

Data Space Playbook

Interoperability Guideline

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1 Executive Summary

This document outlines a structured approach for assessing and launching an interoperable data space. The Data Space Interoperability Framework is organised into four layers: Legal, Organisational, Semantic and Technical Compatibility. Each layer contains capabilities which in turn outlines individual requirements to fulfil and measure the capability.

Each requirement is enforced with a policy that can be classified into: declarative-only, semi-computational and fully computational, which determines the level of automation and verification of the interoperability requirement.

The European Interoperability Framework inspires the Data Space Interoperability Framework, and it conveys practical requirements organised by domain-driven specifications.

The outcome of following each specification is to have a list of explicit requirements and a policy that is attached to each requirement. The more policies match between two data spaces, the more interoperable they are. The more automated policies are, the more verifiable the interoperability is.

2 Introduction

This document aims to enumerate requirements to enable interoperability within and across data spaces.

2.1 Goal of this document

The goal of this document is twofold:

1. To create a shared understanding of the issues regarding interoperability within and across data spaces.
2. To provide a basis for decision-making regarding data space interoperability.

2.2 Structure of the document

This document introduces the reader to the interoperability framework developed by Beyond Civic AG considering the functional requirements identified in (Beyond Civic AG 2024)

2.3 Audience

This document is intended for a diverse group of stakeholders involved in developing, implementing, and utilising data ecosystems. The audience includes:

- Sponsors of public-private data ecosystems, such as governmental agencies that provide funding and governance oversight.
- Subject matter experts who offer domain-specific insights in data spaces.
- Software architects responsible for integrating systems with data spaces.
- Data space solution vendors supplying products and services for enterprise data sharing.
- Data space participants who contribute and consume data in the Swiss Data Ecosystem.

2.4 Scope and Limitations of this document

The document is written in the Swiss/European context, it is sector-agnostic, and it provides a list of concrete interoperability requirements for data space initiatives in the Swiss Data Ecosystem.

The document provides a general framework and may require tailoring to specific contexts and regulatory landscapes. While this report addresses common legal considerations, it is not a substitute for professional legal advice, and readers should consult with legal experts to ensure full compliance with applicable regulations, especially regarding data protection and privacy.

This report does not cover the specific functional and technical requirements, which will be included in a separate report.

2.5 Disclaimer

The information provided in this report is intended for informational purposes only. Any actions taken based on this content are at the reader's risk. While we have made every effort to ensure accuracy, we make no warranties or representations regarding the information's completeness, reliability, or suitability.

It is based on the provided sources and represents a synthesis of the information available at the time of writing. However, the rapidly evolving nature of the data space landscape may lead to new developments and considerations beyond the scope of this document.

Furthermore, the success of data spaces hinges on factors beyond the scope of this document, including stakeholder commitment, clarity of the use cases, and the availability of adequate resources.

2.6 Acronyms used in this document

TERM	DEFINITION
EIF	European Interoperability Framework
DSIS	Data Space Infrastructure Service
MIMS	Minimum Interoperable Mechanisms

2.7 Mandate

Beyond Civic AG, a company based in Luzern, was asked to collaborate with the Federal Chancellery and the Federal Department of Foreign Affairs to produce a report for the General Public by the first quarter of 2025 on the interoperability requirements for trustworthy dataspace in Switzerland. The report should cover national and international perspectives while considering previous work related to the topic.

2.8 Relationship with other reports

The present report is part of a series of documents mandated by the Swiss Federal Chancellery and the Swiss Federal Office of Foreign Affairs which include Baseline, Scope and Stakeholders of Trustworthy Data Spaces in Switzerland Data Collaboratives Playbook, Rulebook for Data Collaboratives in Switzerland, Functional Requirements for Data Spaces in Switzerland, Technical Requirements for Data Spaces in Switzerland and Interoperability Guideline for Trustworthy Data Spaces in Switzerland (this document).

3 Prior Art: EIF and MIMs

During the research process for writing this report, two relevant frameworks were identified: The European Interoperability Framework (EIF) and the Minimal Interoperability Mechanisms (MIMs).

3.1 European Interoperability Framework

This framework was developed to inspire and guide European public services to become more interoperable with each other to enable a digital single market (European Commission 2017). It was developed as a response to a major lack of interoperability present in the heterogeneous jurisdictions that comprise the European Union.

The EIF is a generic framework that acts as the common denominator for relevant initiatives that involve administrations, citizens and businesses.

It consists of 4 layers of interoperability (legal, organisational, semantic, and technical) and a cross-cutting component (integrated public service governance):



Figure 1. EIF Governance interoperability

It also includes 12 underlying principles:

1. Subsidiarity and proportionality
2. Openness
3. Transparency
4. Reusability
5. Technological neutrality and data portability
6. User centricity
7. Inclusion and accessibility
8. Security and privacy
9. Multilingualism
10. Administrative simplification
11. Preservation of information
12. Assessment of Effectiveness and Efficiency

3.1.1 Challenges using EIF for Data Space Interoperability

Mainly the main challenge is that EIF is not specific enough to guide the interoperability of data spaces. The same argument applies to the 12 principles outlined by the EIF. Therefore, the overall recommendations mentioned in the EIF report miss the mark to be practical for implementation.

3.1.2 Adaptation to Data Spaces

With regards to the layers: The author acknowledges that the four layers identified by the EIF (legal, organisational, semantic, and technical) are appropriate for classifying the interoperability specifications for data spaces.

With regards to the principles: The author replaced them instead with the 4 principles of Trustworthy Data Spaces identified in Code of Conduct for trustworthy Data Spaces (Federal Department of Foreign Affairs; Federal Department of the Environment, Transport, Energy and Communication 2022), those are: *Transparency, Control, Efficiency and Fairness*. These four principles are used to classify the specifications of organisational interoperability.

3.2 Minimal Interoperability Mechanisms

The Minimal Interoperability Mechanisms (MIMs) are designed to support cities and communities to become smarter, although they may have wider relevance. (OASC 2024).

A MIM specifies a set of requirements that any mechanism, or set of technical solutions, needs to address to provide a minimal but sufficient set of capabilities needed to achieve a certain city or community objective.

MIMs identified 4 levels of interoperability:

1. Plug & Play
2. Common connectors developed
3. Pivotal points of interoperability identified
4. No common standard.

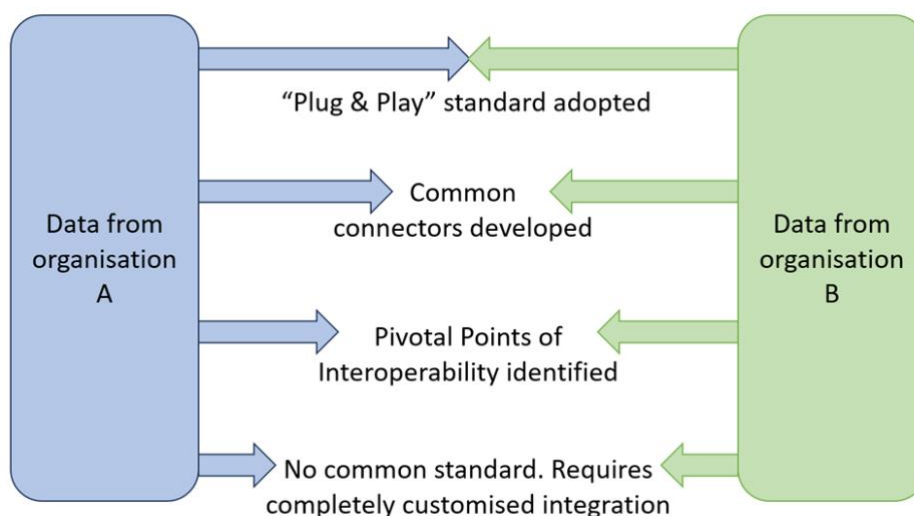


Figure 2. Levels of MIMs interoperability. (OASC 2024)

MIMs are structured and documented with the following content, according to (OASC 2024):

- Objective
- Capabilities
- Requirements
- Mechanisms
- Interoperability guidance
- Conformance and compliance testing

The following are the officially published MIMs according to (OASC 2024)

- MIM 1. Context Information
- MIM 2. Data Models
- MIM 3. Contracts
- MIM 4. Trust
- MIM 5. Transparency
- MIM 6. Security
- MIM 7. Places
- MIM 8. Indicators
- MIM 9. Analytics
- MIM 10. Resources

The following diagram annotates the overlap between the Data Spaces Technology Building Blocks and MIMs:

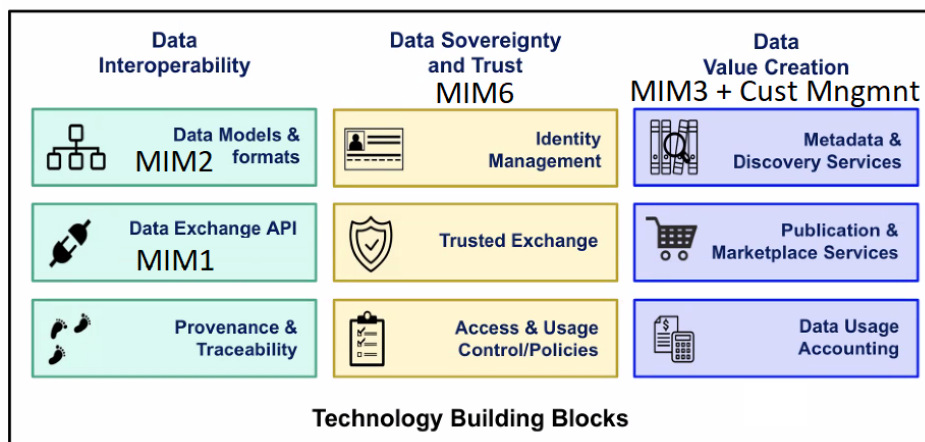


Figure 3. Data Spaces Technology Building Blocks annotated with MIMs. (OASC 2024)

3.2.1 Challenges using MIMs for Data Space Interoperability

After a meeting with the team in charge of the maintenance of MIMs, additional meetings were held to discuss the findings, both internally and with BFH (Berner Fachhochschule). There was a consensus the maturity was lower than expected. Even the existing structure is currently under review and therefore it is not suitable as a definite guidance to enable interoperability across data spaces. Nevertheless, concepts such as Contracts, Trust, Transparency and Security are also included in this report, so there is a certain level of overlap with the themes introduced in MIMs.

3.2.2 Adaptation to Data Spaces

The author acknowledges the usefulness of identifying capabilities as a thematic separation of requirements, therefore it was included in the guideline. This helps improving the readability of the conceptual model.

Note: The most appropriate MIMs are MIM1 until MIM 6. All other MIMs are mostly related to city-oriented projects, with little usefulness for data spaces.

4 Introduction to Data Space Interoperability Framework

This section introduces the different components of the Data Space Interoperability Framework. The conceptual model is made up of 3 blocks:

1. 4 Layers of interoperability
2. Capabilities contained in each layer
3. Requirements corresponding to each capability

4.1 Conceptual model

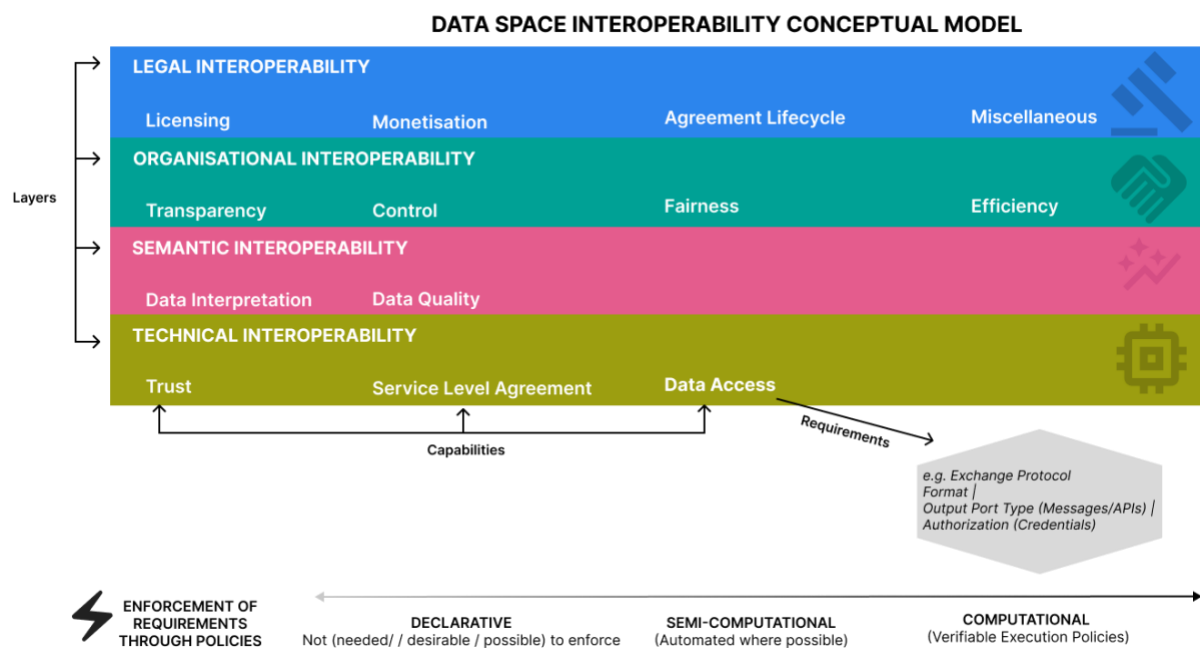


Figure 4. Data Space Interoperability Conceptual Model. Own source.

4.2 Layers of Interoperability

The author proposes the following layers of interoperability:

4.2.1 Legal and Regulatory Interoperability

The legal and regulatory compliance is oriented towards data sharing agreements, Covering licensing, monetisation, agreement lifecycles, and legal safeguards. These topics ensure clarity on the rights and obligations of the parties involved in the data-sharing exercise.

4.2.2 Organisational Interoperability

The organisational alignment focuses on transparency, control, fairness, and efficiency domains, enabling a balancing act between risk and reward to participate in a data-sharing exercise.

4.2.3 Semantic Interoperability

Semantic compatibility ensures standardised data exchange through well-defined specifications for access and integration. It goes further than technical systems and includes facilitating seamless data interpretation across the systems.

4.2.4 Technical Interoperability

Technical compatibility aims to improve the odds of implementing reliable and high-quality data exchange between separate systems. It addresses three key areas: trust specifications for identity management and data provenance, and service level agreements.

4.3 Classification of policies to enforce interoperability

The author proposes the following classification of policies based on the capability to execute them:



Figure 5. Policy Classification Diagram. Own source.

4.3.1 Declarative policies

Declarative policies serve as high-level directives that outline organisational requirements and compliance standards without specifying technical implementation details. These policies directly translate organisational values and legal requirements into written guidelines.

4.3.2 Semi-computational policies

Semi-computational policies attempt to narrow the gap between human-readable statements and automated enforcement mechanisms. These policies complement natural language specifications with programmatic validation where feasible. They particularly apply to measurable technical requirements like service level agreements and data quality standards.

4.3.3 Computational policies

Computational policies represent requirements that are fully capable of being automated. Executable rules that can be directly implemented in software systems.

5 Legal and Regulatory interoperability

This area is oriented towards data-sharing agreements, covering licensing, monetisation, agreement lifecycles, and legal safeguards. It ensures clarity on the rights and obligations of the parties involved in the data-sharing exercise.

This area can also be summarised as the terms and conditions necessary for sustainable data ecosystems.

5.1 Licensing Capabilities

It establishes the parameters that govern how data and services can be used within the ecosystem. A well-defined licensing structure is essential for maintaining trust, protecting intellectual property rights, and facilitating compliant data exchange between parties.

5.1.1 Scope

The extent to which data providers can define the boundaries of data usage and sharing permissions, specifying which datasets, services, and functionalities are included within the connected data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.1.2 Usage Restrictions

The extent to which data providers can define explicit limitations and restrictions on data utilisation. This helps establish precise parameters for how shared information can be processed, transformed, and applied across participating organisations and across data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.1.3 Rights

The extent to which data providers can define a list of rights and privileges, specific entitlements, and obligations regarding data access, modification, and distribution within and across data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.1.4 Geographical Area

The extent to which data providers can define a clear delineation of geographical and jurisdictional boundaries. This helps address cross-border data flows and regional compliance requirements for interconnected data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.1.5 Temporality

The extent to which data providers can define Time-based parameters and duration of data-sharing, including provisions for renewal, modification, and termination of access rights across data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.1.6 Exclusiveness

The extent to which data providers are able to define terms governing exclusive access or usage rights. This helps balance individual organisational interests with the broader goals of open collaboration and data space connectivity.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi- computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.1.7 Ownership

There must be an unequivocal declaration of the ownership status of the data provided in the data space, disclosing as much information as possible in good faith.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi- computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.2 Monetisation Capabilities

The monetisation capabilities define how value is captured and distributed when data and services are exchanged within the ecosystem. At its core, this capability addresses the pricing models that govern these exchanges, ensuring transparent and fair compensation for data providers while maintaining accessibility for data consumers. A clear monetisation strategy is crucial for sustaining the ecosystem's long-term viability, incentivising high-quality data sharing, and creating equitable value distribution among all participants. The pricing model must balance commercial interests with the broader goals of fostering innovation and collaboration.

5.2.1 Pricing model

The following is a list of the most popular pricing models that can be used for inspiration:

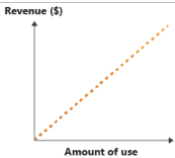
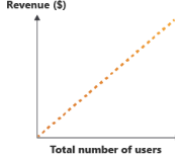
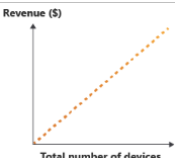
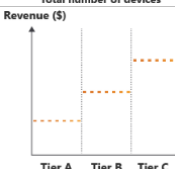
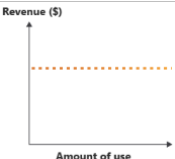
Model	Description	Illustration
Consumption-based pricing	Customers are charged based on the number of services or resources they use.	
Per-user pricing	A fixed price is charged for each user who has access to the service or product.	
Per-active user pricing	Like per-user pricing, but only users who actively use the service or product are charged.	
Per-unit pricing	Customers are charged based on the number of units they purchase or consume.	
Feature and service-level-based pricing	Pricing varies based on the features or level of service the customer selects.	
Freemium pricing	Basic services are provided for free, while advanced features or services are charged.	
Cost of goods sold pricing	Prices are set based on the cost of producing and selling the product, with no added profit margin.	
Flat rate pricing	A single fixed fee for a service, regardless of usage or users.	

Table 1. Pricing models

5.2.2 Payment model

The following is a list of payment models that can be used in a data space:

Payment model	Description	Pros	Cons
Centralised payment centre	The Data Space Infrastructure Service (DSIS) requires participants to settle payments using the platform.	+ Consistency for DSIS Provider + Simplicity for Provider/Consumer	- Complexity for Infrastructure Provider: A complex feature to maintain. - Higher Risk for DSIS Provider: it bears the financial risk if participants default on payments - Dependency: everyone relies on platform feature
Decentralised payment method	The Data Space Infrastructure Service (DSIS) requires participants to settle payments offline	+ Flexibility: participants can agree on different methods to transact directly + Reduced risk for DSIS provider	- Lack of opportunities to monetise for DSIS provider - Reduced trust as members must trust direct transactions with each other
Hybrid	The Data Space Infrastructure Service (DSIS) allows settlements within or outside the platform	+ Flexibility: participants can agree on different methods of payments + Revenue diversification for DSIS Provider: combine service fees with transactional fees	- Complexity: managing both models requires careful coordination.

Table 2. Payment models

The hybrid model mentioned in the previous table brings to the surface a potential combination of different fees:

#	Fees	Description	Reason	Requires payment in DSIS?
1	Transaction fees: Charge costs for model running + margin	Charge model consumers for the costs of running models and displaying results.	Could apply to complement other fees	Yes
2	Entry & Subscription fees	Charge model consumers for being onboarded in the platform and remain active.	This could apply if model consumers are expected to reduce costs by using the models listed.	No
3	Marketplace fees: Charge service providers for listing their offers in DSIS	Subscription for listing resource	This could apply if model providers expect to get new clients while being listed.	No

Table 3. Fees models

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.3 Agreement Lifecycle Capabilities

The agreement lifecycle capabilities establish the temporal framework and key transition points in data-sharing relationships between parties. A well-structured agreement lifecycle helps prevent disruptions in data flows and ensures all parties have clear expectations about the duration and evolution of their data-sharing arrangements within and across data spaces.

5.3.1 Notice Period

The extent to which standard notification timelines can be established for significant changes or termination of participation, ensuring both parties (provider and consumer) have adequate time to adapt their operations and data flows.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.3.2 Termination Conditions

The extent to which clear criteria and procedures for ending data-sharing relationships can be defined, including specific conditions that warrant termination and the required steps for proper disengagement from connected spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi- computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.3.3 Continuity Conditions

The extent to which provisions can be established to allow for uninterrupted data access if both parties agree, ensuring operational continuity and minimal disruption when the agreements reach their maturity.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi- computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.4 Miscellaneous Capabilities

The miscellaneous capabilities is an umbrella term to address crucial legal and operational considerations that underpin reliable data-sharing relationships. While these elements may appear supplementary, they form a critical foundation for risk management and legal compliance in data-sharing arrangements. A clear definition of these aspects helps prevent disputes, ensures accountability, and provides a framework for handling unexpected situations that may affect data-sharing agreements within and across data spaces.

5.4.1 Damages

The extent to which organisations can define responsibilities and compensation mechanisms for potential damages arising from data-sharing activities. This is especially important for establishing consistent protocols when data flows across diverse data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.4.2 Confidentiality

The extent to which explicit, robust safeguards can be declared to protect sensitive information, with a protocol for handling confidential data as it moves between organizations and across different data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.4.3 Applicable Laws

The extent to which participating organisations can align with relevant legal frameworks ensuring compliance across jurisdictions while maintaining consistent standards for data exchange.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.4.4 Warranties

The extent to which organisations can define clear assurances and guarantees regarding data quality, service levels, and performance. This provides participants with defined expectations and remedies across data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.4.5 Auditability

The extent to which organisations can define audit mechanisms to verify compliance and track data usage, enabling transparent oversight and accountability throughout interconnected data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

5.4.6 Force Majeure

The extent to which organisations can define circumstances beyond reasonable control which may affect data-sharing obligations, establishing clear protocols for managing disruptions while maintaining essential services where possible.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi- computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6 Organisational interoperability

Organisational interoperability focuses on transparency, control, fairness, and efficiency domains, enabling a balancing act between risk and reward to participate in a data-sharing exercise.

This area can also be summarised as the compatibility of ethical principles across data spaces.

6.1 Transparency Capabilities

The transparency guidelines form a crucial foundation for building trust and accountability in data-sharing relationships. These guidelines establish clear principles for ensuring that all participants have comprehensive access to essential information about business operations and organisational processes.

6.1.1 Easy and Transparent Access to Information

The extent to which the data space ensures straightforward discovery and retrieval of information across connected data spaces. Documentation should be structured and maintained.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.1.2 Transparent Business Model and Organisation

The extent to which the data space enables documentation and communication of business models and processes to support transparency between participating organisations, defining clear expectations across data spaces.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.1.3 Comprehensible Information and Data

The extent to which the data enables and encourages consistent formatting and documentation to enable seamless interpretation within and across data spaces, with standardised approaches to metadata and contextual information.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.1.4 Guaranteed Traceability of Data

The extent to which the data space maintains comprehensive records of data movement and modifications as information flows between systems until it reaches the data consumer.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.2 Control Capabilities

The extent to which essential safeguards are established to empower participants to maintain sovereignty over their data throughout its lifecycle. It must outline mechanisms for managing data transmission ensuring that data providers retain appropriate oversight of their information assets.

6.2.1 Necessary Control Tools for Data Usage

The extent to which every data space participant has access to robust tools and interfaces that enable monitoring and management of how their data is used, shared, and processed across interconnected environments.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.2.2 Guaranteed Control Over Data Transmission

The extent to which Data transmission sets verifiable control mechanisms that allow participants to oversee, regulate, and validate the movement of their data assets through standardised protocols and authentication methods.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.2.3 Optional Participation with Specific Conditions

The extent to which organisations can define and accept specific terms and conditions of the data product offerings. Including establishing flexible terms that accommodate varying levels of risk appetite and security needs.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.2.4 Clear Processes for Risk Identification and Reduction

The extent to which organisations can define an approach to identifying, assessing, and mitigating risks according to their risk appetite.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.3 Fairness Capabilities

The fairness capabilities establish fundamental principles to ensure equitable and balanced data-sharing practices across all participants. These capabilities address the critical need for proportional data exchange, non-discriminatory participation and protection of vulnerable groups in the dataset.

6.3.1 Exchange and Use Data Proportionality

The extent to which participants manage the volume and scope of data exchanged, proportional to legitimate business needs, such that its usage across data spaces remains appropriate and purposeful.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.3.2 Non-Discriminatory Conditions and Participation

The extent to which access to the data space is governed by uniform conditions that ensure equal opportunities for participation, preventing unfair advantages while maintaining consistent standards for all organizations regardless of their size or resources.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.3.3 Balance Between Interests of Different Actors

The extent to which the data space balances the diverse needs and objectives of all stakeholders, creating harmonised exchanges that serve both data providers and consumers while fostering sustainable collaboration.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.3.4 Strive for High Data Quality

The extent to which participants commit to maintaining and improving data quality through standardised metrics and validation processes. This ensures that shared information remains reliable and valuable across interconnected data spaces. Here, the concept of Data as a Product is particularly useful in that it conveys the idea of “readiness for consumption”.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.3.5 Special Protection for Vulnerable populations.

The extent to which the data space implements safeguards when handling data related to vulnerable populations, establishing additional layers of protection while enabling necessary service delivery and support. The vulnerable populations include but are not limited to children, adolescents and the elderly.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.4 Efficiency Capabilities

The efficiency guidelines establish core principles for optimising the operational and technical aspects of data-sharing ecosystems.

6.4.1 Effective Application and Implementation of Conditions

The extent to which governance requirements are practical and enforceable. With clear mechanisms for applying conditions across data spaces that minimise friction while ensuring compliance with established agreements.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

6.4.2 Easy and Free Access to Data

The extent to which procedures minimise technical complexity and cost barriers. It also includes the easiness of importing, referring and reusing Open data.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

7 Semantic Interoperability

Semantic interoperability ensures standardised data exchange through well-defined capabilities for interpretation and quality.

This area can be summarised as the technical conventions for data usage.

7.1 Data Interpretation Capabilities

The Data Access Capabilities define the fundamental elements required for seamless and standardised data exchange between systems. These capabilities serve as the foundation for achieving semantic interoperability, enabling different systems to exchange data and interpret it correctly and consistently.

7.1.1 Vocabulary (Schema)

The extent to which the data space regulates data models and semantic definitions through common vocabularies and schemas. This helps organisations ensure consistent interpretation of information meaning and structure across interconnected data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

7.2 Data Quality Capabilities

Data quality forms the bedrock of meaningful and valuable data exchange, directly impacting the utility and reliability of shared information. The Data Quality Capabilities define essential requirements and criteria that ensure shared data meets rigorous quality standards.

7.2.1 Accuracy | Completeness

The extent to which organisations can define thresholds for data precision and comprehensiveness. This helps organisations ensure that shared information meets fundamental requirements for reliability and usability across spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

7.2.2 Conformity | Consistency

The extent to which organisations can verify that data adheres to defined formats and maintains internal consistency. This helps organisations enable seamless integration and processing across interconnected systems.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

7.2.3 Coverage | Timeliness

The extent to which organisations can define parameters for expected data scope and temporal relevance. This helps organisations ensure shared information provides appropriate coverage and remains current for its intended use across data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

7.2.4 Validity | Uniqueness

The extent to which organisations can confirm data authenticity and prevent redundancy, establishing mechanisms to validate information integrity and maintain unique records across data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8 Technical Interoperability

Technical compatibility aims to improve the odds of implementing reliable and high-quality data exchange between separate systems. It addresses three key areas: trust specifications for identity management and data provenance, comprehensive service level agreements and data quality specifications.

This area can be summarised as the technical conventions to execute data transactions.

8.1 Trust Capabilities

Trust is a fundamental cornerstone of effective data sharing and exchange between organisations. The Trust Capabilities outline the essential mechanisms and requirements for establishing and maintaining trustworthy relationships between participating entities. These specifications serve as the technical foundation for building confidence in data-sharing relationships and enabling secure, reliable interactions between participants.

8.1.1 Natural Person Registry

The extent to which the data space supports a system to maintain verified identities of individual users and their roles, enabling secure authentication and appropriate access rights while ensuring personal data protection across connected data spaces.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.1.2 Legal Person Registry

The extent to which the data space supports standardised registration and verification mechanisms for participating organisations, including maintaining records of their status, certifications, and authorised interactions within and across data spaces.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.1.3 Data Provenance

The extent to which the data space enables the tracking of data origins, transformations, and movements, providing verified records of data lineage.

Capability Requirement	Low	Medium	High
Weight	x0	x1	2x
Total score			

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.2 Service Level Agreement Capabilities

It establishes clear, measurable performance standards that govern the operational aspects of data-sharing arrangements. These capabilities define critical metrics and thresholds that ensure reliable, efficient, and responsive data exchange between parties.

8.2.1 Latency | Uptime | Response Time

The extent to which organisations can define performance metrics for data transmission and system availability. Including acceptable thresholds for delays, system accessibility, and processing speeds across interconnected data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.2.2 Error Rate | Update Frequency

The extent to which organisations can define reliability standards for maximum acceptable error rates and required update frequencies. This helps ensure data quality and system currency while maintaining operational efficiency.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.2.3 End of Support | End of Life

The extent to which organisations can define timelines for system support and eventual retirement. This helps enable participants to plan transitions and maintain continuity across connected spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.2.4 Time to Detect | Time to Notify | Time to Repair

The extent to which organisations can define timeframes for identifying issues, notifying affected parties, and implementing solutions. This helps organisations ensure consistent incident management across the data space network.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.3 Data Access Capabilities

It focuses on the technical means to transfer data seamlessly. A clear definition of these aspects reduces the time to integrate disparate systems within and across data spaces.

8.3.1 Data Exchange Protocol

The existence of pre-defined exchange protocols (e.g. International Data Spaces Association Protocol) that standardizes the technical access to data for all participants.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.3.2 Format

The extent to which the data space regulates standardised data formats and structures, ensuring consistent interpretation and processing of information as it moves between different systems and data spaces.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.3.3 Output Port Type (Messages/APIs)

The extent to which the data space regulates the Interface requirements including supported communication protocols and API standards.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi-computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

8.3.4 Authorisation (Credentials)

The extent to which the data space regulates credential requirements and authentication methods.

Capability Requirement Enabled	Yes	No
Weight	x0	x1
Total score		

Policy Enforcement	Declarative-only (Low)	Semi- computational (Medium)	Computational (High)
Weight	x1	1.5x	2x
Total score			

9 Sample Scorecards

Example 1: A data space with the maximum number of requirements, relying on fully automated and policies:

Layer	Score
Legal	36
Organisational	60
Semantic	10
Technical	44
INTEROPERABILITY SCORE	150

Example 2: A data space with low requirements, relying on declarative policies only:

Layer	Score
Legal	0
Organisational	0
Semantic	0
Technical	0
TOTAL	0

Example 3: A data space with medium requirements relying on declarative policies for organisational and legal capabilities, but relies on semi-computational policies for technical and semantic capabilities:

Layer	Score
Legal	18
Organisational	15
Semantic	7.5
Technical	16.5
TOTAL	57

For more details refer to the companion excel spreadsheet

10 References

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