TNO report

Eemsgolaan 3
9727 DW Groningen
P.O. Box 1416
9701 BK Groningen
The Netherlands

www.tno.nl

T +31 88 866 70 00
F +31 88 866 77 57

ISHARE as generic trust framework capability

- The role of iSHARE for federative data sharing and data spaces
- Reflections on the relation to the Basic Data Infrastructure (BDI)

A TNO expert opinion

Date	June 2022
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Author	H.J.M. (Harrie) Bastiaansen, PhD

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Management summary

This report provides an independent TNO expert opinion on iSHARE as generic trust framework capability, encompassing:

1. the potential role for (further developing) iSHARE as generic trust framework capability for the logistics sector to support both B2B and B2G data sharing,

2. the possibilities for iSHARE to enable data sharing in (and across) other sectors and application areas, for instance the mobility sector and the energy sector, and

3. the broader perspective of iSHARE in the context of the European Data Strategy and data sharing initiatives.

The results on the positioning of iSHARE as generic trust framework capability are provided as observations and recommendations from the functional (on both intra and inter data space interoperability) perspective, the governance perspective and the legal perspective. The observations and recommendations for each of these perspectives are summarized in the tables below. For their elaboration and motivation, the reader is referred to the corresponding section in the report.

Observations on iSHARE as generic trust framework capability	
Functional Perspective Intra Data Space Interoperability (Section 3.3)	**Functional Perspective** Inter Data Space Interoperability (Section 4.3)
• *ISHARE provides generic capabilities and is starting to be used in various sectors and application areas.* • *Alternative architectures for trust framework capabilities are being developed by the main European initiatives on reference architectures for federative data sharing and data spaces.* • *The level of maturity of ISHARE trust framework capabilities is ahead of alternative trust framework capabilities being developed as part of the main European initiatives on reference architectures for federative data sharing and data spaces.* • *ISHARE is aligning with the main European initiatives on reference architectures for federative data sharing and data spaces.*	• *Inter data space interoperability is only starting to be addressed in the main European reference architecture initiatives on federative data sharing and data spaces.* • *ISHARE Satellites are based on a full harmonization approach for inter data space interoperability. In case of agreement on adherence to the iSHARE scheme this enables low-barriers for and efficiency in deployment.* • *The iSHARE Satellites approach needs to be augmented with partial harmonization architecture capabilities for inter data space interoperability.*

Observations on iSHARE as generic trust framework capability (continued)	
Governance Perspective (Section 5.3)	**Legal Perspective** (Section 6.3)
• *Federative data sharing, data spaces and the role of trust frameworks therein are of public interest.* • *Coherence across federative data sharing, data spaces and trust framework initiatives requires aligned or integrated governance.* • *A joint and aligned European governance framework for federative data sharing (and the role of trust frameworks therein) is only starting to emerge.*	• *Mandatory sharing of data with governmental agencies doesn't conflict with iSHARE.* • *International initiatives develop for negotiation of legally binding agreements per data sharing transaction. It hasn't proven technical and market viability yet.*

Recommendations on iSHARE as generic trust framework capability	
Functional Perspective Intra Data Space Interoperability (Section 3.4)	**Functional Perspective** Inter Data Space Interoperability (Section 4.4)
• *Support iSHARE as generic trust framework capability.* • *Provide evolution roadmap and scenario's towards inclusion of the extensive data space capability sets.* • *Monitor and assess the developments on alternative trust framework capabilities as part of the main European initiatives on reference architectures for federative data sharing and data spaces.* • *Design and plan for migration scenario's towards alternative, distributed, trust framework capabilities.*	• *Prepare for interoperability between iSHARE-based and not iSHARE-based data spaces.*
Governance Perspective (Section 5.4)	**Legal Perspective** (Section 6.4)
• *Develop a public-private governance structure for federative data sharing and the role of iSHARE therein.* • *Embed the governance structure for federative data sharing (and the role of iSHARE therein) in a broader European governance framework.* • *Provide adequate resources to assure quality and continuity.* • *Overcome start-up hurdles towards large-scale adoption by stimulating initial implementations.*	• *Prevent individual tendering obligations for (iSHARE) trust framework capabilities by separate data space initiatives.* • *Do an in-depth assessment by legal experts on the role of identity brokers in view of public and private law.*

The observations and recommendations as listed in the tables lead to overarching conclusions that are drawn on iSHARE as generic trust framework capability.

- With iSHAREs prominent position in the Netherlands and its high visibility in the various European initiatives that lead the international development for federative data sharing and data spaces, iSHARE is in a good position for becoming a leading international generic trust framework capability. As such, it is advised to support the development and deployment of iSHARE as trust framework and adequately enable it to continue its alignment with these European initiatives. This advice also underlies the observations and recommendations on the governance perspective. An assessment on the scalability and performance (under the ambition of large-scale adoption) may be required.

- A major benefit of iSHARE is in its capabilities to support trusted data sharing between multiple data spaces. As such, it is of major benefit to align the adoption of iSHARE across sectors, starting with the logistics and mobility sector.

- The (inter-)national environment of federative data sharing and data spaces is still in development. This also holds for trust framework capabilities. Specifically, the main European initiatives on federative data sharing and data spaces (IDSA, GAIA-X, ….) are developing alternative, fully distributed, trust framework capabilities for identity, authentication and authorization (IAA), contract negotiation and usage control. These developments still have to prove their technical and market viability and are not yet sufficiently mature to be deployed at a large scale on the short term. Over time and for specific application areas these may provide an alternative for the more centralized trust framework capabilities as currently provided by iSHARE. Moreover, tt is to be expected that these various approaches and solutions will coexist. In view of these developments it is advised that iSHARE adoption is accompanied by (1) a vision and roadmap on whether and how develop and align its trust framework capabilities with the developments on alternative, fully distributed, trust framework capabilities, and (2) migration scenario's providing data space participants a smooth and seamless (service and technical) evolution trajectory for these developments.

Based on this broader perspective on the international developments on federative data sharing, data spaces and the potential role of iSHARE as trust framework therein, reflections are made on the policy for deploying generic data space and iSHARE trust framework capabilities in the context of the Basic Data Infrastructure (BDI). The Digital Transport Strategy for freight transport from the MinI&W has set the ambition and policy towards full digitization of freight transport information streams. A main pillar is the development of the BDI, acting as a foundation of trust for federative data sharing. It refers to the European Communication on a common European data space as a way forward for the MinI&W to realize full digitization of freight transport. As such, the BDI can be considered as a data space for the logistics sector, operating within a larger ecosystem of emerging European data spaces in other sectors and application areas. Jointly, they pave the way towards fully exploiting the business potential for the emerging data economy.

The basics for the BDI are defined in the EU FEDeRATED initiative. FEDeRATED has developed a semantic model and an architecture for pull-based federative data sharing, in which data remains at the source. The pull-mechanism requires Identification, Authentication, and Authorization (IAA) services / building blocks. The long term preferred for FEDeRATED is that every organization applies its own identity

and access management capabilities, supported by Self Sovereign Identities (SSIs) and Decentralized IDentifiers (DIDs).

Whereas SSI and DIDs are considered the best solution for the future, they may not (yet) be acceptable by the public and private sector on the short term. Using the iSHARE trust framework capabilities may be considered for the short term.

Moreover, the goal of the FEDeRATED initiative and the BDI for developing the IAA trust framework capabilities towards distributed architectures aligns with the goals for development of similar capabilities with the main European initiatives on federative data sharing and data spaces that are working towards the ambition of the European Data Strategy, most notably GAIA-X. Hence, whether and how to align the BDI development in relation to the developments within the main European initiatives on federative data sharing and data spaces seems to be mainly a policy decision, less a technical decision. Alignment and collaboration at an early stage may lead to mutual benefits and prevent from potential complex and costly future migration and integration trajectories. Therefore, it is recommended to do a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and an impact analysis on aligning the trust and IAA approach of the BDI with the capabilities being developed in the European generic initiatives on federative data sharing and data spaces, i.e. OPEN DEI, iSHARE, IDSA and GAIA-X.

This report has been made on assignment by the Ministry of Infrastructure and Water Management (MinIenW) and the Top Sector Logistics (TSL). The TNO expert opinion in terms of observations and recommendations apply on the capabilities of the iSHARE trust framework for data spaces. An assessment on the applicability of other trust frameworks has not been part of the assignment. This also holds for an assessment of the scalability and performance of the iSHARE trust framework capabilities.

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1 Introduction

1.1 Background

The Digital Transport Strategy for freight transport defines the long-term plan of the Ministry of Infrastructure and Water Management (MinIenW) to realize full digitization of freight transport information streams [1]. The development of a Basic Data Infrastructure (BDI) is one of the three milestones that has been identified in the Digital Transport Strategy. The Digital Transport Strategy refers to the European Communication on a common European data space [2] as a way forward for the MinI&W to realize full digitization of freight transport by means of the BDI.

A trust framework is considered a main capability of a data space, being suitable for both Business-to-Government (B2G) and Business-to-Business (B2B) applications. The iSHARE trust framework for data spaces [3] (simply referred to as 'iSHARE') is considered to provide this capability. ISHARE has its origins for B2B data sharing in the logistics sector [4]. It has potential to be broader applicable as trust framework, both for other sectors and application areas, for various types of data sharing and for data sharing both within a specific data space and between multiple data spaces.

1.2 The scope of the report

This report provides an independent TNO expert opinion on iSHARE as generic trust framework capability, encompassing:

1. the potential role for (further developing) iSHARE as generic trust framework capability for the logistics sector to support both B2B and B2G data sharing,

2. the possibilities for iSHARE to enable data sharing in (and across) other sectors and application areas, for instance the mobility sector and the energy sector, and

3. the broader perspective of iSHARE in the context of the European Data Strategy and data sharing initiatives.

The results in this report are provided as observations and recommendations on the positioning of iSHARE as generic trust framework capability from both the functional perspective, the governance perspective and the legal perspective, and as reflections on the policy for deploying generic data space and iSHARE trust framework capabilities in the context of the BDI.

1.3 The scope limitations

Based on experience in data sharing initiatives and projects within logistics and various other sectors, four main types of business data sharing can be distinguished [5]: (1) Sharing of operations data for collaborative optimization, (2) Sharing of supply chain data for real-time visibility, (3) controlled access to sensitive data for data analytics, and (4) sharing of real-time streaming data. Each of these four types of business data sharing has its own characteristics and requires trust framework capabilities. Within the scope of this report are the types (1) and (2). The types (3) and (4) are out-of-scope of the expert opinion in this report.

Additional aspects that are out-of-scope of the expert opinion in this report:

- an assessment on the applicability of other trust frameworks, and

- an assessment of the scalability and performance of the iSHARE trust framework capabilities.

1.4   The methodology

The role of iSHARE as generic trust framework capability for federative data sharing is ever more becoming intertwined with the broader perspective on the international developments thereof in the context of the European Data Strategy and its associated European reference architecture development initiatives. Therefore, this broader perspective on federative data sharing and data spaces form a main part of the expert opinion in this report, addressing three main perspectives on iSHARE as generic trust framework capability: the functional, governance and legal perspective.

Moreover, this broader perspective on the international developments (and the role of iSHARE therein) also provide the background and basis for the reflections on the policy for deploying generic data space and iSHARE trust framework capabilities in the context of the BDI.

The results of the TNO expert opinion in this report are based on:

- interviews with various stakeholders of iSHARE (see the annex),

- desk-top literature research,

- TNO-expertise on iSHARE through working with iSHARE implementations and collaboration with the iSHARE Foundation in various contexts, and

- TNO-expertise on developments on federative data sharing, data spaces and the role of trust frameworks therein in various (inter-)national data sharing initiatives.

1.5   The structure of report

The report has the following structure: Chapter 2 starts with describing the broader perspective on federative data sharing (data spaces) within which iSHARE as generic trust framework capability is considered. The subsequent chapters present the TNO expert opinion on (the further development of) iSHARE as generic trust framework capability for federative data sharing and data spaces from various perspectives. Chapter 3 and chapter 4 address the functional perspective for intra and inter data space interoperability, respectively. Chapter 5 addresses the governance perspective. Chapter 6 addresses the legal perspective. Each of these chapters includes paragraphs describing the context, the positioning of iSHARE, observations and recommendation. The final chapter 7 provides additional overarching conclusions on iSHARE as generic trust framework capability for federative data sharing and data spaces. Moreover, this chapter provides reflections on the policy for deploying generic data space and trust framework capabilities for the development of the BDI, and the role of iSHARE therein.

2 The broader perspective: federative data sharing

This chapter addresses iSHARE as (generic) trust framework capability for federative data sharing from the broader perspective of the (inter-)national developments on federative data sharing and data spaces. The sections in this chapter subsequently address the Digital Transport Strategy, the European Data Strategy, the role of trust frameworks as integral part of a data space, the relation to interoperability within and between data spaces and the duality in generic and specific development lines, respectively.

2.1 Digital Transport Strategy, federative data sharing and BDI

The Digital Transport Strategy [1] defines the BDI as a federated network of platforms and IT systems that offers companies and governments the procedural and technical capabilities to securely share good quality data with each other in a decentralized, open and neutral manner. It acts as a foundation of trust, so that parties can make data available to each other from within their own systems. Currently, this approach is more generically referred to as 'federative data sharing'. Federative data sharing is considered as an attractive option to address the challenges for fully exploiting the business potential for the emerging data economy: it enables the (sharing of) ubiquitous available data, whilst adhering to the European values of data sovereignty.

The Digital Transport Strategy refers to the European Communication on a common European data space [2] as a way forward for the MinI&W to realize full digitization of freight transport.

2.2 European Data Strategy: data spaces

Federative data sharing is clearly on the radar of the European Commission. Its release of the European Data Strategy [6], the Data Governance Act [7] and the additional input sought on data spaces through the OPEN DEI initiative [8] [9] illustrate the importance the EU attributes to data sharing for society and economy. Moreover, various (European and national) initiatives are exploring the potential, architectures and implementations for federative data sharing. An extensive overview on federative data sharing initiatives is given in [10].

The ambition on federative data sharing as expressed in the EU Data Strategy can be summarized as:

> *'Towards a federation of interoperable data spaces'.*

The EU OPEN DEI initiative is building upon this ambition. It has defined a data space as "a *decentralized infrastructure for trustworthy data sharing and exchange in data ecosystems based on commonly agreed upon principles*", requiring the following elements [9]:

- *building blocks such as data platforms*, providing support for effective data sharing and exchange as well as for engineering and deployment of data exchange and processing capabilities;

- *building blocks such as data marketplaces*, where data providers can offer and data consumers can request data, as well as data processing applications;

- *building blocks ensuring data sovereignty*, i.e. the ability for each stakeholder to control their data by making decisions as to how digital processes, infrastructures, and flows of data are structured, built and managed, based on an appropriate governance scheme enabling specification of terms and conditions.

2.3 Trust framework as integral part of a data space

The OPEN DEI initiative [9] has elaborated the data space concept in terms of a soft infrastructure consisting of 12 building blocks as depicted Figure 1.
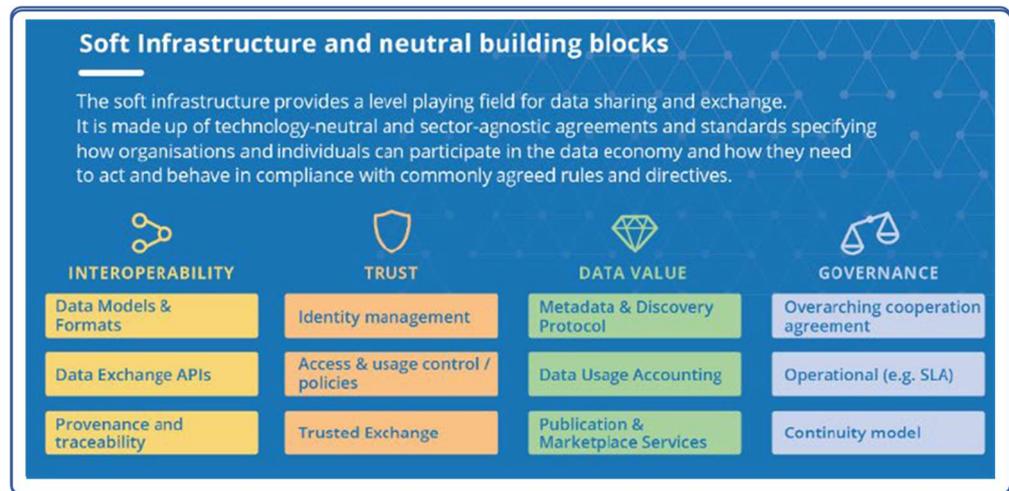

Figure 1: The OPEN DEI soft infrastructure and neutral building blocks [9].

As the figure shows, the OPEN DEI soft infrastructure distinguishes between technical building blocks (in the verticals 'Interoperability', 'Trust' and 'Data Value') and governance building blocks (in the vertical 'Governance').

Moreover, the figure shows that trust and its associated building blocks are a key and integral part of the data space concept. Jointly they can be referred to as a trust framework. OPEN DEI defines a trust framework as '*a structure that lets people and organizations do business securely and reliably online*'. Typically, a trust framework includes capabilities for legal agreements between participants in a data space, for transaction specific data sharing agreements and for data sovereignty management.

2.4 Data space interoperability: intra and inter data space interoperability

In view of the European ambition summarized in section 2.1 as *'Towards a federation of interoperable data spaces'*, both interoperability within individual data spaces and interoperability between multiple data spaces need adequate architectures and governance. These are referred to as intra and inter data space interoperability, respectively:

- *Intra data space interoperability:* Individual data spaces have a high degree of autonomy in developing and deploying their own internal agreements and architecture. Intra data space interoperability focusses on the alignment of the various capabilities (building blocks) within an individual data space.

- *Inter data space interoperability:* Interoperability between multiple data spaces is key for the federation of data spaces as expressed in the ambition of the EU Data Strategy. Inter data space interoperability requires alignment and guidelines for individual data spaces to ensure interoperability between them.

Figure 2 illustrates the concepts of intra and inter data space interoperability.
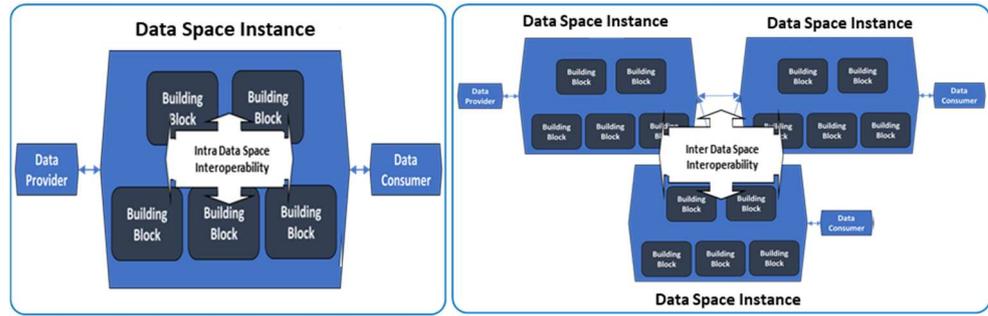

Figure 2. Intra (l) and inter (r) data space interoperability.

Data space interoperability is more than merely the interoperability of technical components. An approach to systematically categorize the interoperability aspects is provided by the new European Interoperability Framework (EIF) as developed by the European Commission [11]. As Figure 3 depicts, the EIF distinguishes four interoperability levels (technical, semantic, organizational and legal) under an overarching integrated governance approach.
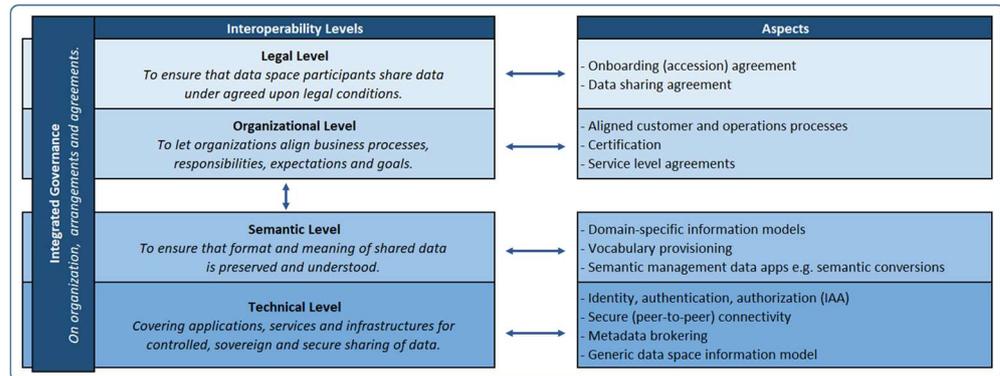

Figure 3. Layered functional model as aligned with the New European Interoperability Framework [11].

Each of the four EIF interoperability levels needs to be addressed in developing the interoperability architecture for data spaces, both for intra and inter data space interoperability. Moreover, various interoperability aspects are further distinguished within each of the four levels of the EIF, as described in the right column in the figure.

2.5   Duality in (European) initiatives: generic and specific

The value and potential of federative data sharing is ever more recognized as a key enabler of the emerging data economy. As such, it is clearly on the radar of the European Commission. Many European initiatives are being undertaken to support the development and deployment of federative data sharing. From a high-level perspective, these initiatives can be categorised into:

- *Generic initiatives,* aiming at basic federative data sharing capabilities applicable to and over multiple sectors and application areas.

- *Specific initiatives,* targeting a specific sector and / or a specific application area and providing domain-specific data sharing and value adding functionalities.

This duality in generic and specific initiatives potentially leads to frictions. The specific initiatives may offer business value for a specific sector or application area by means

of targeted development, whilst the generic initiatives may offer business value for society as a whole but requires broad adoption and alignment. Such frictions however can (and should) be overcome by mutual alignment and close collaboration. This however, is not 'automatically' guaranteed and it should be considered as a joint responsibility to collaborate and seek alignment.

3 Functional perspective: intra data space interoperability

This chapter addresses the functional perspective on the trust framework capabilities that iSHARE may contribute for sharing data within individual data spaces, i.e. to intra data space interoperability.

3.1 Context

The European Data Strategy (see section 2.2) and various, associated, EU initiatives work on defining and aligning federative data sharing and data space reference architectures and developing reference implementations for their enabling building blocks.

A main initiative defining the policy, approach and building blocks is the EU OPEN DEI initiative. It aims at supporting the creation of common data platforms based on a unified architecture and an established standard. The OPEN DEI initiative has defined (the scope of) a data space in the context of the European Data Strategy and has described the OPEN DEI soft infrastructure with 12 building blocks for realizing data spaces, as described in section 2.3 and depicted in Figure 1.

The OPEN DEI soft infrastructure and its building blocks have been identified and described at a high abstraction level. Technical specification and elaboration of the building blocks are done by various European initiatives on reference architectures and implementations. The most noteworthy of these EU initiatives are:

- The *International Data Spaces Association (IDSA)* initiative, having developed a reference architecture model for data spaces [12]. The IDS data space architecture leverages existing standards and technologies as well as governance models for the emerging data economy. It facilitates secure and standardized data exchange and data linkage in a trusted (business) ecosystem, thereby providing a basis for creating smart service scenarios, while at the same time guaranteeing data sovereignty for data owners. The IDSA GitHubs provide both a repository with the specifications for the IDS components [13] and an overview of repositories with IDS open source components [14].

- The *GAIA-X initiative* having the goal to establish an ecosystem in which data is made available, collated and shared in a trustworthy environment in which entitled parties always retain sovereignty over their data [15]. It develops a software framework of control and governance and implements a common set of policies and rules that can be applied to existing cloud / edge technology stacks to obtain transparency, controllability, portability and interoperability across data and services. The GAIA-X architecture aims at a set of interconnected data and infrastructure ecosystems, enabled by a set of GAIA-X Federation Services (GXFS) [16], which are categorized into four groups: Identity & Trust, Data Sovereignty Services, Federated Catalogue and Compliance.

- The *Data Space Business Alliance (DSBA) initiative* [17] that has recently started and in which the International Data Spaces Association (IDSA) GAIA-X work together with the Big Data Value Association (BDVA) and the FIWARE

Foundation towards an aligned and coherent architecture for data spaces. The work on the DSBA coherence architecture has only recently started and is under development.

3.2 Positioning iSHARE

The iSHARE trust framework is based on the OAuth2.0 protocol [18]. The OAuth2.0 protocol is commonly used as an implementation technology for policy management with access tokens, based on generic web service calls in the form of APIs using access tokens for authentication of data consumers by the data provider. A two-stage approach is followed in which (1) an access token is obtained from the data provider, based on approval provided by the entitled party, with which (2) the data can be retrieved from the data provider. Policy enforcement capabilities are only required for the data provider.

Based on this technology, iSHARE currently provides the following trust framework capabilities to support individual data spaces [4]:

- *Participant trust registration and administration*

  The iSHARE participant register node (iSHARE Satellite) is used to register (membership of) participants in a data space. It ensures that the coverage by the iSHARE legal framework and is digitally verifiable. In an iSHARE Satellite data space administrators can register participants with a unique ID, EIDAS identification and public key, signed Terms of Use and possible additional terms and Chamber of Commerce documentation to assure that the contract is legally signed.

- *Participant discovery and status information*

  Every iSHARE Satellite has API's to serve as source for participant information for a data space. It allows for automated participant discovery in data spaces and to retrieve data from a single or a selection of participants in the iSHARE Satellite.

- *Authorization Registry*

  An iSHARE Authorization Registry can be used to manage (delegations of) data access or usage rights for data space participants to other data space participants. For instance, a data service consumer can delegate rights to another data space participant which then becomes the (delegated) data service consumer. Multiple service providers are currently providing iSHARE Authorization Registry services.

3.3 Observations

The following observations are made on the positioning of iSHARE from the intra data space interoperability perspective:

- *ISHARE provides generic capabilities and is starting to be used in various sectors and application areas.*

  The iSHARE trust framework stems from the logistics sector in the Netherlands. Its capabilities are generic. Domain specific features for the data being shared (e.g. the semantics) are not part of the iSHARE capabilities. As such, iSHARE can be characterized as a generic initiative as described section 2.5. As provider

of trust framework capabilities it can be used in various application areas and sectors. Moreover, this is already being illustrated by the current developments in (the intention of) incorporating iSHARE as part of:

- the DVU (Datastelsel Verduurzaming Utiliteit) allowing companies and organizations to share their energy and building data more easily and more securely as key enabler for sustainability [19], and

- the DSGO (Digitaal Stelsel Gebouwde Omgeving) aiming at a set of uniform agreements that ensure safe, reliable and controlled access to data in the construction / building sector [20].

- *Alternative architectures for trust framework capabilities are being developed by the main European initiatives on reference architectures for federative data sharing and data spaces.*

   The international initiatives as listed in section 3.1 are further developing the architectures for federative data sharing, data spaces and the role of trust frameworks therein. Two developments need specific attention:

   - The development towards more distributed trust framework capabilities by means of federative contract negotiation and usage control. An approach that supports contract negotiation of legally binding agreements per data sharing transaction and policy enforcement to manage usage policies is currently being developed by the IDSA and is expected to be adopted by GAIA-X as well. A two-stage approach is followed in which (1) a data sharing contract is negotiated between a data provider and a data consumer, based on which (2) the data provider shares the data with the consumer.

   - The development of fully distributed implementations of Identity, Authentication and Authorization (IAA) capabilities, based on Self Sovereign Identities (SSIs) and Decentralized IDentifiers (DIDs), as an alternative for the more centralized implementations of the IAA capabilities as currently realized by the iSHARE and IDSA architectures. This development is specifically pursued by GAIA-X and the BDI (FEDeRATED) architecture as will also be reflected upon in section 7.2.

- *The level of maturity of ISHARE trust framework capabilities is ahead of alternative trust framework capabilities being developed as part of the main European initiatives on reference architectures for federative data sharing and data spaces.*

   The maturity status of the trust framework capabilities as part of the European initiatives as listed above differs from the maturity status of the iSHARE trust framework capabilities. The architectures for distributed trust framework capabilities within IDSA, GAIA-X and DSBA are in development. Large scale technical feasibility and market acceptance still have to be proven. In the meantime, market developments need solutions for the short-term. ISHARE is well-positioned to serve the current market needs and is gaining a market position in various sectors and application areas.

- *ISHARE is aligning with the main European initiatives on reference architectures for federative data sharing and data spaces.*

   ISHARE is aligning with the European Data Strategy and its associated EU initiatives working on defining federative data sharing and data space reference

architectures. This applies to the IDSA, GAIA-X and DSBA as described in the previous section.

The main focus of these European initiatives is on developing (technical) architectures, less on the associated trust frameworks. Nevertheless, as described in section 2.3, a trust framework is an integral part of a data space.

As such, iSHARE is currently well positioned and aligning the these European initiatives to be integrated. Moreover, iSHARE has been included as one of the best practices in a recently published international analysis by the European Commission on industry agreements for digital value chains [21].

Through the EU i4Trust initiative [22] iSHARE is cooperating with the FIWARE Foundation [23] on integrating a trust framework as integral part of the data space architecture.

3.4   Recommendations

The following recommendations are made on the positioning of iSHARE from the intra data space interoperability perspective:

- *Support iSHARE as generic trust framework capability.*

  ISHARE has a prominent position as generic trust framework capability in the Netherlands. It has high visibility in the various EU initiatives that lead the international development for federative data sharing and data spaces. Therefore, iSHARE is in a good position for becoming a main generic trust framework capability. As such, it is important to support the development and deployment of iSHARE as trust framework and adequately enable it to continue its alignment with these EU initiatives in becoming a leading generic trust framework capability.

- *Provide evolution roadmap and scenario's towards inclusion of the extensive data space capability sets.*

  As indicated in the OPEN DEI soft infrastructure and its 12 building blocks (as described in sections 2.2 and 2.3 and depicted Figure 1, federative data sharing and data spaces encompass a multitude of capabilities and building blocks in addition to the trust framework capabilities. As such, adopting iSHARE can be consider a (first) step as part of the realization of a broader and more extensive data space ambition. An adequate *evolution roadmap and scenario's* to ensure future proof evolution towards *inclusion of the extensive data space capability sets* as being developed by the main European initiatives on federative data sharing and data spaces (IDSA, GAIA-X, ….).

- *Monitor and assess the developments on alternative trust framework capabilities as part of the main European initiatives on reference architectures for federative data sharing and data spaces.*

  As described in the previous section, the main European initiatives on federative data sharing and data spaces (IDSA, GAIA-X, ….) are developing alternative, fully distributed, trust framework capabilities for IAA, contract negotiation and usage control. Over time and for specific application areas these may pose an alternative for the more centralized trust framework capabilities as currently provided by iSHARE. These development should be monitored and assessed on market and technical viability.

- *Design and plan for migration scenario's towards alternative, distributed, trust framework capabilities.*

In view of these developments on alternative, fully distributed, trust framework capabilities by the main European initiatives on federative data sharing and data spaces, it is key that adoption of iSHARE is accompanied by a migration scenario providing iSHARE data space participants a smooth and seamless (service and technical) evolution path towards incorporation of additional intra and inter data space interoperability features.

4 Functional perspective: inter data space interoperability

This chapter addresses the functional perspective on the trust framework capabilities that iSHARE may contribute for sharing data between multiple data spaces, i.e. to inter data space interoperability.

4.1 Context

Interoperability between data spaces is a key aspect of the EU Data Strategy, which has been summarized in section 2.1 as *'Towards a federation of interoperable data spaces'*. The Data Sharing Coalition (DSC) addresses interoperability between multiple data spaces in its Data Sharing Canvas [24]. It introduces the concept of 'harmonization', which is defined as *'the establishment of agreements, standards, and requirements between participants to enable data sharing between them'*.

As the Data Sharing Canvas describes, interoperability between multiple data spaces can be achieved via full or partial harmonization:

- In case of *full harmonization* of data spaces, individual data spaces adhere to the same harmonized requirements and principles. Full harmonization between data spaces provides major advantages for inter data space interoperability, both functionally and on ease and efficiency in realization. Nevertheless, full harmonization between of data spaces is often not feasible in practice and will also be an utopia for all newly formed data spaces. For existing data spaces for example, going for full harmonization with other data spaces may have a big impact in terms of alignment and migration efforts and costs.

- The Data Sharing Canvas therefore introduces *partial harmonization* through a new component, called a data space proxy, that absorbs the complexity of harmonization of data spaces. Proxies allow data consumers and providers within a data space to simply connect to other data spaces via their proxy. Proxies have the main functionality of translating data space specific transactions to their harmonized equivalents, thereby facilitating interoperable transactions and creating an understanding of concepts like trust and security across data spaces. Proxies may separately operate at the individual interoperability levels of the EIF interoperability architecture as depicted in Figure 3.

Both full and partial harmonization are applicable to each of the interoperability levels of the EIF interoperability architecture as depicted in Figure 3.

Both full and partial harmonization are expected to be required to support the diversity of existing and emerging data space implementations. Therefore, both harmonization options are to be taken into account when considering the role of iSHARE trust framework capabilities for inter data space interoperability.

4.2 Positioning iSHARE

To support individual data spaces iSHARE currently provides the following capabilities [4]:

- *Participant discovery and status information across data spaces*

The iSHARE Satellite API's allow for automated participant discovery and participant status information retrieval across iSHARE satellites / data spaces. This may apply to a single or to a selection of participants in the network of iSHARE Satellites.

- *Data space profile registration*

  As part of the network of (synchronized) iSHARE Satellites, data spaces are registered and administered allowing for exposure and discovery. Pointers are available in the network to find the data space definitions. To allow for discovery and interoperability across multiple data spaces, the iSHARE Satellite registers several pointers:

  - a capabilities end-point, to allow to find where data services from a participant are reachable, and

  - an authorization end-point, to allow to find where a participant has their authorizations available for querying.

4.3   Observations

The following observations are made on the positioning of iSHARE from the inter data space interoperability perspective:

- *Inter data space interoperability is only starting to be addressed in the main European reference architecture initiatives on federative data sharing and data spaces.*

  The European initiatives on federative data sharing and data spaces as described in section 3.1 (OPEN DEI, IDSA, GAIA-X) are currently only in the initial phases of defining the architectures, guidelines and reference implementations of the capabilities for inter data space interoperability. As such, the iSHARE trust framework capabilities are (in time) ahead of the developments in these international initiatives.

- *ISHARE Satellites are based on a full harmonization approach for inter data space interoperability. In case of agreement on adherence to the iSHARE scheme this enables low-barriers for and efficiency in deployment.*

  In case data space instances are aligned on adhering to the iSHARE scheme, the iSHARE Satellite capabilities offers clear advantages for realizing interoperability between these data space instances. It minimizes the integration effort for inter data space interoperability and it allows for iSHARE IAA and trust processes to be re-used for data sharing between participant across the data spaces.

- *The iSHARE Satellites approach needs to be augmented with partial harmonization architecture capabilities for inter data space interoperability.*

  There will be a multitude of different (existing and new) data space implementations. Not all have adopted or will adopt the iSHARE Satellite approach. Sectors and application areas are currently deploying or developing data sharing initiatives using a variety of trust framework approaches [25] [26] [27]. Full harmonization through iSHARE Satellite of all emerging data spaces may turn out be an utopia, also in view of the developments going on in the European initiatives on federative data sharing and data spaces. Hence, as it is expected there is no single architecture, (legal) framework or protocol stack that

is used by all data sharing initiatives, additional partial harmonization architecture capabilities for inter data space interoperability will be required.

4.4 Recommendations

The following recommendations are made on the positioning of iSHARE from the inter data space interoperability perspective:

- *Prepare for interoperability between iSHARE-based and not iSHARE-based data spaces.*

  There will be a diverse landscape of varying data space approaches, requiring adequate inter data space interoperability architectures. In case both data spaces are iSHARE-based the iSHARE Satellites provide adequate means for interoperability (full-harmonization). When that is not the case, a partial harmonization approach by means of data space proxies may be needed for interoperability between iSHARE-based and not iSHARE-based data spaces. A first example thereof is described in the Use Case Implementation Guide (UCIG) [28] as developed by the Data Sharing Coalition.

  It will be obvious that for cases in which neither of the data spaces to be interconnected is iSHARE-based, similar full or partial harmonization approaches will be developed. This for instance applies for interoperability between IDS-based data spaces.

5　Governance perspective

The technology for federative data sharing and data spaces to enable the ambition of the European Data Strategy (expressed as a '*federation of interoperable data spaces*', see section 2.2) is rapidly maturing. Hence, adequate governance of its development and deployment is currently the main prerequisite for actual operational realization. With the growing interest (of both the public and private sectors) in the development of federative data sharing, data spaces and the role of trust framework capabilities therein, governance challenges become ever more important. The governance aspects are addressed in this chapter.

5.1　Context

A governance structure for agreements systems and trust frameworks must involve (to a greater or lesser extent) a system of checks and balances, a structure for interoperability and a trust structure aimed at ensuring that data sharing takes place safely, carefully and lawfully. Governance requirements and structures for such situations are described in BOMOS (Beheer- en OntwikkelModel voor Open Standaarden) [29] and by the Forum Standardization (Toetsingsprocedure en criteria voor de lijst open standaarden) [30].

For the challenges on and approach for the governance of trust framework capabilities for federative data sharing and data spaces, similarities can be drawn from the development of the Pan-European Public Procurement Online (PEPPOL) governance framework, which is used for the secure and cross-border receipt and/or sending of invoices and purchase orders between companies and European Governments. Over its lifetime, the governance of the PEPPOL framework went through various phases: PEPPOL started in 2008 as EU-project for cross-border interoperability of procurement documents across governments within Europe, aiming at increased efficiencies and reduced costs. In 2013, PEPPOL was adopted in the Netherlands by the Simplerinvoicing Foundation. It contributed to the development and introduction of the European Norm for e-invoices (EN16931). The legal requirement for (semi-) governmental organizations to be able to receive and process e-invoices considerably boosted the adoption of e-invoicing. As of January 2020 the Dutch Ministry of the Interior positioned PEPPOL as public facility for e-procurement and took over the role of PEPPOL Authority for the Netherlands: Netherlands PEPPOL authority (NPa). The rationale is described in [31]. The mission of the NPa is to provide a secure, reliable and interoperable generic digital infrastructure for exchanging e-procurement messages that uses the European e-Delivery building blocks: the PEPPOL agreement scheme.

5.2　Positioning iSHARE

The governance of the iSHARE Foundation is described in [32] [33] and is depicted in Figure 4.
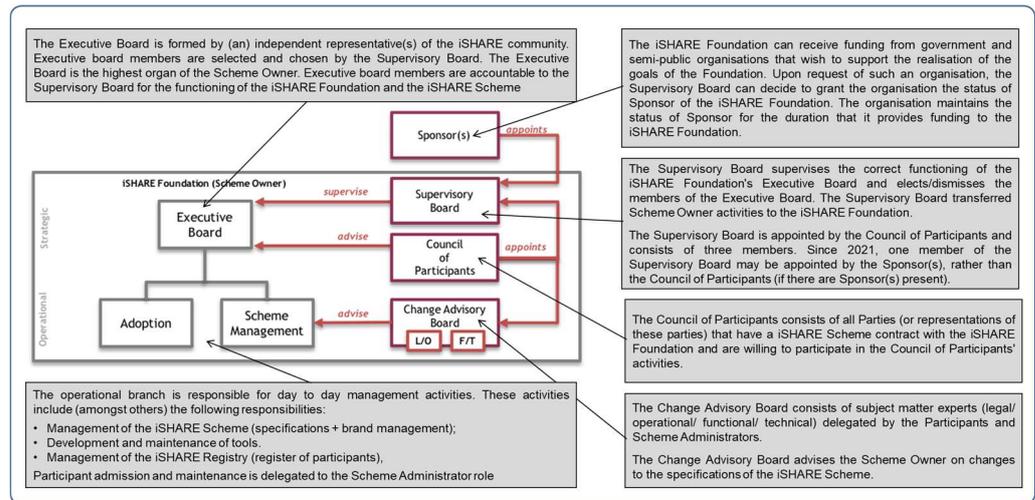
Figure 4. Governance structure for the iSHARE Foundation [32] [33].

As the figure shows, the iSHARE Foundation is the iSHARE Scheme Owner. It is responsible for all activities related to the iSHARE Scheme. The iSHARE Scheme Owner consists of an Executive Board, an operational branch, the Supervisory Board, the Council of Participants, the Change Advisory Board and the Sponsors of the iSHARE project. The responsibilities for each of these governance bodies is described in the figure.

5.3   Observations

The following observations are made on the governance of iSHARE:

- *Federative data sharing, data spaces and the role of trust frameworks therein are of public interest.*

  The public interest of federative data sharing (and the role of trust frameworks therein) is twofold. Firstly, for many federative data sharing applications (including applications in the logistics sector) data is to be shared with governmental organizations and as such the government itself is stakeholder in the data sharing process. Secondly, data sharing is generally considered as a main enabler for the emerging data economy. This holds for data sharing both within and between sectors and application areas. Hence, adequate (governance of) data sharing initiatives are a necessity for society as a whole. The potential threat of market failure should be prevented.

- *Coherence across federative data sharing, data spaces and trust framework initiatives requires aligned or integrated governance.*

  The scale, scope and reach for deploying and adopting federative data sharing data spaces and trust frameworks should not (or to a minimal extend) be hindered by multiple and incompatible approaches and standards. This should be enabled through aligned or integrated governance frameworks. For trust frameworks such as iSHARE this specifically applies to alignment or integration of the governance framework with that of the European initiatives such as IDSA, GAIA-X and the work being done by the Data Sharing Coalition.

- *A joint and aligned European governance framework for federative data sharing (and the role of trust frameworks therein) is only starting to emerge.*

The European Data Governance Act (DGA [7]) can provide the basis for developing the broader European governance framework . The DGA has been developed as the enabling governance framework for European data spaces. Its goal is to balance the interest of both private and public actors to ensure innovation and continuity in the long run.

The DGA provides a good basis, although requiring concretization in European and national governance structures.

5.4 Recommendations

The following recommendations are made on the governance of iSHARE and the iSHARE Foundation:

- *Develop a public-private governance structure for federative data sharing and the role of iSHARE therein.*

  The fact that federative data sharing is of public interest still leaves open the manner in which it is organized and governed. The major interest of (cross-sectoral) data sharing for enabling the emerging data economy and a potential threat of market failure require that federative data sharing (and the role of iSHARE therein) should be addressed by the public authorities as such. Leaving the developments to the (private) market may result in a situation that the data economy is not served in a satisfactory manner.

  Hence, a public-private governance structure should be aimed for. The public-private governance structure is also recommended by the OPEN DEI initiative ([9], paragraph 0.2.4). The goal of the public-private governance structure should be to ensure adequate funding for further development and deployment and to optimize cross sectoral alignment.

- *Embed the governance structure for federative data sharing (and the role of iSHARE therein) in a broader European governance framework.*

  For the governance of federative data sharing, data spaces and trust frameworks, it will be advantageous to prepare for, align with and to build upon the DGA guidelines.

  The DGA proposes a two-tier governance structure: a governance entity required for each data space and an overall governance organization concerned with common aspects of data space interoperability and data sovereignty. For the former, existing domain / sector specific bodies can play a role, such as SCSN for the smart industry sector, AgroConnect for the agricultural sector, Aedes for the housing sector and SUTC for the logistic sector. These sectoral organizations already serve their respective domains with data standards and have the appropriate governance bodies in place, enabling a scalable governance model to introduce and support the common data sharing building blocks as described in the OPEN DEI soft infrastructure as depicted in Figure 1, including the trust framework capabilities.

  In the previous section the observation has been made that coherence across federative data sharing, data spaces and trust framework initiatives requires aligned or integrated governance. This for instance applies to the IDSA and GAIA-X and their work on distributed architectures for trust framework capabilities. For iSHARE, an adequate governance structure to stay aligned with these international developments is essential.

On this aspect of alignment within Europe on a governance structure, lessons may be learned from the governance of PEPPOL as described in section 3.1. However, it is also to be noted that are also dissimilarities between the development of the (governance of the) PEPPOL and iSHARE frameworks on the aspect of international alignment. The development of PEPPOL started from an European initiative after which its realization and governance dispersed towards the member states, including the Netherlands. For iSHARE, the development is in the opposite direction: it has started as initiative for the logistics sector in the Netherlands and is now faced with the challenge to align with and be adopted by the (governance of the) emerging EU data sharing initiatives.

Guidance on the development of the governance structure for iSHARE as open standard may be found in BOMOS [29] and at the Forum Standardization [30].

- *Provide adequate resources to assure quality and continuity.*

  With the ambition of the adoption of iSHARE within and over multiple sectors and application areas, sufficient staffing to adequately support the individual initiatives is needed. This applies both to the staffing of the iSHARE foundation and the implementation partners. Based on an adoption and introduction prognosis, staffing (re-) considerations should be made. To support this, structural forms of financing are to be preferred. Organizations will be reluctant to implement a standard of which it is uncertain whether it will still be managed over the coming years because the standard works with an inadequate financing structure.

- *Overcome start-up hurdles towards large-scale adoption by stimulating initial implementations.*

  The public interest in federative data sharing, data spaces and the role of trust frameworks therein requires as a governance approach for their development towards a common utility Adequate initial investments are required to kick-start initial implementation and initiate broad adoption. Such initial investments may not be possible or attractive for individual sectors, organizations, or application areas. Hence, alternative options need to be considered:

  - *Stimulate and enable early adopters.* These may be upcoming communities with a joint data sharing interest. They provide a learning trajectory for various stakeholders and provide opportunities to promote the benefits and stimulate interest and adoption for other communities.

  - *Promote adoption by governmental organizations.* As illustrated for the PEPPOL case (see section 5.2) adoption for sharing data with governmental organizations can provide a main stimulus for further large scale adoption.

  - *Develop and portfolio roadmap for service providers.* For service providers a portfolio of federative data sharing, data space and trust framework services may be a natural extension of the service portfolio. This may for instance apply to both system integrators and telecommunication service providers. Traditionally, these latter organizations already operate across economic sectors, have extensive experience of large-scale operational support processes and have considerable and adequate market power to stimulate adoption over various sectors, whilst ensuring interoperability across data spaces.

6   Legal perspective

A legal framework ensures that data space participants can share data (and possible other ICT resources) under common, agreed-upon and legally binding conditions. Data sharing agreements provide the legal basis for the sharing of data between organizations. In a data sharing agreement (sometimes also referred to as a Data Service Transaction Agreement), the participants in a data sharing transaction acknowledge that data is being exchanged, with both participants recognizing and committing to their own responsibility, whilst adhering the applicable law. The legal aspects are addressed in this chapter.

6.1   Context

Two main approaches for establishing a data sharing agreement can be distinguished:

- *A joint overarching legal agreement* to which all the participants in a data space agree to adhere. The scope of the *joint overarching legal agreement* can be extended over multiple data spaces, with specific additional (legal) agreements per data space.

- A *legal agreement negotiation approach*, in which data providers and data consumers bilaterally negotiate the legal conditions under which they share data. To automate this, a strong and formalized semantic fundament for machine-interpretable legal data sharing agreements is essential to make sure that various organizations operating in different sectors and jurisdictions unambiguously understand each other. Moreover, the Dutch law prescribes specific conditions on an electronic data sharing contract to be legally valid [1].

6.2   Positioning iSHARE

The legal framework of iSHARE consists of a contract between all iSHARE participants and the iSHARE Scheme Owner [34] [35]. This contract is the 'Accession Agreement'. By signing the Accession Agreement, a party becomes a participant of the iSHARE Scheme either as an Adhering Party or a Certified Party, for which there are two separate Accession Agreements.

The Accession Agreement refers to the iSHARE Terms of Use. The Terms of Use further define the rights and obligations of every iSHARE Participant and the Scheme

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[1] To be legally valid, the Dutch law prescribes three steps that have to be gone through when engaging into a data sharing agreement in an electronic manner. It starts with an offer that the data provider makes to the data consumer. That offer may subsequently be accepted and that acceptance must on its turn be confirmed by the data provider. As long as the confirmation has not been received, the data consumer may cancel the agreement. Failure to confirm an offer in time counts as a rejection thereof. In case the data consumer doesn't accept the offer, he may return a new. This process is referred to as the 'contract negotiation process'. Moreover, for an electronic data sharing agreement to be (legally) equivalent to a written data sharing agreement, the Dutch law imposes four requirement (Dutch Civil Code (Burgerlijk Wetboek): Article 6:227a) imposes four requirements: (1) the data sharing agreement is equally accessible (consultable) by both parties, (2) the authenticity of the data sharing agreement can sufficiently be guaranteed, (3) the time of creation of the data sharing agreement can be established with sufficient certainty, and (4) the identity of both parties can be established with sufficient certainty.

Owner. The Terms of Use also state that participants fully abide to the iSHARE scheme specifications.

The Terms of Use apply to each party participating in the iSHARE scheme. The Terms of Use leave room for participants to derogate from or further detail the provisions of the Terms of Use on a bilateral basis [35]. However, there will be certain requirements that participants should comply with at any time, and from which they will not be able to deviate. These are the requirements that deal with the proper functioning of the iSHARE Scheme.

6.3 Observations

The following observations are made on the positioning of iSHARE from the legal perspective::

- *Mandatory sharing of data with governmental agencies doesn't conflict with iSHARE.*

  It may be mandatory to share specific data with governmental agencies. For instance to the logistics sector, in which there is an obligation to share specific transport documents and data with government agencies. In the iSHARE trust framework, the entitled party has the means to define and to delegate authorizations rights. This option doesn't have to conflict with suitability of the iSHARE trust framework for mandatory sharing of data providers with governmental agencies. It remains the entitled party's obligation to comply to laws and regulation, whilst considering the use of the iSHARE trust framework for managing their data sharing policies.

- *International initiatives develop for negotiation of legally binding agreements per data sharing transaction. It hasn't proven technical and market viability yet.*

  As described in section 3.3, an approach that supports contract negotiation of legally binding agreements per data sharing transaction and policy enforcement to manage usage policies is currently developed by the IDSA and is expected to be adopted by GAIA-X as well. These developments still have to prove their technical and market viability for large scale deployment.

6.4 Recommendations

The following recommendations are made on the positioning of iSHARE from the legal perspective:

- *Prevent individual tendering obligations for (iSHARE) trust framework capabilities by separate data space initiatives.*

  To optimally exploit the iSHARE added value on inter data space interoperability as described in the previous chapter, an aligned adoption strategy thereof may be preferred across data spaces. This implies that the iSHARE trust framework capabilities are to be used by each specific data space. This scenario for aligned adoption should not be prevent because of individual tendering rules and obligations by each specific data space.

- *Do an in-depth assessment by legal experts on the role of identity brokers in view of public and private law.*

  Additional juridical assessment may be required on the aspects of the mutual recognition of identity brokers in view of public and private law and whether possible incompatibilities can or should be solved by individual data space solutions (e.g. as provided by iSHARE, IDSA or BDI) or whether they need to be addressed at (at least) the level of the European Commission.

7 In conclusion

The role of iSHARE as generic trust framework capability for federative data sharing is ever more becoming intertwined with the broader perspective on the international developments thereof in the context of the European Data Strategy and its associated European reference architecture development initiatives. Therefore, the expert opinion in this report has adopted this broader perspective on federative data sharing and data spaces for addressing three main perspectives on iSHARE as generic trust framework capability: the functional, governance and legal perspective. Its results for each of these perspectives have been provided as observations and recommendations in the subsequent chapters of this report and enumerated in the tables of the management summary.

Based on this broader perspective, the following sections draw additional overarching conclusions on iSHARE as generic trust framework capability and provide reflections on the policy for deploying generic data space and iSHARE trust framework capabilities in the context of BDI), respectively.

7.1 Conclusions on iSHARE as generic trust framework capability

With iSHAREs prominent position in the Netherlands and its high visibility in the various European initiatives that lead the international development for federative data sharing and data spaces, iSHARE is in a good position for becoming a leading international generic trust framework capability. As such, it is advised to support the development and deployment of iSHARE as trust framework and adequately enable it to continue its alignment with these European initiatives. This holds for both the iSHARE trust framework capabilities within individual data spaces (i.e. for intra data space interoperability) and between multiple data spaces (i.e. for inter data space interoperability). This advice also underlies the observations and recommendations on the governance perspective as have been presented in this report. Additionally, an assessment on the scalability and performance (under the ambition of large-scale adoption) may be required.

A major benefit of the iSHARE trust framework is in its capabilities to support trusted data sharing between multiple data spaces, i.e. inter data space interoperability. As such, it is of major benefit to align on adopting iSHARE across data sharing and data space initiatives, preferably also even beyond those in the logistics and mobility sector.

The (inter-)national environment of federative data sharing and data spaces is still in development. This also holds for trust framework capabilities. Specifically, the main European initiatives on federative data sharing and data spaces (IDSA, GAIA-X, ...) are developing alternative, fully distributed, trust framework capabilities for IAA, contract negotiation and usage control. These developments still have to prove their technical and market viability and are not yet sufficiently mature to be deployed at a large scale on the short term. Over time and for specific application areas these may provide an alternative for the more centralized trust framework capabilities as currently provided by iSHARE. It is to be expected that these various approaches and solutions will coexist. In view of these developments it is advised that iSHARE adoption is accompanied by:

- a vision and roadmap on whether and how develop and align its trust framework capabilities with the developments on alternative, fully distributed, trust framework capabilities, and

- migration scenario's providing data space participants a smooth and seamless (service and technical) evolution trajectory for incorporating the data space features and capabilities in these European initiatives.

7.2 Reflections on the policy for generic data space and iSHARE trust framework capabilities in the context of the BDI

Based on this broader perspective on the international developments on federative data sharing, data spaces and the potential role of iSHARE as trust framework therein, reflections are made on the policy for deploying generic data space and iSHARE trust framework capabilities in the context of the Basic Data Infrastructure (BDI).

The Digital Transport Strategy for freight transport from the MinI&W has set the ambition and policy towards full digitization of freight transport information streams. A main pillar is the development of the BDI, acting as a foundation of trust for federative data sharing. It refers to the European Communication on a common European data space as a way forward for the MinI&W to realize full digitization of freight transport. As such, the BDI can be considered as a data space for the logistics sector, operating within a larger ecosystem of emerging European data spaces in other sectors and application areas. Jointly, they pave the way towards fully exploiting the business potential for the emerging data economy.

The basics for the BDI are defined in the EU FEDeRATED initiative. [36]. FEDeRATED is a CEF (Connecting European Facilities) Action providing input to the DTLF (Digital Transport and Logistics Forum [37]), an Expert Group raised and chaired by the EC Directorate-General for Mobility and Transport (DG Move). The objective of FEDeRATED is to provide validated specifications to the DTLF for the creation of a federated network of platforms for freight data sharing as the basis for the EU Mobility Data Space (covering both persons and freight), recommendations for the governance of those specifications, and explore the potential of an EU Regulation for establishing the EU Mobility Data Space for freight. FEDeRATED has developed a semantic model and an architecture for pull-based federative data sharing, in which data remains at the source. The pull-mechanism requires Identification, Authentication, and Authorization (IAA) services / building blocks. The long term approach as taken by FEDeRATED is that every organization applies its own identity and access management capabilities. Since the US requires an open environment based on Self Sovereign Identities (SSIs) and Decentralized IDentifiers (DIDs), this is also considered by FEDeRATED as a potential and attractive solution.

Whereas SSI and DIDs are considered as solution for the future, they may not (yet) be acceptable by the public and private sector on the short term. Using the iSHARE trust framework capabilities may be considered for the short term.

Moreover, the goal of the FEDeRATED initiative and the BDI for developing the IAA trust framework capabilities towards distributed architectures aligns with the goals for development of similar capabilities with the main European initiatives on federative data sharing and data spaces that are working towards the ambition of the European Data Strategy, most notably GAIA-X. Hence, whether and how to align the BDI development in relation to the developments within the main European initiatives on

federative data sharing and data spaces seems to be mainly a policy decision, less a technical decision. Alignment and collaboration at an early stage may lead to mutual benefits and prevent from potential complex and costly future migration and integration trajectories. Therefore, it is recommended to do a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and an impact analysis on aligning the trust and IAA approach of the BDI with the capabilities being developed in the European generic initiatives on federative data sharing and data spaces, i.e. OPEN DEI, iSHARE, IDSA and GAIA-X. It may turn out that a relatively (small) effort on the short term on alignment of initiatives may create a win-win situation.

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[37] EC Digital Transport and Logistics Forum (DTLF). "Mobility and Transport". URL: https://www.dtlf.eu.

Annex: interviews

As part of the research underlying this report, interviews were held with various stakeholders in iSHARE:

- Dhr. M. (Mitchell) Out

  – Chairman FEDeRATED Architecture Board, Dutch Customs

- Dhr. M. (Marco) Witschge

  – Product Owner Agile Team Datastelsel Verduurzaming Utiliteit (DVU)
  – Taskforce Member Energy Data Governance for Techniek Nederland

- Dhr. R. (Rik) de Lange

  – Senior advisor RVO for Datastelsel Verduurzaming Utiliteit (DVU)

- Dhr. V. (Volker) Kraft

  – Project leader Fraunhofer DataNetPort, a logistics data space in Germany

- Dhr. S. (Sebastian) Steinbuss

  – Chief Technology Officer IDSA (IDS Association)

- Dhr. R. (Ries) Bode

  – Program Director DSGO (Digitaal Stelsel Gebouwde Omgeving)

- Dhr. P. (Pieter) Bruring

  – Technical contributor BDI, Portbase

Signature

Groningen, June 2022 TNO

M. (Marieke) van Milligen-Versluis

H.J.M. (Harrie) Bastiaansen, PhD

Head of department Data Ecosystems

Author