by. Use case development, data product development, business model development are elements of the business part of governance building blocks. Use case development is a strategic approach to increase the value of a data space by exploiting the creation, support and scaling of use cases.

Data product development considers data product templates for the data providers, data space governance rules for the data products and network effects between data providers and users. Business model development focuses on supporting a data space in developing its business model by identifying the key elements of a data space business model and identifying some considerations the governance authority should take into account while developing its business model.

Data models, data exchange and provenance and traceability are elements of the technical building blocks. Data models are used to define and use shared semantics in a data space, data exchange denotes the capabilities relating to the actual exchange and sharing of data and provenance and traceability is focused on tracking the process of data sharing, so it becomes traceable and compliant.

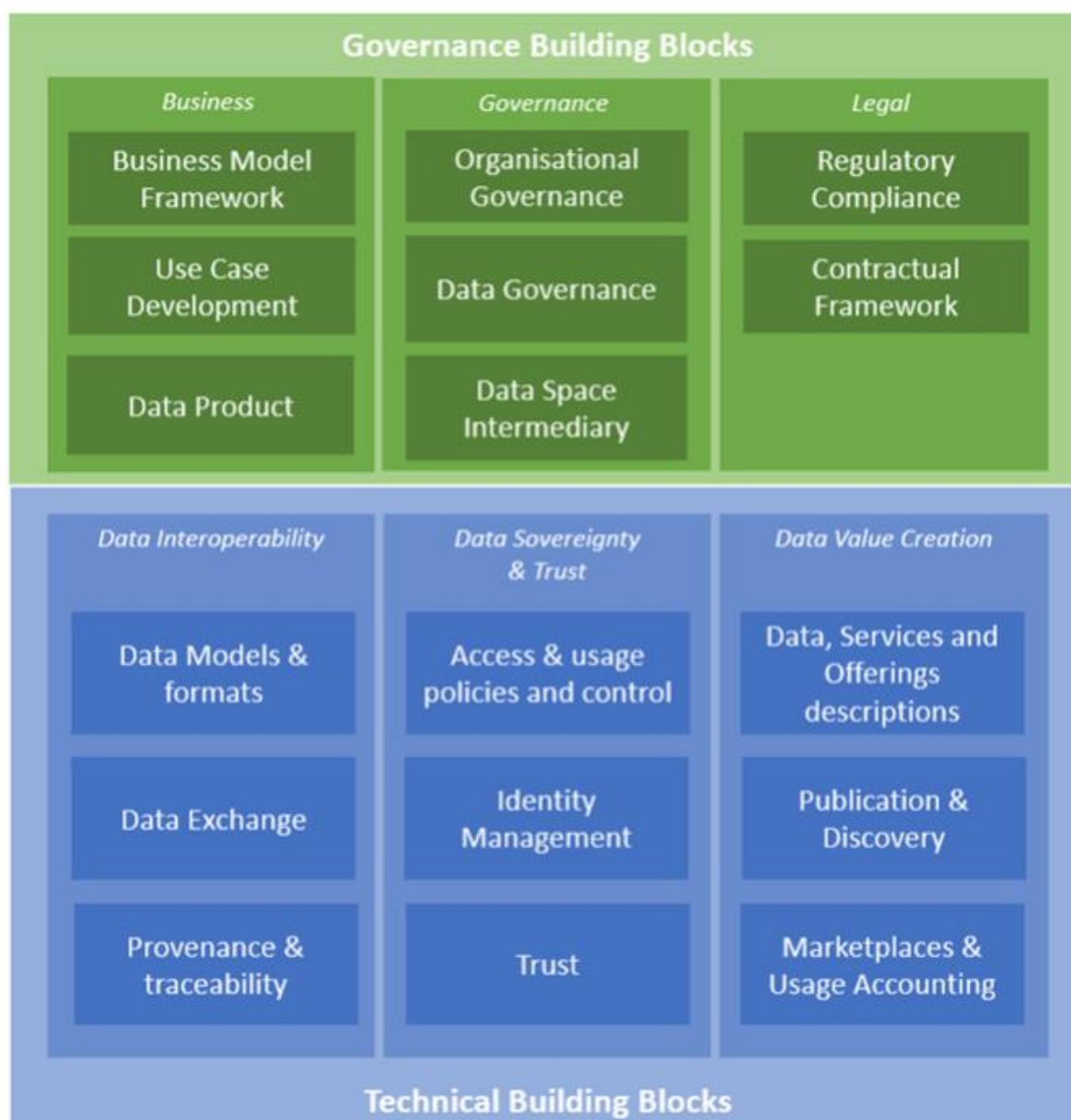


Figure 15: Data spaces building blocks taxonomy as defined in the DSSC BP draft

7.4.2. Governance

The structure of Governance Building Blocks has evolved since the previous working version that was provided by the DSSC. In DS4Skills reference version it consists of three groups of building blocks as follows:

- **Governance pillar 1:** Business Building Blocks.
- **Governance pillar 2:** Governance Building Blocks.
- **Governance pillar 3:** Legal Building Blocks.

These three pillars relate directly to the deliverable *D3.2 DS4Skills Blueprint* chapters “5. Business model for the skills data space” (Pillar 1) and “6. Governance

model for the data space” (Pillar 2 and Pillar 3). In the following subchapters a more detailed analysis is provided.

7.4.2.1. Governance pillar 1: Business Building Blocks

This pillar is composed of the following building blocks:

- **Business Model Framework** BB focuses on creating and sustaining business models in data spaces. These models consider the interests and objectives of all actors involved and aim to co-create and distribute value through data exchange, decision enablement, and monetization. While value creation is a primary focus, covering costs is essential, especially in public sector data spaces. The building block includes various business models tailored to different participants, intermediaries, data products, and data processing objectives, ensuring the data space's sustainability and value creation goals. It considers the evolution of business models over the data space's lifetime and their alignment and governance. Key functions: define value propositions, specify the actors involved, outline mechanisms for value creation, detail value exchange processes, identify roles and benefits for each actor, and ensure equitable value distribution based on agreed-upon models such as revenue sharing.
- The **Use Case Development** BB enhances data space value by promoting the creation and support of data space use cases. These use cases are practical applications addressing business challenges or generating value, evolving from initial ideas to operational solutions. The building block provides guidelines, templates, and promotes synergy among use cases, facilitating interoperability. A 'Use Case Owner' acts as a consortium spokesperson for use case development. Key elements include Use Case Registration for tracking progress, enabling the learning from both successful and abandoned scenarios; Use Case Core Aspects defining value proposition, sources, and roles; Brokering aims to find efficiencies and shared infrastructure among use cases; and the Use Case Simulator is a tool used in decision-making processes and understanding the potential value and impact of a use case.
- A **Data Product** BB focuses on data products within data spaces, which are standardized data units used to package relevant data and services for easy consumption by participants. Data products come in three categories: those that adhere to the **standard definition, infrastructure products and services** within the data space, and **end products** like business apps. Viewing data as a product can lead to improved data reuse and offers scalability benefits. Data products serve as the fundamental units for use cases, reduce infrastructure costs, and accelerate use case development by making data resources readily available. Data products provide value for data rights holders and can be monetized or exchanged for benefits, with flexibility in packaging and a focus on delivering value and meeting commercial and technical requirements. The key elements in this context include templates for creating data products and product offerings.

DS4Skills: Relevance, usage and gaps

DS4Skills reused as much of DSSC's building block content as feasible. Additionally, DS4Skills diligently monitored the advancement of DSSC's building blocks business expert group, ensuring their alignment.

The most significant divergence between DS4Skills and DSSC lies in DS4Skills' focus on the business case and data space development for all participants, not with the main focus to data space itself. This emphasis underscores the critical role of the Data Value Chain Tracker, as outlined in *D3.2 DS4Skills Blueprint*, in addressing this broader perspective.

Another distinction is that DS4Skills has tracked participant journeys and provided additional descriptions for building blocks, which are primarily technical in nature. Nonetheless, highlighting the business perspective is essential to ensure satisfied participants and drive data space growth.

Feedback and recommendations for DSSC

Currently, there is a discussion in the DSSC Expert Group on Business about whether to incorporate information related to the use case business model or costs within this Governance pillar, with the argument being that these aspects should be addressed in business building blocks. DSSC believes it's crucial to consider including these elements here, as they play a pivotal role in the decision-making process for the initiation of use cases ("go/no go decision"). These factors are instrumental in determining the feasibility and viability of a use case, and by incorporating them, a more comprehensive and well-informed approach to use case development can be ensured.

Additionally, DS4Skills experts proposed to business expert group the inclusion of some elements of the Data Value Chain Tracker in the Use Case Development BB and the inclusion of business models of participants in Business Model Framework BB. This holistic perspective could greatly enhance DS4Skills decision-making capabilities and ultimately lead to more successful use cases and data space development and growth. Furthermore, the Data Value Chain Tracker enhances transparency and fair value share, fostering trust among all participants, particularly individual end users.

The advice is for DSSC to adopt a participant-centric approach, closely tracking their journey and requirements at each stage, and identifying the key elements necessary for ensuring satisfied participants who trust in the data space, ultimately fostering data space growth.

7.4.2.2. Governance pillar 2: Governance Building Blocks

The governance pillar encompasses two essential topics:

- **Data sharing governance** emphasises the importance of clear rules and trust in facilitating effective data exchange, allowing participants to control data access, purposes, and terms.

- **Organisational governance** is pivotal for data space operations, focusing on decision-making, collaboration, and the role of the governance authority in overseeing rules, boundaries, compliance, conflict resolution, trust-building, access management, and overall data space success.

DS4Skills: Relevance, usage and gaps

Following the guidance from the DSSC to compare the DS4Skills blueprint using the DSSC building blocks taxonomy, it can be concluded that DS4Skills building blocks essentially represent more elaborated subcategories that align with the suggested DSSC categories. The primary difference lies in DS4Skills' mandatory inclusion of PDI (Personal Data Intermediaries) as a component, while the DSSC framework does not enforce this requirement. This emphasises DS4Skills' human-centric approach.

Feedback and recommendations for DSSC

DS4Skills had a strong collaboration with the DSSC, notably to ensure personal data sharing is properly covered in the DSSC Blueprint and building blocks.

The Inclusion of DS4Skills in the DSSC Governance Expert Group contributed to ensure that Personal Data Intermediaries were included and described.

DS4Skills also actively participated in the public consultation on the DSSC Blueprint Draft. Notably to advocate for the mandatory aspect of the Personal Data Intermediary, as an essential requirement to guarantee human-centricity.

DSSC should make the handling of personal data clearer and more central to its architecture and propositions, as most if not all data spaces will require personal data sharing. The DSSC Blueprint should ensure that personal data sharing is human-centric by making mandatory the use of Personal Data Intermediaries and in this way truly applying the EU data strategy and the mandates of the Data Governance Act. In general, DSSC does not require the use of data intermediaries in data sharing, possibly aligning itself differently from the EU strategy in this aspect.

7.4.2.3. Governance pillar 3: Legal Building Blocks

This pillar is divided into two building blocks: Regulatory Compliance and the Contractual Framework.

The first building block compiles the pertinent regulations and underscores the need of establishing mechanisms for ensuring dataspace compliance, along with a robust system for continuously monitoring legislative changes. It also describes the upcoming inclusion of the DSSC Legal Compass, which promises to be an invaluable resource, as it will be a tool to guide data space legal compliance throughout their lifecycle.

The second building block is dedicated to the contractual framework, which is designed to ensure that all essential contracts, templates, and related elements are not only prepared but also meticulously managed and maintained. This holistic approach aims to provide a comprehensive and well-structured foundation for effective governance within the dataspace ecosystem.

DS4Skills: Relevance, usage and gaps

The contractual framework for a DS4Skills dataspace is addressed in *D3.2 DS4Skills Blueprint*, section "Governance Model for the Dataspace." DS4Skills recommends that an updated governance framework for DS4Skills incorporates a more comprehensive list of contractual guidelines based on DSSC proposals. However, it is worth noting that DS4Skills has placed greater emphasis on refining governance building blocks, while dedicating relatively less focus to contractual and legal aspects. This strategic approach stems from the recognition that governance elements play a more central role in addressing the unique requirements of the skills domain, as contractual framework is less domain-specific and rely to a significant extent on the broader data space principles outlined in the DSSC blueprint. Similarly, to achieve a more comprehensive regulatory framework, further refinement will be essential, especially as DS4Skills anticipates the introduction of the forthcoming Legal Compass.

The suggestion for additional elaboration should be considered once the Legal Compass is finalized. This approach helps prevent duplication of efforts already undertaken by the DSSC and potential misalignment. Additionally, in the future, sector-specific regulations can be seamlessly integrated into the Legal Compass, ensuring its relevance and applicability across diverse industry sectors.

Feedback and recommendations for DSSC

The Legal Compass is a valuable resource for data space initiatives. It should be finalised, maintained and provided as key reference guidance for legal compliance. This approach will avoid duplication of work across data spaces. The DSSC may also consider including sector-specific and relevant national legislation in the Legal Compass.

7.4.3. Technical

The Technical Building Blocks consists of three groups of building blocks as follows:

- **Technical pillar 1:** Data Interoperability Building Blocks.
- **Governance pillar 2:** Data Sovereignty & Trust Building Blocks.
- **Governance pillar 3:** Data Value Creation Building Blocks.

In the following subchapters a more detailed analysis is provided.

7.4.3.1. Technical pillar 1: Data Interoperability

“In data spaces, it necessitates that technologies, applications, or members are able to seamlessly exchange data, which allows for improved collaboration and efficiency among individuals, organizations, and systems. In the absence of data interoperability, the data formats and understanding varies between organisations, individuals, and systems. This incompatibility hampers the benefits of data exchange as aligning with ambiguous data becomes an expensive and time-consuming process. Therefore, it requires the adoption of a common language.

The objective of this building block category is to provide a framework, components and best practices that data spaces can use to ensure data interoperability (as defined in the DSSC blueprint).

The three building blocks related to this pillar are listed below, with a short description of their functionalities:

1. **Data Models & Formats** establishing a common language and a centralised repository of standardised terms, organisations can overcome semantic barriers and achieve better data interoperability, enabling seamless data integration, exchange, and collaboration.
2. **Data Exchange** is about describing how these semantic data models are used in the interaction between systems, and/or data members, and between systems themselves.
3. **Provenance and Traceability** describes how the data sharing process is being monitored within a data space.

DS4Skills: Relevance, usage and gaps

In the skills data space blueprint (D3.2 DS4Skills Blueprint), the significance, utilization, and limitations of the building blocks within the Data Interoperability pillar can be summarized as follows:

- **Data Models & Formats:**
 - For the skills data space, where semantic interoperability holds great importance, specific functions are proposed as extensions to those defined by the DSSC:
 - Data Format Conversion (extension of DSSC function 5 Integration and alignment of multiple data models to address overlapping or related concepts).
 - Data Structure Conversion (also an extension of DSSC function 5).
 - Taxonomy/Ontology/Learner Model Conversions (also an extension of DSSC function 5).
 - Data Skills Normalisation (extension of DSSC function 4 Easy creation of standardised data models from data assets that are not compliant with standards).
 - Language Models (also an extension of DSSC function 4).
 - It's important to note that the dependencies and relationships with other building blocks align with those defined by the DSSC, with no additional changes or additions.
- **Data Exchange:**
 - Given the emphasis on the human-centred approach and personal data protection in the skills data space, specific functions are suggested as extensions to those defined by the DSSC:
 - Safeguard for personal data (extension of DSSC function 2 Generic data exchange protocols).

- Privacy preserving data sharing protocols (also an extension of DSSC function 2).
 - Furthermore, the dependencies and relationships with other building blocks remain consistent with the DSSC's definitions. However, an additional dependency is introduced:
 - Access & Usage Policies and Control: for consent.
- **Provenance and Traceability:** as this building block is not yet defined by the DSSC, the building block is not adopted in the blueprint for the skills data space. Probably, envisioned functions of this building block are now incorporated in other building blocks of the skills data space blueprint.

Feedback and recommendations for DSSC

Commonly used standards and specifications, along with reference implementations tailored to the skills context, have been shared with the DSSC as feedback for these three building blocks.

7.4.3.2. Technical pillar 2: Data Sovereignty & Trust

Within Data Spaces, the emphasis lies on establishing trust and sovereignty among participants. This entails adopting common standards for managing participant identities, verifying their authenticity, and enforcing agreed-upon policies for controlling data access and usage. Identity management, trust-building, and the enforcement of access policies are critical components, ensuring secure and authorised access to sensitive information and guarding against unauthorised breaches or misuse.

The objective of this building block category is to provide a framework, components and best practices that data spaces can use to ensure data sovereignty and trust.

The three building blocks related to this pillar are listed below, with a short description of their functionalities:

1. **Access and Usage Policies and Control:** is the ability to specify and policies within a given data space, both by the data space authority and the individual participants.
2. **Identity Management:** the management of identities within a data space.
3. **Trust:** being able to verify that a participant of a data space adheres to certain rules.

DS4Skills: Relevance, usage and gaps

In the context of the blueprint for the skills data space (*D3.2 DS4Skills Blueprint*) the relevance, usage and gaps of the building blocks within the Data Sovereignty and Trust pillar can be outlined as follows:

- **Data Access and Usage Policies and Control**

- As the human-centred approach and consent are considered important requirements for the skills data space, specific functions are proposed as an extension of the DSSC building block:
 - PDI Consent:
 - Process information (personal and otherwise) to generate consent based on a predefined contact created by engaging with the contract block.
 - Consent Modification.
 - Consent Validity Verification.
 - Consent Fraudulent Use Detection.
 - Consent Logging.
 - Data Transactions Traceability Functions.
 - Personal Data Access Logs:
 - Identity Management and Trust.
 - Data Value Creation.
 - Publication and Discovery.
 - Business.
 - Governance.
 - Legal side: it manages how data usage is enforced by a legal block.
 - Contract Framework.
- The dependencies and relationships with other building blocks are adopted as defined by the DSSC, no additions are done.
- **Identity Management**
 - As human-centred approach and consent are considered important requirements for the skills data space, a specific function is proposed as an extension of the DSSC building block:
 - PDI Identity:
 - Managing Credentials.
 - Portable Identity management.
 - Privacy management.
 - Privacy by Design.
 - Terms and conditions scheme ecosystem.
 - The dependencies and relationships with other building blocks are adopted as defined by the DSSC, no additions are done.
- **Trust**
 - As the human-centred approach and personal data protection are considered important requirements for the skills data space, a specific function is proposed as an extension of the DSSC building block:
 - Trustworthy AI assessment: geared towards being able to recognise which AI algorithms are best suited in the context of fairness and explainability.

- The dependencies and relationships with other building blocks are adopted as defined by the DSSC, no additions are done.

Feedback and recommendations for DSSC

For all three building blocks, commonly used standards and Specifications and Reference Implementations specifically for the skills context are provided to the DSSC as feedback.

Nonetheless, DS4Skills has a specialized building block called "Decentralized AI Training," and it is suggested that DSSC considers it as a foundational component for AI training applications that are not domain specific.

7.4.3.3. Technical pillar 3: Data value creation

A data space has the ultimate objective of generating value out of data sharing among participants. One option to achieve this goal is to make use of methods and features that could provide marketplace functions, within which, participants can value their services and account for them. Building a trading relationship between a provider and a receiver or user is facilitated by the data space offering publication services to the provider, and discovery services to the potential users. To such publication services, data providers need to publish descriptions of their data and service offerings in a language of which users can make sense and whose processing can be automated.

The goal of a data-driven business-ecosystem is to create value out of data based on sharing and usage of data to:

- Enable interoperability.
- Connect Providers and Users.
- Add monetisation means as marketplaces services.
- Account the usage of the data and services to track the overall trading process.

The Data Value Creation category is the third DSSC category of technical building blocks (in addition to Data Interoperability and Data Sovereignty & Trust), encompassing three building blocks:

- **Data, Services and Offerings Descriptions:** a self-description of a data or service offering consisting of machine-comprehensible, structured metadata, which cover the content and context of the data, the concepts addressed, the community of trust around the data, communication about the data, and the commodity nature of the data.
- **Publication and Discovery Services:** enable the participants who provide data resources and data-driven services to publish descriptions of their resources and resource offerings, such that they become discoverable for future, potential consumers.
- **Marketplaces & Usage Accounting:** the generation of value out of sharing data materialises through marketplace capabilities, which provide functionality for

procurement, monetisation, contract lifecycle management, logging, usage accounting, billing, payment, aftersales, etc.

DS4Skills: Relevance, usage and gaps

In the context of the blueprint for the skills data space (*D3.2 DS4Skills Blueprint*) the relevance, usage and gaps of the building blocks within the Data Value Creation pillar can be outlined as follows:

- **Data, Services and Offering Descriptions**
 - For the skills context and its specific requirements coming from the business model, a specific function is proposed as an extension of the DSSC building block:
 - Offerings (Offerings Descriptions).
 - The dependencies and relationships with other building blocks are adopted as defined by the DSSC, no additions are done.
- **Publication and Discovery Services**
 - As the human-centred approach is considered an important requirement for the skills data space, specific functions are proposed as an extension of the DSSC building block:
 - PDI Catalogue.
 - PDI Distributed data visualisation.
 - For the skills context and its specific requirements coming from the business model, a specific function is proposed as an extension of the DSSC building block:
 - Publication and Discovery Services (Participant-driven search, Potential matches and Collaboration requests and templates)
 - The Skills Data Space can implement this building block in a centralised or decentralised manner. However, due to the specific requirements in the skills context in terms of *decentralization*, the decentral approach is advocated.
 - The dependencies and relationships with other building blocks are adopted as defined by the DSSC, no additions are done.
- **Marketplaces & Usage Accounting**
 - For the skills context and its specific requirements coming from the business model, specific functions are proposed as an extension of the DSSC building block:
 - Contract/Order (Comprehensive inclusion of all contractual details).
 - Marketplace (Empowering participants to explore offerings).
 - Billing (Specific focus on accuracy, transparency and precision).
 - Aftersales (Assisting participants in resolving issues).

- The dependencies and relationships with other building blocks are adopted as defined by the DSSC, no additions are done.

Feedback and recommendations for DSSC

All the feedback detailed above regarding the building blocks customization or further optimisation needs was provided to DSSC.

7.4.3.4. Technical: Data Space Protocol

Data Spaces are instruments aiming to achieve interoperability between services and entities. The Protocol building block is especially designed for this function. It is a set of specifications designed to facilitate interoperable and sovereign data sharing between data space participants. These specifications define the schemas and protocols required for entities to, for example, publish data, negotiate usage agreements, and access data as part of a federation of technical systems termed a data space.

Nonetheless, the engagement among individuals within a data environment is orchestrated by participant agents known as Data Space Connectors, responsible for implementing the protocols. Although most exchanges occur among Connectors, certain interactions with external systems are necessary.

The final objective of this building block is to facilitate the interoperable data sharing between entities in the context of a data space.

DS4Skills: Relevance, usage and gaps

DS4Skills has foreseen an implementation of a data space connector, providing a secure, scalable and reliable underlying architecture, enabling participants to run the required data space connector in a secure, scalable, and reliable way. The extensible nature of many data space connectors makes it simple for different parties to develop extensions and integrations that can use the architecture providers' capabilities to supply a secure, scalable, and cost-effective infrastructure to make the most of their data assets. However, the DSSC building block is *not* about the data space connector, but about the data space protocol. According to the DSSC the connector implements the protocols and brings together elements of several technical building blocks. The DSSC data space protocol building block as such is currently not adopted by DS4Skills, but in the current DS4Skills architecture only a direct link between the connector and the other technical building blocks is established.

Feedback and recommendations for DSSC

DS4Skills refrained from offering feedback or recommendations on this particular building block to DSSC since DS4Skills anticipated significant changes resulting from discussions with them.

7.4.4. DSSC Conceptual Model

The purpose of the DSSC Conceptual Model for Data Spaces is to provide a well-defined language – precisely defined concepts and terms for referring to them. It is meant to support the definition of the business, governance and technical parts of the blueprint. When using this such a well-defined language the DSSC wants to ensure that texts produced within the DSSC but also by domain specific data spaces are coherent and consistent, making them easier to read and understand. The version of the DSSC conceptual model used in DS4Skills consists of two levels, as depicted in the figures below.

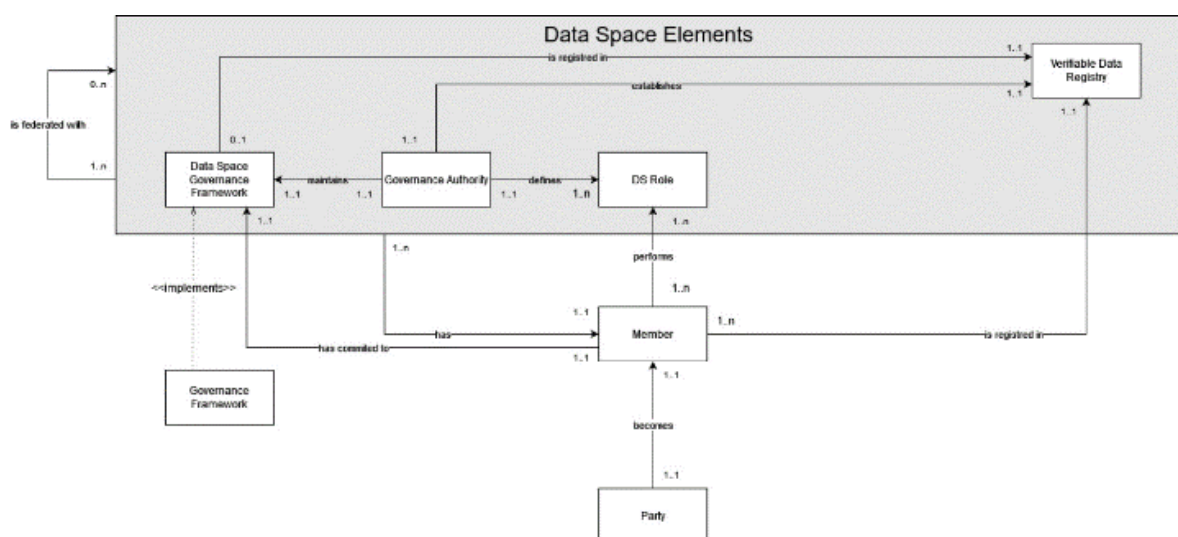


Figure 16: Level 1 of the DSSC conceptual model

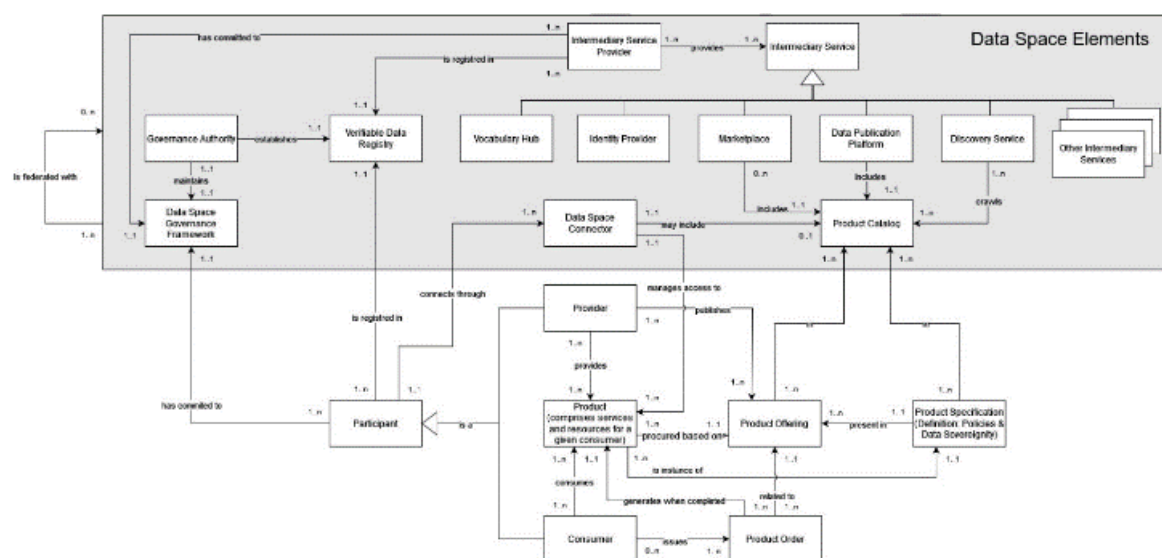


Figure 17: Level 2 of the DSSC conceptual model

DS4Skills: Relevance, usage and gaps

DS4Skills completely followed the DSSC Conceptual Model and reused the terms and relationships between the concepts.

DS4Skills detailed the DSSC Conceptual Model in *D3.2 DS4Skills Blueprint* by:

- Precising the role of the Data Space Governance Authority.
- Precising the relationship between the different types of participants.
- Precising the different kinds of data intermediaries, with the inclusion of the PDI.

Feedback and recommendations

On an earlier version of the DSSC Conceptual Model (June 2023) feedback has been provided to the DSSC. At the first level, it is not clear that a natural person can also be a participant of the data space, while this is crucial in the skills data space. At the second level, Personal Data Intermediaries need to be included as well, as they have a specific role and set of building blocks.

7.4.5. DSSC Glossary

The glossary primarily serves as a tool for enhancing information sharing and collaboration among various data space initiatives and individuals associated with the Data Spaces Support Centre (DSSC). It provides definitions within the DSSC context, acknowledging that these terms may have different meanings elsewhere.

A secondary goal is to establish a common language for DSSC communications and publications, ensuring clarity and consistency in messaging. Each term includes specific criteria to enable consistent interpretation within the DSSC and data space initiatives.

DS4Skills: Relevance, usage and gaps

- The Glossary is an evolving document that went through several iterations during the project duration. Activities in *WP3 Blueprint development* have constantly aligned with the Glossary.
- The main identified gap has been the usage in *D3.2 DS4Skills Blueprint* of a term “Data Sharing Ecosystem” to define a specific group of participants working on the implementation of a solution that brings added value to them. After a question was provided to the DSSC, that term has been replaced with the more suitable “Data Space Use Case”.

Feedback and recommendations

Feedback has been provided to earlier versions of the Glossary. Later versions of the Glossary received feedback and were subsequently modified during the work on and commenting of different building blocks. This process highlighted the necessity for glossary updates.

7.4.6. Towards Federation of Data Spaces

In the digital age, data spaces have emerged to facilitate collaboration and data sharing across sectors and regions. To fully harness the potential of data, there's a growing need to federate these spaces, enabling interoperability. The DSSC Blueprint chapter about federation of data spaces aims at addressing challenges of interoperability at business, legal, governance and technical levels.

DS4Skills: Relevance, usage and gaps

Dataspaces federation is a concept that is natively included in the DS4Skills blueprint as the conceptual model of the DS4Skills Blueprint and the proposed functioning of the Data Space Governance Authority ensures and obligates:

- a federation and interoperability between all DS4Skills Data Intermediaries,
- a development of building blocks that enable federation,
- a decentralised architecture of the DS4Skills.

By following the DS4Skills blueprint, the skills data space will necessarily allow federation.

www.skillsdataspace.eu



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