POSITION PAPER

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Unlocking the Potential of Data Spaces for Manufacturing

Executive summary

Data spaces are decentralised systems enabling data sovereignty, interoperability, and trusted data exchanges across value chains, as distinct from single-entity data platforms. They operate under common governance and standards to facilitate multiple use cases efficiently. Various European industry-driven data space initiatives exist, differing by sector focus, use cases, stakeholders and maturity, highlighting the ecosystem's complexity and the central role of standardisation and governance.

- **Why data spaces for manufacturing?** Data spaces underpin Advanced Manufacturing by allowing secure and trusted sharing of high-quality industrial data, fostering innovation, new business models and competitive advantage through integration of automation, robotics and connected solutions.
- **Practical business cases** include supply chain collaboration, regulatory compliance via Digital Product Passports, predictive maintenance, quality management, production optimisation, energy management and enabling new business models like Manufacturing-as-a-Service.
- **Challenges to adoption** include limited awareness, complexity, upfront investment especially for SMEs, scaling and financial sustainability, heavy regulatory burdens and interoperability between different data spaces.
- **Policy recommendations:** Orgalim urges a business-driven, open, and internationally interoperable policy approach that simplifies data rules, supports inclusive industry-driven data spaces, encourages use of recognized standards, and leverages existing European initiatives.

1. Introduction

This paper sets out Orgalim's recommendations to accelerate the practical uptake of industry-driven data spaces for manufacturing in Europe. It is intended for EU policymakers, national public data authorities and businesses considering participation in manufacturing data spaces.

The uptake of advanced manufacturing technologies and processes across manufacturing sectors is a precondition for Europe to address the defining challenges of our time. The transition to advanced manufacturing will be crucial for every sector across Europe's industrial base. At its heart is the convergence and integration of technologies like automation, robotics and digitally connected solutions on the manufacturing shopfloor. This enables new production processes ('Industry 4.0' or 'Smart Factories'), as well as new types of products. Using the vast amounts of industrial data generated in the process, manufacturers can make products and services with higher added value and develop entirely new business models. The companies, and economies, that complete this transformation first will have a competitive edge for decades to come.

To facilitate the deployment of advanced manufacturing, building trust in secure data sharing and use will be key. With their promise to increase interoperability and trust in data sharing across manufacturing value chains, data spaces can become the backbone of advanced manufacturing and play a key role in the competitiveness and sustainability of Europe's manufacturers.

One of Europe's greatest assets lies in its wealth of high-quality, domain-specific industrial data. This data holds enormous potential; for example, developing and training industrial AI applications, driving innovation and strengthening competitiveness across value chains. Data spaces can play a crucial role in unlocking this potential by enabling secure and efficient data sharing between companies and sectors. However, this will only succeed if data sharing is based on contractual freedom, accompanied by trusted governance frameworks, and ensures robust protection of business secrets. Only under these conditions can trusted data sharing become a reality and Europe fully capitalise on its industrial data advantage.

2. What are data spaces?

Data spaces are generally understood as decentralised, federated systems where data holders keep control ('data sovereignty') while interoperability mechanisms, trusted identity frameworks and policy enforcement enable trusted exchanges across supply chains, entities, devices and services. They distinguish themselves from single-platform situations where a single entity, usually a platform service provider, is connecting bilaterally with several other entities and the data exchange between the other entities happens only through that single platform.

In the framework of the European standardisation work on Trusted Data Transactions[1] at CEN, standardisation experts have adopted the following definition of data spaces: "*Interoperable framework, based on common governance principles, standards, practices and enabling services, that enables trusted data transactions between participants*". In this sense, the services *enabling* the data space can be provided by different entities and infrastructures. At the same time, the services that are built on the basis of (and are *enabled by*) such data spaces can cover one or more use cases.

[1] CEN workshop agreement, July 2024.

The Data Spaces Support Centre (DSSC), an EU-funded consortium supporting the development of data spaces across sectors, adopted the same definition in its data space Blueprint v2.0.

A data space is	A data space is not
A data space is a decentralised digital system.	A data space is not a data platform managed by a single entity.
In data spaces, the rights holders of the data remain in control. They decide who can use their data and under what conditions. A data space also facilitates sharing value derived from data use among participants.	Participation in a data space does not require publishing data openly or sharing it in an uncontrolled way without compensation.
A data space is a scalable solution for data sharing. It is technically and contractually easy to add new participants and use cases into a data space.	A data space is not merely a tailored solution for data sharing between two or a few entities for a specific purpose.
A data space is defined by its rulebook, which all participants adhere to. The same technical infrastructure can support multiple data spaces and the same data space can be enabled by different service providers at the same time.	A data space is not one single standard, piece of software or cloud solution.
A data space typically supports multiple use cases, making their implementation cost-effective and enabling network effects when use cases involve partly the same actors and data sources.	A data space is not equivalent to one single use case.
A data space provides greater legal clarity and predictability for data sharing and processing between participants.	A data space is more than merely a technical solution for transferring data.

In recent years, a number of industry-driven initiatives aimed at the creation of data spaces for manufacturing have emerged in Europe. These bottom-up initiatives are different in terms of: focus on specific fields (e.g. Catena-X for the automotive supply chain and Factory-X for shopfloors), focus on specific use cases related to data spaces (e.g. the Digital Product Passports 4.0 and the Smart Connected Suppliers Network for supply chain management), involvement of different types of stakeholders (for example national alliances such as the Belgian Data Spaces Alliance, the Data Spaces Alliance Finland, or Platform Industry 4.0 in Germany) and maturity.

In all these examples, data interoperability and standardisation matters are at the core of the discussions among participating stakeholders. **Technical and legal interoperability** of devices and data is the foundation for the effective deployment and scaling of advanced manufacturing solutions, particularly in complex and highly interdependent industrial value chains, where collaboration, data sharing and interoperability between partners are critical. This is the case for shopfloors and Industrial Internet of Things (IIoT) environments and life cycle services. **Technical interoperability** ensures that diverse machines, sensors, and IT systems – often sourced from different vendors or generations – can communicate, share, and process information seamlessly. This capability is crucial for real-time monitoring, predictive maintenance, and production optimisation, which rely on the continuous flow of accurate data across interconnected devices. Without standardised protocols and interfaces, data silos emerge,

hindering the full realisation of smart factory benefits like enhanced flexibility, efficiency, and agility. For example, international standards such as the Asset Administration Shell (AAS, standard IEC 63278) and the OPC Unified Architecture (OPC UA, standard IEC 62541) have been developed to enable interoperability.

Initiatives based on these standards, such as the Universal Machinery Technology Interface (Umati), have already built data space implementations that are easy to integrate for SMEs as they are built on existing machine interfaces, enabling use cases such as energy management.

Equally important is **legal interoperability**, which provides the necessary frameworks for data sharing and use across organisational boundaries while respecting data sovereignty, intellectual property rights and regulatory requirements. Manufacturers increasingly rely on structured data exchange with suppliers, customers and service partners for regulatory compliance (e.g. Digital Product Passports).

3. Why data spaces? Practical business cases

- **Supply chain collaboration and transparency:** Real-time order, logistics and quality information exchange across multi-tier networks[2]. Benefits: fewer errors, shorter lead times, better planning and resilience, faster information sharing and decision-making processes, earlier detection of deviations or bottlenecks, more trust between partners (paving the way for better collaboration), better planning, responsiveness in production resilience, risk management, and discovery of customers and providers.
- **Regulatory compliance by design:** Sharing of Digital Product Passports (DPP) data and sustainability indicators (e.g. Product Carbon Footprint) to comply with the Ecodesign for Sustainable Products Regulation[3] and sectoral rules (such as battery[4] and construction products regulations), while avoiding one-off, siloed reporting solutions.
- **Condition-based and predictive maintenance:** Trusted sharing of machine/asset data with OEMs and service partners to enable proactive services, such as real time analytics, adaptive control, higher uptime, lowering of maintenance costs and better spare parts logistics.
- **Quality management and traceability:** End-to-end traceability and quality data loops across suppliers to reduce scrap and recalls, and support for targeted, data-driven root cause analysis and corrective actions.
- **Production optimisation (operational and process efficiency) and energy management:** Cross-site, cross-partner optimisation (e.g. scheduling, modular production, energy load management) based on interoperable data and digital twins.
- **Innovation and new business models:** "As-a-Service" models (Manufacturing-as-a-Service, Data-as-a-Service), marketplaces for data and apps, collaborative engineering based on standardised interfaces and rulebooks, pooling of data for specialised AI training.

[2] See also: World Economic Forum, January 2020.
[3] Ecodesign for Sustainable Products Regulation (EU) 2024/1781 (ESPR).
[4] Battery regulation (EU) 2023/1542.

4. Challenges facing data spaces for manufacturing

a. **Limited awareness and complexity.** Limited awareness of ongoing industrial initiatives and their concrete business value; confusion about which data space, connector or technical standard to use. For many industrial companies, especially SMEs, the economic value proposition of participating in data spaces is still not sufficiently tangible. Benefits such as improved data interoperability, collaborative innovation, or new data-driven services often appear abstract, while the required investments in infrastructure and know-how are immediate and concrete. This imbalance between visible costs and uncertain returns discourages engagement and slows down adoption.

b. **Upfront investment, especially for SMEs.** Adapting infrastructures, processes and products to connect to a data space can require significant investment. In certain cases, kicking off projects to adapt the companies' infrastructures, processes, products or services to be able to 'connect' to a data space may constitute a substantial investment, which may be challenging – especially for SMEs (the size of this challenge depends on a number of factors and is not always easy to calculate upfront). In addition, the Data Act regulation introduces new contractual obligations (Article 4) and interoperability requirements for data space participants (Article 33) at a stage where many initiatives are still emerging. Without sufficient guidance and proportional implementation, this risks creating additional complexity and uncertainty, especially for SMEs. The Data Act has intervened much too early in the development and diffusion of data spaces.

c. **Scaling and financial sustainability.** Many initiatives struggle to move beyond pilots and public funding; even in mature initiatives, one recurrent challenge is the determination of the entity (or entities) entrusted with running the governance of the whole data space. Apart from issues of representation in the governance of the different stakeholders of the data space, this aspect is usually included in the business model to make governance (and the whole data space) financially sustainable in the long-term, when investment moves beyond initial public funding.
Early intervention by the Data Act[5] and Data Governance Act[6] has changed contractual dynamics, complicating long-term planning for sustainable business models, particularly in immature ecosystems. For example, under the Data Governance Act, providers of data intermediation services must act neutrally and provide the service through a separate legal person. While this aims to build trust, it raises barriers and costs for operators wishing to serve data spaces and may hinder upscaling.

d. **International dimension vs. localisation.** Most manufacturing value chains are global in nature; sovereignty objectives or localisation requirements (e.g. at national level) should not inadvertently fragment cross-border collaboration or exclude trusted and reliable international partners.

e. **Incremental adoption vs. top-down designs.** Pragmatic uptake should build on widely used standards and proven ecosystems, rather than imposing entirely new top-down stacks that risk vendor or country silos.

f. **Interoperability between data spaces.** Although in some cases the same underlying technical standards can be shared across different data spaces, this is not always the case and the issue of interoperability of data spaces remains open. This may lead to two unintended consequences: 1) lock-in effects at the level of data spaces (rather than single products or entities) and/or 2) the same company being forced to adapt to different standards and rulebooks to be able to participate in different data spaces. The issue of

[5] Data Act regulation (EU) 2023/2854.
[6] Data Governance Act regulation (EU) 2022/868.

interoperability between data spaces may be even more important in cases where different sectoral data spaces (e.g. energy data spaces and manufacturing data spaces) interact in the same situations.

5. Recommendations for EU policymakers

Orgalim recommends a policy approach that is business-driven, open and internationally interoperable:

- **Simplify data rules**[7]**:** Implement a 'simplification-first' agenda across the Data Act, GDPR and the Data Governance Act. Provide practical guidance on implementation and interplay between legislation, secondary legislation and realistic transition periods to avoid overburdening SMEs and early pilots.
- **Support industry-driven data spaces for manufacturing:** Enhance data usage and value creation while ensuring interoperability, trust and security, with particular attention to practical accessibility and onboarding for SMEs. Keep data spaces inclusive and internationally oriented; allow sector-specific solutions where they deliver value. Ensure interoperability within and across manufacturing data spaces to avoid new silos.
- **Encourage development and networking of data spaces:** For regulatory projects (e.g. Digital Product Passports), ensure that technical solutions are based on recognised standards already used in the sector and connectable to data spaces (e.g. OPC UA, AAS, Eclipse Dataspace Components).
- **Leverage existing European initiatives:** Recognise the role of current industrial initiatives on Digital Product Passports (such as the DPP 4.0) and data spaces (such as Manufacturing-X and the other examples mentioned above) in the net-zero transformation and as foundations for industrial AI.
- **Remove competition law uncertainty around data pooling**: Economic operators willing to pool data in joint initiatives for the purpose of training AI models face uncertainty as to whether pooling data assets would be compliant with EU competition law in certain cases. This legal uncertainty is an obstacle to the development of AI models that are specifically for industrial uses (e.g. in advanced manufacturing). The upcoming review of the Technology Transfer Block Exemption Regulation (TTBER) must address and resolve this uncertainty.
- Maintain the focus of the **European Data Innovation Board (EDIB)** on the support of European data spaces, including for manufacturing.
- **Legal clarity for international data spaces**: International data flows are essential for globally integrated, data-driven value chains, especially in manufacturing. The EU must align its regulatory approach with emerging initiatives like International Manufacturing-X (IMX), which builds on Gaia-X and Catena-X principles to enable secure, sovereign, and interoperable data spaces across borders. To ensure Europe's industry remains competitive and digitally sovereign, EU policy must support internationally compatible data spaces while upholding European values on trade secrets, data protection and trust.
- **Adopt a three-track EU funding approach:**

    1) **Performance-based trickle-down funding**: support industry-led spaces with clear 12-month adoption KPIs (e.g. number of active participants, use cases in production), releasing funds on results (in full compliance with GBER and state aid rules);

[7] More details in Orgalim's position on the EU Data Union Strategy: setting the right framework to speed & scale up the use of industrial data in Europe, July 2025.

2) **Support national alliances**: sustained resources to align stakeholders, disseminate rulebooks and provide hands-on onboarding, especially for SMEs;

3) **Prioritise deployment over basic R&D**: scale existing solutions, connectors and conformity assessment capacity (including testing and certification for interoperability and security). Avoid over-investment in new pilots where mature solutions already exist.

Orgalim represents Europe's technology industries, comprised of 770,000 innovative companies spanning the mechanical engineering, electrical engineering, electronics, ICT and metal technology branches. Together they represent the EU's largest manufacturing sector, generating annual turnover of over €2,750 billion, manufacturing one-third of all European exports and providing over 11 million direct jobs. Orgalim is registered under the European Union Transparency Register – ID number: 20210641335-88.

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