



Sustainable development of data-sharing ecosystems: challenges and turning points

Conference report

Conference organized by Dauphine Governance &
Regulation Chair and Gaia-X Institute

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Sustainable development of data-sharing ecosystems: challenges and turning points

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Introduction

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Eric Brousseau | Governance and Regulation Chair, Paris Dauphine-PSL University

This conference will explore the development of data spaces in Europe and seek to explain how these spaces can evolve from subsidised proof-of-concept initiatives to financially sustainable data-sharing ecosystems. Numerous challenges must be tackled and initial concepts reconsidered if data spaces are to live up to their promise and deliver tangible benefits in the form of economic value, growth and competitiveness for Europe.

It was initially thought that data spaces would create economic value by developing markets for data. In fact, economic value seems to derive from the reshaping and reorganisation of value chains within and across industries. Such processes of reorganization trigger huge challenge that combines technological complexity with the need to reorganise and reinvent the business models and processes of industrial partners seeking to access the full potential of these spaces.

Jakob Rehof | TU Dortmund University, Fraunhofer Institute for Software and Systems Engineering & Lamarr Institute

Emerging technology topics, such as automated compliance and the use of generative AI to help solve data-interoperability problems, are of central relevance to the strategic development of the European data-sharing environment. We look forward to rich discussions with you over the course of the day.

From Promotion to Regulation: What are the next steps for policy makers?

Chair: Eric Brousseau

European data spaces: the perspective of the European Commission

Yvo Volman | European Commission

The Data Union Strategy is due to be released in October 2025. Good access to good data is crucial in the current environment: without data, AI cannot function. Even the largest players are seeking new sources of data to fuel their AI models. We must ensure that Europe is a player in the game, not a playing field.

The European Data Strategy envisioned a European Union where data can flow uninterrupted across sectors and borders. The Data Governance Act (DGA) created a framework for data intermediaries to bring data supply and demand together. The Data Act (DA) aims to ensure that the value created by data is shared fairly among all stakeholders. Together, these instruments aim to create massive new opportunities for innovative services across the economy. Their overarching goal is the creation of a data economy based on fairness, trust and innovation.

However, legislation alone is not enough. The European Commission has been investing in the creation of common European data spaces. These are concrete, sector-specific environments where data users and data holders can collaborate under common rules and standards. This initiative has strong political support. The European Council recognised the need to accelerate the creation of common data spaces and a number of member states have supported specific data-space projects that contribute to the thriving ecosystem that is emerging. More than one billion euros has been invested by public and private actors and the Commission alone has invested 300 million to support data spaces in fourteen sectors over the last five years. As part of a broader European open-data policy, member states are also making high-value data sets freely available in six categories, including geographic, statistic and meteorological data that are ideal source material for SMEs and start-ups. A European trusted data framework is being developed to define standards for data spaces. This is a very technical but hugely important project.

The picture is not, however, without challenges. Many data spaces are still at an early stage: infrastructure is being deployed, governance is being agreed, but results will take time to materialise. We cannot plant a tree and expect fruit the next day, but we need to ensure that the fruit will grow. Scaling up is difficult and business models are not yet sustainable. As a result, many initiatives still depend heavily on public funding. The link with AI development is still missing, even though data spaces could be a key enabler of European AI leadership. We must do more to showcase successes, like the cancer imaging database and the genomics data space, and find more examples that demonstrate the value of sharing data. Frameworks need to be turned into real drivers of economic value and competitiveness and data spaces need to be connected with AI development as a source of training data. The Data Union Strategy is about supporting the creation of large, high-quality data sets that will enable European AI models to compete globally. Data spaces will play a key role by ensuring that data sets are shared in ways that protect the rights of those who generate them. A further 200 million euros has been allocated to data spaces in the 2025-2027 Digital Europe work programme.

The Data Union Strategy will focus on data for AI, data infrastructure and new data sources. It will also seek to simplify an increasingly complex digital rulebook that was designed to embed trust in data sharing, establish a fair distribution of data value and create an internal market for data. We are exploring ways to simplify the legal framework to make compliance as straightforward as possible. We will continue to support and listen to stakeholders to ensure that rules remain

proportional and pragmatic, and offer practical resources to help businesses understand and comply with these rules. We are preparing formal guidance on trade secrets. Before the end of 2025, the Commission will also announce the creation of an EU-wide digital business wallet which will enable enterprises to identify themselves across the EU and interact with administrations far more easily.

In recent years, this conference has discussed the potential to use data for simplifying compliance and reducing administrative burden. The Commission has launched an action within the Digital Europe programme to develop digital solutions that will make reporting faster, cheaper and less burdensome by enabling companies to use their internal operations, logistics, compliance and production data to automatically meet EU reporting requirements. This will help companies to stay competitive.

The pillars of the Data Union Strategy are data for AI, simplification, and the external dimension of the data union. As geopolitical tensions and digital protectionism grow, Europe must respond with an assertive, strategic approach to international data flows. Although Europe has made huge progress in building the foundations of a strong and trusted data economy, it is still at the beginning of the journey. We must scale up to ensure that the benefits of data sharing are felt across our economy, and better link data with innovation to give companies the tools they need to compete globally. If we get this right, the data spaces and European data framework will drive competitiveness, innovation and digital sovereignty.

Martine Gouriet

What does digital sovereignty mean to you?

Yvo Volman

This term is used in different ways by different people. For me, it means that Europe would not be dependent on the technologies of third countries and would be able to chart its own course.

Data spaces and data policy within Europe: a regulator's view

Sarah Jacquier Pelissier | ARCEP

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Arcep mandate in the field of data regulation is rooted in the European Union's aim to create a genuine single market for data. I will tell you where we stand in the implementation of our duties inherited from the Data Governance Act (DGA) and the Data Act in France.

The DGA created the new category of intermediation services with the view to develop neutral and trusted providers of data-sharing services who could pool and organise data neutrally to increase trust in data sharing. To ensure neutrality, intermediation services have to comply with strict requirements, and in particular, they cannot share data for their own interest, but can offer additional services for the purpose of facilitating data exchange. While they have to notify themselves to the national competent authority – Arcep in France – they may, in addition, apply to be authorised to use a label across the EU. At present, out of the 23 data intermediation services that have filed a notification in the EU, 9 are in France, in sectors including health, airport logistics, tourism, space and education. 2 also have also applied and obtained the label (MiTrust and Hub one Datatrust)

To implement our new duties, we have been able to build on Arcep's experience and reputation in the telecom sector as a "technical and economic regulator", and we have had to get attuned to a different sector, different players active in the data sharing economy as well as a new regulatory framework.

These initial results are positive and tend to show that there is a vibrant ecosystem around data intermediation. On this basis, we argue that the regulation framework of data intermediation services should be maintained in essence and that the logic of promoting trusted intermediaries is valid. However, we also argue that some clarifications and changes in the current regulatory framework should be considered. For example, it is important not to have an overly strict interpretation of the "additional services" that are compatible with the status of intermediary services provider under the DGA. Also, given the investment and resources involved in applying for the label, Arcep believes that more concrete benefits could be attached to such label when obtained.

A few words on data spaces which have been largely mentioned by other speakers. Under the DGA, data spaces are sector-specific environments composed of a secure technological infrastructure and governance mechanisms. They are meant to allow public and private data from across the EU to be securely exchanged at a lower cost. While Arcep's legal duties regarding data spaces are very limited, two points can be noted; First, intermediation services regulated by Arcep may play an operational role in the sharing of data within those data spaces; and second, Arcep is a member of the European Data Innovation Board (EDIB), responsible for advising the Commission on interoperability norms for data spaces. On a more general note, we share the view that data-space initiatives are maturing notably with the involvement of high-profile industrial players.

Cloud services are key to data economy: they underpin Europe capacity to extract value out of data. The market is concentrated among three non-EU suppliers which, and due to their huge financial capacity and the digital ecosystems they develop, are in a position to hinder competition in the cloud market and adjacent sectors like AI. While the Data Act applies since September, with the objective notably to foster cloud market by facilitating switching between cloud services, Arcep has been working for two years on the commercial and technical barriers that limit the possibility of cloud switching, based on a mandate from the French authorities to enforce in anticipation some of the provisions of the Data Act. In that context we have notably produced an opinion stating that egress fees charged to a customer by a cloud supplier when switching to another supplier should, as a general rule, be equal to zero, and we are preparing future guidelines on switching charges other than egress fees. In parallel, we have also worked on technical limits to the portability of customer data and digital assets, interoperability between cloud services, and openness of APIs. On these topics, we have completed a public consultation and will soon publish a recommendation on best practices. Finally, we have identified priorities for standardisation,

such as identity and access management services, and we believe in the importance of API documentation and transparency to enable users to change cloud services.

Arcep is determined to play its role in achieving the objective of a data economy in Europe and a trustworthy environment for such economy. With our new powers in the field of data regulation, Arcep is transforming itself from a regulator of telecoms infrastructure into a regulator of digital infrastructures. We apply the same guiding principles: intensive dialogue with the players of the sectors, opening markets and foster competition.

Data sharing: a multi-dimensional challenge

Mario Campolargo | Aveiro University

Data is our most abundant resource and most under-used asset. In Europe, extensive work is being done to unlock innovation and competitiveness in health, space, agriculture and other key areas. This is creating a new social value for data, which must be given due consideration alongside its economic value. Nevertheless, significant, multi-dimensional challenges must be tackled if real data sharing is to be achieved. They have four dimensions: legal, governance, economic and technical.

The GDPR is a gold standard for data protection but it was not designed to cover data sharing at scale. There is a need to develop a legal and regulatory structure that can cope with large-scale activities like cross-border research and the training of models on shared data, and with the fragmentation that arises when national authorities interpret rules in different ways. Uncertainty and ambiguity give rise to higher costs, higher risk premiums, and an increased reluctance to share.

Data spaces cannot function without trust, but trust requires structures, rules and credible enforcement. As ecosystems scale up, they require formal, representative and accountable governance structures to set rules, resolve disputes, and protect the interests of smaller players. This is a significant design challenge as there are likely to be misaligned incentives between providers that fear losing their commercial advantage and users that have concerns about data quality.

Data needs to have a value, but it is unclear whether it should be priced by volume, uniqueness, frequency of update, usage rights or some other metric. Without a clear value, data is an intangible asset with no market price. As a result, it remains economically invisible. Data with public good characteristics, such as space data, health data and environmental data, have the potential to drive innovation and create social value. If this process is left to market forces, there is a risk that this value will not flow easily, or that the flow will simply reinforce the dominance of large incumbents.

The technical difficulties involved in making data syntactically interoperable can be overcome, but issues are likely to arise with semantic interoperability. There are also costs and challenges associated with ensuring that data is clean, reliable, accurate and of known provenance. Any solutions to these issues must confer legal recognition and be adopted in practice. Sovereignty and security are very significant technical issues. Technologies like fine-grained access controls, privacy-preserving analytics and federated learning exist but they remain costly and difficult to scale. Unless we can ensure that data is sovereign, will not be exposed to foreign interference and will remain under European jurisdiction, participants will be very hesitant to share data, especially in sensitive areas like health.

This simple analysis tells us that we face a number of inter-related issues: legal uncertainty undermines governance; weak governance distorts incentives; poor incentives limit economic value; limited economic value means investment in technical solutions will remain marginal. Unless we address these issues holistically, progress will continue to be slow.

I believe that it is time to move from promotion to regulation, and from experimentation to some kind of institutionalisation. Europe has a unique opportunity to show that data sharing can be competitive, fair, sustainable and democratic. These challenges must be viewed not as silos but as parts of an interdependent ecosystem. The turning point is now, for Europe in particular, and Gaia-X deserves special attention. Gaia-X builds governance that is representative and gives SMEs, industries and civil society a voice in our data space. It provides infrastructure for secure sovereign data exchange so markets can function, and delivers the missing layer of interoperability so data can flow across borders without losing control or trust. The opportunity is bigger than ever for Gaia-X to build the rules, trust and institutions that make data spaces work for the European economy and European citizens.

Discussion

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Yvo Volman

This presentation highlights the important, practical work done by regulators. It is important to note that ten years ago, our focus was on data protection; today, we are discussing data use and data sharing. Work on data standardisation is ongoing and seeks to take account of the maturity of data spaces and data-space participants. We must be very ambitious and achieve substantial change in these areas if Europe is to have a chance of being competitive.

Sarah Jacquier Pelissier

We appreciate the work that the Commission has done to promote data spaces, including their work on trying to give clarity on some concepts and mechanisms mentioned in the DGA.

Mario Campolargo

This is an interesting time in Europe, as we are moving from a period where the focus has been on regulation into a new phase. There is a need to simplify and rationalise in order to avoid inconsistencies in definitions and duplication of efforts across channels. More importantly, Europe needs to invest in data as an integral aspect of its investments in other priorities, such as health and defence. We must ensure that the importance of data is properly understood in these contexts.

Joëlle Toledano

Do you think it is possible to tackle the issue of interoperability on the cloud outside the confines of the Digital Markets Act (DMA)? This issue is at the root of many competitive problems. Who will deal with it?

Yvo Volman

Without going into the detail of the DMA and cloud providers, I would like to note that Europe aims to set out an ambitious cloud policy in the Cloud and AI Development Act that is planned for 2026.

Sarah Jacquier Pelissier

Cloud services are mentioned in the DMA as potential gatekeepers. Arcep believes that it would be useful to designate concrete actors in that category.

Éric Brousseau

Nowadays, the enforcement of the DMA is shaped by geopolitical realities...

DataSharing and Industrial Transformations

Chair: Hubert Tardieu

Several major new data-sharing spaces have been launched under the auspices of France 2030, which is a major French programme to promote innovation. In the aeronautics and nuclear sectors, executive committees have determined that sharing data across an ecosystem of several thousand companies is the only way to manage the significant challenges they will face in the coming years. Both industries are adopting a similar development pattern and, within the limits set by France 2030, have determined that economic viability, namely independence from public funding, must be achieved within 36 months. The time for ideas and speculative funding has passed. The focus now is on delivering tangible results.

Data4NuclearX, a trusted data space for the nuclear industry

Véronique Lacour | EDF

EDF is a leader in the energy transition. Fifty-eight nuclear reactors built in the 1980s generate most of the electricity that EDF supplies in France. EDF is now working to build six new reactors with an option to build a further eight. The aim is to deliver each new reactor in 70 months.

The construction of a new reactor is extremely complex. The supply chain can involve more than 2,000 suppliers of many different sizes, from small local companies to major multinationals, and there can be thousands of workers on site at any time. This requires significant coordination and planning, which can be facilitated by the effective exchange of data. At present, EDF exchanges data with its Tier 1 suppliers, which exchange data with their Tier 1 suppliers and so on. This can result in duplication and issues around data access; it will become unsustainable as data volumes continue to rise. The challenge is to provide everyone with the right information, at the right time, so they can take the right decision.

Against this backdrop, Data4NuclearX is being built as a joint project by key players across the industry to provide a secure, sovereign and trusted space for the whole sector. The aim is to enable smooth data sharing and to industrialise data exchange, enabling all parties to retain control of their data and decide when and how it is shared and with whom. Possible use cases include data exchanges related to equipment manufacturing tracking or access authorisations for employees on site. Streamlining these processes will increase efficiency for suppliers and clients and provide project managers with real-time visibility of all aspects of the construction programme.

The aim is for this interconnected space to enhance the competitiveness and agility of the entire sector. Trusted data sharing, without manual re-entry, and standardised exchanges should make it possible to reduce error, costs and delays, and facilitate the integration and onboarding of new entrants.

However, four major challenges must be overcome. First, 80% of the 2000 companies in the supply chain are SMEs. These SMEs need support, simple and accessible solutions. They also need predictable and affordable costs to participate. That is exactly what we want to offer with the DataSpace. Second, there is no common language: the fact that each stakeholder uses their own language for scheduling limits interoperability, reliability and productivity. Standardisation of data is underway, notably within GIFEN and we will continue to cover a large panel of data.

Third, the solution must be available or the business will stop. Finally, security and sovereignty are critical: each data holder must retain full control over their data.

Through Data4NuclearX, the nuclear industry aims to make digital technology a major lever for deep transformation and increased efficiency, creating the basis for an agile, connected and resilient energy sector that is able to meet industrial and climate challenges of the coming years.

DECADE-X: unlock the strength of a trusted collaborative supply chain

Catherine Jestin | Airbus

Philippe Grobois | Airbus

Catherine Jestin

Deep collaboration with partners, suppliers and customers is integral to the history and culture of Airbus. Recently, it has become clear that increasing the speed of data flow among the more than 10,000 suppliers in the Airbus network is a vital vector of business acceleration. The guidelines and technical blocks for building data spaces for industrial ecosystems have been defined and it is now time to launch the next phase: operations. This will be a collaborative effort: a leading organisation will act as an orchestrator; at least one operator will provide and manage the necessary IT foundations; and participants will connect their information systems and data using this tool, define contracts for data sharing, and generate an economic ecosystem. Trust among these actors will be key. The Gaia-X trust framework, which makes collaboration and the secure exchange of data possible among participants, regardless of their size, digital environment or location, is a tremendous step forward. Airbus intends to deploy Gaia-X's proposal operationally within DECADE-X.

Philippe Grosbois

The DECADE-X association was created in May 2025 in order to establish a new digital data space for the aerospace and defence industries. Their shared decision to invest in this project is driven by the need for a resilient supply chain, trusted traceability and efficient co-development across these industries.

Resilient supply chains are underpinned by effective collaboration. The design, construction and maintenance of complex products like aircraft requires highly synchronised collaborative work between a wide range of suppliers. Airbus needs to ramp up its production substantially in order to deal with a huge order backlog, meet growing demand, and renew the world's existing fleet. The company currently delivers 766 aircraft per year but aims to deliver 43,000 aircraft over the next 20 years. Every aircraft that is not delivered equates to a loss in market share. Given the very long lead times involved, Airbus needs to monitor the supply chain closely in order to adapt production to variations in demand and rapidly identify and resolve any quality issues that might arise.

The ability to access trusted data is extremely important for the aerospace and defence industries: these are regulated industries that must meet compliance standards to maintain quality and participate in global trade. The ability to trace data accurately and cascade information across the supply chain is also beneficial for reducing the environmental footprint of aircraft. Sustainability is also supported by efficient co-development. Airbus has already made significant progress in reducing its carbon footprint and has made strong commitments to reduce it further by 2035. Achieving these goals will require the development of new aircraft and new technologies, which relies on input from strong, innovative suppliers and new players, which in turn obliges Airbus to reduce barriers to entry and collaboration.

Whereas collaboration previously involved a cascade of information from the top to the bottom of the supply chain, data spaces are now enabling direct exchanges of data between actors. Equipping the supply chain to interact directly mitigates risk through trust, interoperability, multi-tier and adoption. A trust framework like Gaia-X coupled with decentralised architecture, independent governance and a common language with shared standards will support the automatic, efficient

exchange of data, particularly in a complex, multi-layered supply chain. The full integration of SMEs, which comprise almost 90% of the supply chain, will be critical; work is ongoing on the best way to achieve this.

Four strategic success factors have been identified. First, the ability to federate beyond the EU by adopting transparent governance structures that can be used by partners outside Europe and are aligned with the needs and priorities of SMEs. Second, the ability to simplify for adoption. A scalable proof-of-concept design has already been delivered and is being brought to technical maturity alongside the trust framework and user journey. Third, the structuring and automation of the last mile of data access, to ensure that data can be retrieved, exchanged and integrated via multiple types of back-end system. Finally, even though it is a complex economic model involving multiple stakeholders, DECADE-X must reach cashflow break-even after three years of operation and demonstrate that it is financially viable after three years. The planned model is based on fair-value sharing across the industry and different actors.

Trajectories of data-sharing ecosystems

Lucas Eustache | Governance and Regulation Chair, Paris Dauphine-PSL University

Hubert Tardieu

These two examples in absolutely strategic industries for Europe and France both rely heavily on frameworks and concepts developed by Gaia-X and Paris-Dauphine. Some similar projects have, however, suffered from a lack of funding and a failure to define their economic principles upfront. The following intervention is based on interviews from 27 European projects that were interviewed over the last year.

Lucas Eustache

Data-sharing ecosystems are organisational arrangements based on shared technical infrastructure and collective governance. They evolve across time through a process of emergence, diffusion and enlargement. Based on interviews conducted over the last year, it appears that six critical factors underlie the sustainability of ecosystem trajectories.

A number of elements are involved in the economic model of a data-sharing ecosystem. In a symmetric ecosystem, actors – which could be firms, organisations, institutions or even individuals – are the same size and try to collaborate to create use cases that will deliver value. Relationships between actors are mediated by a neutral or non-neutral technical intermediary, which provides tools that enable seamless data exchange between actors. An orchestrator sets the direction of value creation and brings actors together to create value by sharing data or offering services. An orchestrator can work on one or more use cases and an ecosystem orchestrator can oversee different use cases. In an asymmetric ecosystem, one or more key actors in the ecosystem are able to influence governance and might fund the intermediary or have privileged access to use cases.

The first critical factor in ecosystem sustainability is aligned interests. As a zero condition, there must be interest in bringing data together to develop services and aligning interests across industries, firm sizes and value-chain positions. Orchestrators must ensure participants are convinced they will gain value from use cases, particularly in asymmetric ecosystems where alignment may be more of a burden.

Second is the need to invest in an innovation process to fund initial fixed costs as well as recurrent costs throughout an uncertain innovation process that will involve failures, delays, adoption uncertainty and so on. The orchestrator can mitigate this by ensuring that the level of investment matches the operational activity of the data ecosystem and by ramping up as participants' needs and use cases evolve. Key actors can choose to absorb costs, although this raises risks of dominance that must be managed. Ecosystems need critical mass before network effects create value; funding dominance can create power imbalances.

The third factor is the need to manage the progressive onboarding of new actors and use cases, harmonise heterogeneous systems and processes, ensure alignment, and balance openness with selectivity. The orchestrator must generate economies of scope by reusing tools and developing governance routines and technical standards through reflexive design and ongoing reassessment. At the diffusion stage, early choices can create path dependence. Asymmetric ecosystems can be more sensitive, especially when there is heterogeneity between actors.

The fourth factor is the need to deal with risk: as the number of participants and use cases rises, the risks associated with areas like strategy, technology and security rise, especially in sensitive areas like health. Orchestrators need to take a step-by-step approach to balance costs, benefits and risks, optimise security and minimise technical risk.

Fifth, it is important to avoid the transaction trap: the value of a data-sharing ecosystem lies in the exchange of data and the development of data-based services rather than in the transactions themselves. Transactions may be necessary, for example to cover the cost of data transfers, but use cases should be based on the value that can be created by sharing data rather than on transactions or data shopping. The economic model for use cases is not the same as the business model of the intermediary. Stakeholders must be involved in designing use cases.

Finally, it is necessary to mitigate lock-in, particularly if there are dominant key actors. Participation in a data-sharing ecosystem can trigger dependence on essential ecosystem-specific assets like standards, shared infrastructure and analytics; exit costs can raise issues with sunk investments and interdependent processes. The orchestrator must prevent monopolistic capture while ensuring efficiency by stimulating interoperability and providing credible balanced governance mechanisms and options for managed exit. This is particularly important in the enlargement phase and when a key actor is present.

Data-sharing ecosystems are dynamic objects: the economic model and conditions can vary over time. Participants face different challenges during the emergence, diffusion and enlargement phases.

Discussion

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Véronique Lacour

We have a long history of working with Airbus. Lucas' insights into how data-sharing ecosystems can be made to work effectively together are very interesting.

Philippe Grosbois

It is interesting to see this very structured approach to understanding the similar challenges that we face. Do you have criteria for evaluating the point when critical mass is reached and a project becomes viable?

Lucas Eustache

We do not have specific numbers, but the key concept is the number of participants in the value chain that will be required to deliver value. Depending on the answer, different strategies can be used to ensure you onboard enough participants to reach critical mass.

From the floor

You reach critical mass when it becomes impossible to do business without the ecosystem.

Hubert Tardieu

Data-space projects can be submitted to France 2030 in November 2025, June 2026 and November 2026. Participants who are interested in receiving support to prepare for the France 2030 application process can send their projects to Lucas and Joëlle before the Porto meeting.

From the floor

What is the governance approach to managing the risks of nuclear safety, security and health within a single data-sharing framework?

Véronique Lacour

The organization for managing the various topics is currently being defined.

From the floor

Many SMEs in Germany do not see the benefit of the work that Gaia-X is doing. Others participate because they are obliged to by larger partners. How do you convince SMEs of the benefits?

Véronique Lacour

We do not talk about Gaia-X to SMEs. Instead, we focus on the benefits of using the ecosystem and on use cases that will bring them value. Small companies usually do not have internal ecosystems that enable them to embark on digital transformation. This is an opportunity for them to make progress in that respect, gain value from use cases, and participate in the upcoming transformation.

Philippe Grosbois

Presentation is important when talking to SMEs and we try to get them around the table. We emphasise that collaboration can make them more efficient by reducing manual tasks, and highlight the potential to facilitate compliance with new regulations. Our approach also depends on the type of SME. We want to invite new, potentially innovative players to increase our competitive edge and show that data-sharing ecosystems can reduce barriers to entry. We do not have all the answers at the moment.

Hubert Tardieu

This is an important challenge that is not unique to Germany.

From the floor

You cannot share industrial secrets with competitors. How do you manage this?

Philippe Grosbois

The question of whether sensitive data can be shared or not shared depends to a great extent on the trust framework. There are three key elements. First, by design we have a decentralised architecture. Rather than putting all of the data in a common pot, we enable peer-to-peer exchange so sharing is a deliberate choice. Second, we have transparent governance that avoids concentrating responsibility in a single actor. Third, we have verifiable identities so we can be sure who we are interacting with and from whom we are receiving trusted data.

Véronique Lacour

We are implementing a decentralised architecture that enables data sharing. It is not a data warehouse where data would be stored. Each actor chooses what to share and with whom.

Hubert Tardieu

It can be a question of attitude. In Europe, we are proud to share. This is less true in some other regions.

Dynamics of Emergence and Development

Chair: Joëlle Toledano

Data-sharing ecosystems are highly diverse, with a multitude of use cases underlying a variety of economic models. This session will show how data from different actors can be combined to create new uses that serve different stakeholders, provide an example of data monetisation, and show why the strict status of data intermediary can have real significance.

Space data economy overview

Jacques Beas-Garcia | CNES

Within the data economy, the space industry is primarily a provider of high-quality data rather than an end user. Space agencies and industry players have developed satellite infrastructure that is able to deliver high-quality data to meet market demands. Space data includes optical information, radar, meteorology, frequencies, navigation systems, and so on. Historically, data were collected via satellite programmes developed by publicly funded space agencies with support from industry players. These have now been joined by more than 70 private companies, most of which are based in Europe, the US and China, which operate satellites for commercial purposes and are constantly developing new data offers and new business models to meet evolving market demand. Data sets are priced based on metrics like investment cost, addressable market size, data characteristics and potential use.

The market has two main segments. The raw data segment, which is valued at 2.1 billion USD, is dominated by Airbus and Maxar and used by a wide range of sectors from defence and insurance to energy and agriculture. The value-added segment is valued at 3.3 billion USD and is primarily used by the defence sector, although use by the finance sector has grown substantially since 2020 and the insurance sector is also expected to expand. Exploiting the potential value of this segment will depend on the creation of new use cases.

Downstream activities became a strategic priority for CNES around ten years ago. More than 60 people in CNES are now dedicated to unlocking the value of space data, ensuring that it is accessible and available for end-user applications, and fostering innovation by connecting space data with other sectors. To add value to space data, whether economic value, increased efficiency or some other benefit, it is often necessary to combine it with other sources, such as data from social media and public databases. The more specific the user's needs, the more effort is required to identify, extract and generate the right information. Users decide whether to make or buy a solution based on their business model and the value they can obtain, which means the service provider must deeply understand the needs of their customer.

The space data offering sits at the middle of the value chain. To maximise its potential, it is necessary to understand the public and commercial needs of other ecosystems and establish a strong governance model to organize public needs; to create easy access to raw data; to turn raw data into value-added services; and to organise data and service offerings that match real user demand. In France, the CNES is working to create a national governance framework for public needs, which involves regional authorities, public institutions and ministries to identify needs and align budgets. We are also developing a data economy in public policy work thanks to the France 2030 investment plan and have successfully launched several calls for tender for operational services based on space data. The CNES is also identifying trusted third parties that can develop initiatives for operational activities to meet public needs.

MiTrust: a European player in digital trust

Xavier Drilhon | MiTrust

MiTrust is a very small company that focuses on personal data. In everyday life, people are often obliged to share their personal data, for example when they apply for a loan, rent an apartment, make an insurance claim or open an online account. This requires them to take time to complete questionnaires or provide supporting documents and wait while information is checked for fraud and processed. The process can be lengthy and frustrating for the consumer and costly and inefficient for the company.

MiTrust aims to change this by leveraging the fact that the data in question is already held by reliable parties, like banks, utilities and public authorities. The data exists; the user needs to be able to share it with other organisations in a simple and secure way. MiTrust enables users to perform this task while remaining in full control of their data and without needing to create an account or download an app.

The process is simple and transparent. Depending on the needs of the company, the user is offered a range of sources where the data has already been validated. The user chooses what will be shared and, in a few clicks, can transfer the information to the target organisation. A single API enables organisations to pick up to 300 data points with a query language and select the data source depending on the use case. Consents are stored by the platform and time-stamped, and nothing happens without explicit permission from the user.

To illustrate market adoption and benefits for stakeholders, in a 2024 survey of more than 7,000 French citizens, most people said they would share salary slips in person or through a direct upload but only around 40% said they would share this data through an online system. In practice, however, adoption rates are very high. For example, MiTrust is used by 99% of customers at Sofinco, a consumer loan company – the exceptions are fraudsters and people who are simply curious about the service – and by over 90% of customers at Verlingue, a rent-guarantee service. Consumers and companies benefit from increased speed and efficiency. At Sofinco, for example, the time required to get approval for a loan has gone from five days to six minutes, while at Verlingue it now takes two minutes to get a response and business has increased by 516%.

MiTrust was created six years ago and now operates in France, Germany and the Netherlands. It is funded by private investors with a minority stake held by CNP Assurances. The company has reached profitability and its revenues have been growing by over 80% per year over the last 3 years.

The company implements EU regulations related to data, like GDPR, DGA and PSD2. In April 2025, it became the first French company to receive the label of “Data Intermediary recognised in the EU” from Arcep (French regulator) and is a registered account information provider at ACPR (French Central Bank) since 2021.

Overall, with multiple use cases in multiple industries MiTrust service demonstrates the high demand for authentic data from businesses and the willingness of users to share their data if done securely and in full transparency. In terms of social value, this kind of system can help to fight against fraud, identity theft and discrimination. In terms of business model, the service is usually free for the end user and paid by businesses collecting the data.

Data access is however a limiting factor going forward. There is a lack of API with proper SLA. To incentivize access to personal data held by public administrations a fair remuneration could be implemented to cover the technical cost of the API and guarantee a clear SLA. At a time where some European countries have issues with public debt and deficit, it is important to realise that citizens are eager to reuse their personal data held by public administrations and that companies are ready to pay for the access to such data.

Dynamics of Emergence and Development: data sharing in agriculture, from Flanders to Europe

Eva Maes | ILVO – Flanders Research Institute for Agricultural, Fisheries and Food (Belgium), Agrifood Technology Unit

The DjustConnect data-sharing platform grew from the idea that despite increasing use of digital tools, administration still is a very high burden for farmers. There are too many different systems, making it impossible to keep the overview of who has access to which data and for what aim. Farmers maybe want to take part in innovation, contribute to sustainability goals and implement new farming practices, data but are being held back by complexity, administration and legislation. Over the last decade, the potential applications and benefits of sharing more data have increased with the sustainability requirements, governmental decisions to simplify procedures, the need to manage robotic farming and drones, the use of AI, the increasing interaction throughout the value chain, also with the food-processing industry and retailers, , inform consumers about the health impact of their diet, and provide information to governments and regulators.

DjustConnect is a B2B datasharing platform. Farmers register for free and companies get a license based on their needs. It is an open platform and everyone is welcome as long as they respect the common rules. Farmers retain control of the data about their farm and decide what to share and with whom. Participants have to abide by a contract that sets clear ground rules in line with legislation, and a code of conduct for data sharing in agriculture. Farmers benefit from having control of their data, reduced administration, and support from a helpdesk, while data providers have access to new markets, legal coverage, API management, IT support and ConnectShop access. Data users also benefit from advice and support, as well as data access. Participants can see what data is available and make a data access request that is passed to the data provider. To ensure respect for the Data Act, data is provided subject to specific consent.

As well as increasing efficiency and reducing administration for farmers, companies and government, DjustConnect has many use cases for sustainability, certification, mapping and so on. For example, ecological footprints that previously required a time-consuming climate scan can now be calculated more easily using existing data and paired with advice tools that help farmers to reduce their footprint.

Launched in Feb 2020 with one demo, a handful of farmers and an operational platform, DjustConnect now has more than 56 connections with government and companies, 3,800 farmers (25% of Flemish farmers), and became a regional data space. The platform has grown because it is easy to use and accessible for farmers, and safe, efficient and legal for companies. DjustConnect continuously develops new services and offerings based on what participants need and has an API that ensures easy access for small companies and contractors.

The platform is managed by ILVO, a neutral partner which seeks to promote tangible benefits of data sharing, including trust, respect and reduced administration. ILVO also coordinates the Common European Agricultural Data Space (CEADS), which started in April 2025 with 36 partners, 15 countries and eight initial use cases. Although DjustConnect was initially a local platform, ILVO was quick to recognise the need of cross-border collaboration with, for example, machinery providers and has piloted data sharing across borders with France and Finland. These pilots are always based on specific use cases and existing data-sharing systems.

Discussion

From the floor

Could you explain the increase in demand for satellite data from the financial sector?

Jacques Beas-Garcia

Space data can provide consistent, good quality data for actors, like those in the financial sector, that are seeking to understand assets and assess risk in different geographies around the world.

The Governance Challenge

Patrick Laurens-Frings | Caisse des Dépôts

The Caisse des Dépôts is deeply involved in promoting data spaces, particularly in challenging fragmented ecosystems. Governance is probably the main factor underlying the success – or failure – of data spaces. It defines the economic model, the rules, and every aspect of a data space's operations. Governance must ensure that decisions support the underlying operating model.

Fragmented ecosystems are obliged, for regulatory reasons, to have two actors rather than a simple data intermediary and a single network. Experience tells us that this is important for building trust, which itself is vital for onboarding large numbers of actors. This is particularly important in a fragmented ecosystem, as the actors tend also to be competitors and everything must happen on a voluntary basis.

Trust relates to transparency. As in individual interactions, we tend to trust people who say what they will do and do what they say they will do. The strategic orchestrator, which is often a non-profit organisation, is in charge of governance and defines the rules. In a fragmented ecosystem, the key challenge for a strategic orchestrator is to onboard actors that have a shared economic interest in organising data sharing at scale. These actors must be convinced that operating at scale, beyond the limits of their existing data interfaces, will deliver benefits and create value. The data intermediary service provider (DISP) is then responsible for implementing the rules that have been established, ensuring that they support a value-sharing model that enables economic viability.

Success depends on a number of key decisions being taken when the project is launched, rather than over the course of the data-sharing experience. It is our opinion that many data-sharing ecosystems have failed because these decisions were taken too late. First, the core team members must include economic actors who will reap economic and financial benefits from participation and are committed to the financial investment involved in setting up the space. Second, there must be clarity about the initial use cases that will provide the initial financial benefits and lay the groundwork for future success. Third, an onboarding strategy must be defined up front for things like the SME user experience, interoperability and standard technologies. This strategy must be funded by the business case. The fourth key decision relates to scalability, including the financial profitability strategy, a plan for how governance will be expanded as the ecosystem grows, and scalability for use cases and the technical platform. By taking these decisions, it is possible to design a data space to support trust and financial viability. .

Discussion

Martine Gouriet

What do you see as the role of institutions in governance?

Patrick Laurens-Frings

Trust is at the heart of what we are doing. Caisse des Dépôts can be an accelerator in fragmented environments both by providing the 'trust factor' and as an investing partner. We are keen to invest in fragmented data spaces because they are key to the economic development of France and Europe.

From the floor

How do you define financial viability in a fragmented ecosystem?

Patrick Laurens-Frings

We make a distinction between economic benefits and financial viability. Participants in the data-space value chain have to access economic benefits. The DISP has to achieve bottom-line financial profitability.

From the floor

Do you have a specific business case in mind as regards the functioning of the whole ecosystem?

Patrick Laurens-Frings

Our hypothesis is that each private actor must be able to achieve financial profitability from their participation so they can justify their investment in the data space. The DISP must also be able to achieve financial profitability over the short and long term. This is a huge challenge. We did not know it initially, but we know it now.

Eric Brousseau

Public subsidies are also important.

From the floor

How do they have financial stability if they do not decide the pricing?

Patrick Laurens-Frings

Pricing has to relate to value sharing. The strategic orchestrator role must be structured in a way that splits the value across the different actors. Within the chain, there is a specific role for the DISP which guarantees their financial profitability. We will learn more about this in the coming years. At present, we think that pricing in fragmented ecosystems cannot only be done at the level of the DISP because it is an integral part of the value-sharing scheme.

Jakob Rehof

When talking about European technology sovereignty, it is often noted that around 300 billion USD are invested in US capital markets every year and that Europe will struggle to compete without a unified capital market. What are your thoughts on this?

Patrick Laurens-Frings

I agree. We are not responsible for regulations, although we do share our opinions with the Commission. We take a pragmatic approach, seeking to accelerate the sovereign digital economy and actors through investment. We operate in data sharing, invest in many companies, and our shared challenge is to go European. We are part of a long-term investment community that is exploring alignment capabilities and the potential to coordinate investment capacity.

Scaling-up and Involving SMEs

Chair: Joëlle Toledano

Data Spaces and SMEs

Anne Carrere | BoostAeroSpace

AirSupply is a demand-cascading platform that allows OEMs, including the platform's lead customer Airbus and 31 other customers, to cascade their needs to the supply chain. Five thousand suppliers are connected to AirSupply, but only 10% communicate automatically to customers. Most are still entering customer data manually into the ERP, which creates additional workload and can be difficult, especially as some still work from Excel files. These figures show that digitalisation is far from being achieved within the aerospace and defence industries.

Shared data spaces are a source of both fears and opportunities for SMEs. Complex setup and maintenance requires skills that they might not have. Low data quality can undermine the quality of data sharing. Heavy integration requires resources. Scalability and data volumes can be issues as increasing volumes of data need to be maintained. SMEs can have concerns about data privacy and security and may lack confidence that their data will not be exploited behind the scenes. Change is difficult, although often it is the smaller companies that are most willing to adopt new systems. Costs and return on investment can be an issue for SMEs as joining a data space requires investments in resources and software. A lack of common standards and limited interoperability can further complicate matters.

Nevertheless, there are also drivers that encourage SME participation in shared data systems. These include clarity of governance; data accuracy; ease of use and support for data integration, especially with plug and play solutions; cloud-based infrastructure that facilitates system maintenance; anonymisation, shared data encryption and access control for users; common adhesion, understanding and training; use of widely known data formats; a consistent flow between systems and tools; and datanomics and KPIs that measure value and can incentivise SMEs to share data by clarifying potential returns.

Data spaces can be tremendous assets for SMEs. They can improve their competitiveness and provide them with data that they could not otherwise access or use. Data spaces can help them to optimise operations, predict trends, and better understand clients and suppliers. Data spaces facilitate cross-sector collaboration with institutions, researchers and other businesses. They improve data governance maturity by enabling SMEs to understand and mitigate the challenges of internal data quality.

To get SMEs on board with shared data spaces, it is important to involve them from the outset. Data spaces must be built by clients and suppliers to align expectations and meet needs on both sides, ensure everyone speaks the same language, and build agility into the platform. Big OEMs that use data spaces must build trust by setting an example in terms of digitalisation, collaboration and transparency. They should also consider fully or partially subsidising the cost of participation for SMEs. Finally, big OEMs must show that they are worthy of trust, interested in helping SMEs, and offer a genuine benefit.

The Data4NuclearX data-space project

Martine Gouriet | EDF

The new Data4NuclearX project is designed to enable the more than 2,500 companies involved in the nuclear industry, 80% of which are SMEs, to work at scale on massive industrial projects. Data4NuclearX is an industry project rather than an EDF project. The data space is being created not for the love of data itself, but because we want and need to improve our operational processes, improve maintenance, and reduce the time required to build new plants. To do that, we need to exchange data. By changing our operational processes to integrate data, we hope to become more streamlined and efficient.

In establishing Data4NuclearX, we face operational challenges in four key areas. First, governance. The plan is to create a two-tier structure. The first level will have an association of key players in the French nuclear industry working together as an orchestrator, which will be responsible for defining specifications and use cases and setting rules and standards. This should be in place by the end of 2025. The second tier will involve the DISP, known as the technical operator. This entity has yet to be created and the role is being filled in the interim by other industry partners. The relationship between the two levels and their respective responsibilities are yet to be defined. The second challenge relates to the operating model: the technical operator must be economically sustainable and successful in onboarding a large number of SMEs. The data space must create value for all participants and the process of taking part must be simple and affordable for everyone. The business model is promising on paper, but it remains to be seen how it will operate in the real world.

The next challenge is to ensure the sovereignty of our data. Data4NuclearX will rely on trusted cloud infrastructure, require robust security protocols, and comply with all relevant regulations. This is particularly important in the nuclear industry. Every participating company must be confident that its data is protected and will not be shared with other companies without its permission. Finally, a number of complicated technical challenges must be resolved. Working with Gaia-X has shown us that we must solve our governance, operating model and data sovereignty challenges before seeking to resolve these technical issues. Identity management is particularly important: upwards of 15,000 people from several hundred companies can be working in one plant on a single day. At present, workers can waste one or two hours queueing to get identified before they even get into the site to start work. Interoperability standards are another key challenge. Often, suppliers for the nuclear industry also work for other large industrial organisations, such as aerospace, so it is important that Data4NuclearX uses shared standards that allow them to work easily across the data spaces of different industries.

We are excited to be embarking on this significant industrial project that is central for the competitiveness.

Perspectives on data sharing and value creation

Sébastien Picardat | Synevop

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Based on my extensive experience working with SMEs with fewer than 20 employees, I am convinced that to onboard SMEs it is necessary either that the onboarding process is required by the law or by important customers, or that the SMEs have an economic interest in participating.

I would like to highlight four aspects of value creation. First, use cases can increase turnover, reduce costs and mutualise investment. In farming, for example, farmers can increase their turnover by sharing data. If they share data to prove that their oil seed production is sustainable, they can sell the crop to cooperatives which then sell it to industries that produce biofuels. The sustainability data enables the oil companies at the end of the chain to reduce their tax liability, which means they will pay more for sustainable oil seeds.

Value can also be created by lowering costs. For example, there is a farm management system that collects data from 40,000 farmers. Due to the size of the system, many partners want to be connected in order to access the data, but a single API costs 15 to 25,000 EUR. Connecting 100 partners in this way would require a budget of more than two million EUR. Developing one multi-sided API that can be shared through an intermediary would cost around 100,000 EUR but it would enable thousands of partners to access the data without additional spending.

Similar issues of scale arise in my third example, from the construction industry. Building a single section of the Grand Paris subway requires one of the main contractors to produce and share two million documents with partners, resulting in a total of around 20 million transactions requiring more than seven terabytes of data. It would be significantly more efficient to share these documents through an data intermediation service provider. Healthcare also offers many opportunities to create value. For example, data from implanted devices, like pacemakers, is collected by hospitals to be sent to the social security so the costs of the devices can be reimbursed. The employees collecting this data must be paid.

Technology must be simple, affordable and accessible for everyone, especially SMEs. In the automobile sector, the tech partners of CatenaX said they expected to deploy 25 data connectors per quarter. In Germany, there are 8,000 suppliers working in the automobile industry, so it would take 80 years to connect them all. Security of transactions is important to protect SMEs against cyber attacks. Digital identity is necessary to onboard SMEs in a data space. It is also a key issue in industries like aeronautics and nuclear. Currently, in France, SMEs can verify their identity by sending a Kbis document or national identity card. In 18 months, thanks to Europe regulations, all EU citizens will have their own wallet, all companies will have a business wallet and all member states will be able to provide verifiable credentials to allow the identity of a citizen or company to be checked online in real time. This is a tangible proof of the benefit of digitalisation.

Discussion

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Anne Carrere

Thank you for these interesting presentations.

Martine Gouriet

It is very useful to share these insights as it shows that we all share similar challenges.

Joëlle Toledano

It could be useful to create a club to share experiences.

Éric Brousseau

It may be possible to create a club for data sharers.

Sébastien Picardat

This second generation of data spaces needs to be successful. DECADE-X and Data4NuclearX are major projects. It would be good to hear more about fragmented ecosystems so we can learn how they compare to these major projects and understand more about the experience for SMEs.

From the floor

In the construction industry, the issue is less about SMEs because they need a common language to work with the big players. Instead, the question is why we cannot convince the big players to invest together in these projects. They are willing to cooperate to develop standards and exchange information, but they fail to invest together to work with nuclear, railways and other major industries. How do we discuss this with major companies like Bouygues, Eiffage and Vinci? This is not a question of use cases. It is a question of explaining that we have an obligation to share information as part of our contracts. A core issue is data sovereignty. Competition has not been mentioned today but this is also a crucial issue.

Martine Gouriet

Eighty percent of our suppliers are SMEs but we also have big suppliers that are not SMEs. We aim to work with them on the first level and we expect that they will cooperate because the data space will improve their operational efficiency. Ultimately, that is the aim. In the nuclear industry, time is money.

From the floor

How do you improve cyber security, resilience and maturity around identified risks and potential security issues, and gain actionable information to prepare for modern cyber risks?

Anne Carrere

All of the solutions at BoostAeroSpace are secured as we do not want to put SMEs at risk of being triggered by a cyber attack. Being secure does not mean you are immune, but it does facilitate mitigation if an attack occurs. Cyber security is a big issue in data spaces. DECADE-X works on this on a regular basis.

Philippe Grosbois

Cyber security is essential and we have a dedicated team working on that. But it is only one element that must be considered when aligning different groups. There are other topics that might be more complex. We tackle cyber security at the outset and try to identify potential issues through testing.

Generative AI & Data interoperability

Chair: Jakob Rehof

Data sharing is only useful if the data can be interpreted, but information can be represented in many, many different ways. For this reason, data interoperability is a strategically important issue and a key challenge for data ecosystems.

DECADE-X / Data Interoperability: GenAI Opportunity

Jeremy Mambrini | Airbus

The DECADE-X ecosystem is being built to streamline the data sharing within the aerospace and defence supply chain. From the outset, it was clear that interoperability issues would be a key challenge, as a range of heterogeneous systems are deployed across different business partners within these industries. All data-sharing ecosystems share the challenge of ensuring not only that data can be exchanged, but also that they will be understood in the same way both by the business actors and the systems.

Data spaces across different sectors, from healthcare, mobility and finance to agriculture and manufacturing, all make the same promise: that they will unlock the value of data for participating organisations. And they all face the same challenge: data interoperability. It is important to understand that developing standardised ways to share data does not overcome this issue. As well as having shared technical standards for exchanging data, the data itself must be presented in ways that ensure consistent interpretation by both humans and machines. Achieving syntactic interoperability, whereby data is organised according to consistent formats and protocols, is relatively straightforward. Semantic interoperability, which ensures that the meaning and context of the data remains consistent and unambiguous across every system, is a significant hurdle.

GenAI has the potential to tackle many aspects of this challenge, for example through automated data transformation and standardisation, enhanced semantic interoperability, synthetic data generation, and natural language for data discovery. To explore the opportunities offered by genAI in depth, Airbus brought together in-house experts and researchers from Gaia-X and other leading institutions at a workshop in July 2025. The objective was to confirm the potential of genAI, identify application scenarios or use cases that would be relevant for the data ecosystem, and test feasibility. A 'hackathon' approach is planned to be organised later in 2026 to explore feasibility.

Three opportunities were explored and agreed by the participants. The first was data instantiation via genAI, namely the generation of data packages according to common ontology / semantic data models. The second opportunity was data standardisation, namely the generation of common ontology / semantic data models from multiple sources. The third was data integration: the generation of mapping solutions from heterogeneous ontologies / data models to common standard ontology. Having defined those three opportunities, we are now looking to collect enough inputs to try them out on real aerospace and defence use cases, perform the hackathon and explore how we can transform the genAI ecosystem into a reality.

From the floor

How would existing ontologies that are manually crafted be synchronised with something generative?

Jeremy Mambrini

We would take them as an input into the genAI so that it can be mapped or extended to meet our needs. It really depends if the ontology will fit our needs or not. We aim to use what already exists as an input.

From the floor

Would an extended or automated ontology be validated as part of this process?

Jeremy Mambrini

Yes.

Éric Brousseau

What kinds of genAIs are you using? Are they generic or specific? Could your approach to using genAI to resolve these issues be applied to other industries and in other value chains?

Jeremy Mambrini

This was one of our objectives with the hackathon and the reason why we are partnering with experts from research institutes. In order to achieve our goals, we might need to benchmark different options, explore open-source LLMs, and so on. We do not want to use a black box.

Jakob Rehof

I will discuss this in my presentation.

Hubert Tardieu

Can you give us some examples so we understand where you started and where you want to get to?

Jeremy Mambrini

At present, we still have a lot of processes, documents and standards that are paper based. One example is certificates of conformity, which are a key use case: having machine-readable standards for managing conformity in defence and aerospace could deliver a lot of value for the ecosystem. We are working to structure these standards into an open format to make them machine-readable.

The paradox of interoperability – from dataset exchange to living data

Benoît Tiers | Benoît Tiers Consulting

Discussions about interoperability often focus on the exchange of data sets, but in order to manage complex value chains, we must be able to work with living data. True interoperability involves synchronising digital processes in real time. Whether the focus is on the needs of large players driving industrial transformations, or the needs of the SMEs that need to come on that journey with them, the foundational elements are the same.

While it can be useful to think about exchanging historical ‘cold’ data sets, this is insufficient for managing complex supply chains. To do that, it is necessary to exchange ‘hot’ data and synchronise processes in real time. Without a shared language, each system remains locked in its own format and interactions require costly and fragile ad hoc mapping. A shared ontology provides a common foundation and defines the concepts, relationships and formats, but interoperability means mutual understanding. Infrastructure interoperability is also essential, but it must go hand in hand with trust, secure transactions, reliable identities and auditable exchanges. But even this is not sufficient.

Semantic interoperability seeks to ensure that systems go beyond data exchange to ensure that systems consistently understand the same concepts.

It is important to avoid auto-immune syndromes, which are the proprietary standards that are often offered by large platforms. They offer local interoperability but aggravate the problem by creating dependency and lock-in. This is a technical, strategic and economic risk for Europe. If we allow proprietary standards to dominate, European data spaces will remain fragmented or dependent. A shared semantic backbone is the only way to ensure sovereignty in the data economy. For me, this means the capability for companies and governments to choose and to guarantee economic viability by reducing duplication and mutualising costs across ecosystems. This will only work if data remains under full control of its owner, who decides with whom to share it. Storing data creates silos; sharing it creates value.

The point of a common backbone is to create a welcoming, interoperable environment that can create complementary ontologies. The aim is not to standardise everything by reinventing standards or specific processes for every industry. Any attempt at universal standardisation will fail because it will be heavy and too slow. The ontology of interoperability is a neutral backbone that welcomes sector-specific ontologies and existing definitions without trying to redefine them. For example, a postal address and GPS coordinates are equally valid ways of defining a location, but systems need to be able to carry those definitions consistently and unambiguously across domains and sectors. Integrating AI will make this easier. Developing a shared backbone will protect us from dependency, ensure true sovereignty in the data economy, and support economic viability by reducing duplication and mutualising costs.

A common semantic backbone also needs to be operational and have connectors that plug existing systems into the network in the least intrusive way possible. Connectors raise the risk of lock-in. If they are proprietary, the system will be interoperable only in appearance and the system will remain captive in reality. Open, standardised connectors need to be designed that are available to large actors and SMEs. AI can automate connector generation, validate mappings and reduce integration costs. Interoperability must also be inclusive: if connectors are not designed for SMEs, the result will be digital subcontracting instead of empowerment. For true sovereignty, both large and small actors must be able to plug in and benefit. SMEs cannot afford to build their own digital infrastructure, but by collaborating they can share costs, access standards and simplified regulations, and open new markets that would otherwise remain closed to them.

Interoperability must cover not only exchanges of static data sets but also the synchronisation of living flow. If AI is applied to heterogeneous, unaligned data sets, there is a high risk of approximations, errors and bias. It will also waste CPU resources for no benefit. Running thousands of AI agents to translate dialects is a waste of energy and resources. The sustainable path standardises the

backbone and then lets AI accelerate on top of it; it does not use AI to compensate for the absence of standardisation. The same applies to use cases: rather than solving a multiplicity of fragmented use cases, it is important to consider the foundations of the system upon which they sit.

The main challenges of interoperability are transversal to all industries, all data spaces and all data-sharing ecosystems. The turning point is now: moving from fragmented exchanges of cold data sets to shared semantics, open connectors and living, real-time data. This is the foundation that will enable AI to be a real connector and allow use cases to scale on common ground.

Martine Gouriet

Thank you for this clear explanation. What is the first step towards achieving this ambitious goal?

Benoît Tiers

The first step is to work together. For example, in recent European regulations for greenhouse gas emissions and transportation emissions, weight is called mass in one regulation and weight in the other, although it is not clear if this refers to gross weight, net weight or something else. A computer cannot perform tasks on this basis. When dealing with situations like this, it is important to stay focused on the interoperability part of the language. We do not have to enter into processes that are specific to an industry or reinvent language. When we focus on what is necessary for interoperability, we simplify the task and are able to welcome the specific semantics of specific industries. We can start by identifying generic topics around which we can communicate, and then use technology and AI to support that. It is a difficult task, but I think that this is the right way to approach it.

The challenge of data interoperability in data ecosystems

Jakob Rehof | TU Dortmund, Fraunhofer Institute, and Lamarr Institute

Data interoperability is a very old problem but it remains an exciting challenge. Little fundamental progress has been made on it but genAI provides new avenues and new hope. The challenge is to align different representations of the same or similar information, ensuring it is consistent within and across multiple data sources. The problem takes many forms and different kinds of mapping between ontologies and data and data models can take place.

From a limited, technical, computer science perspective, data interoperability offers a number of potential roles for genAI. These include assisting in the construction of ontologies or schemata from data; constructing mappings of data into existing ontologies or schemata – which could be very important for helping SMEs to be onboarded at low cost into existing models along a highly complex supply chain; constructing mapping between ontologies or schemata; or constructing data transformation to align between different presentations of the same information. Often, computer scientists can understand these mappings as programs of sorts. In these cases, genAI would take the form of automatic code generation, which is another classical computer science problem. A very successful part of that story is the construction of compilers, which are programmes that translate from high-level programming languages down to machine code. However, a more ambitious goal would be to seek a solution whereby the program would be written automatically based on a logical high-level specification. This is an extremely hard problem due to the difficulty of writing the logical specification and because, computationally, it is extremely costly to generate a program in this way. It has only been successful in very limited scenarios.

GenAI is changing the game here. In particular, since 2017, the transformer model from Google DeepMind has created a revolution in automatic natural language translation. We are close to achieving natural simultaneous translation. Twenty years ago, this was completely unthinkable; something fundamental has changed. This development also promises to revolutionise software development. Large language models (LLMs) are highly complex, highly scaled statistical models that make it possible to associate an enormous amount of contextual information, built around vectors of hundreds of millions if not billions of parameters, with a particular word or token in a language then tell you the kinds of contexts in which that word or sequence of words or tokens might appear. This works extremely well with natural language for two reasons: first, the availability of a very large training set in the form of the internet and secondly, at a deeper level, because grammar provides a hidden structure in language that can be automatically discovered on a statistical basis by these models. Software code is also written in a highly structured, logically definable language, which means that this strategy can transfer from natural language to code. In this case, it is possible to take advantage of pre-trained language models, which are already a good basis for generating computer code. Trained, specialised models are even better and coding repositories are available to facilitate this training. In the case of computer language, the model's output can be executed and automatically tested, which opens the door to very efficient unsupervised learning scenarios.

This kind of technology has been developing for a number of years. In the Airbus hackathon, we shall aim to benchmark some of the models that are available, including a number of European models. Identifying the best solution for the applications we have in mind, such as generating code that automatically provides the mappings we require, is difficult in advance and is the focus of the testing that will be performed with Airbus. The use of LLMs to generate code has, for a while now, been recognised as very important, particularly in the US. All of the big tech companies are throwing LLM technology at automatic code generation. There is an opportunity for Europe to do something more specialised with this in data ecosystems, and see whether it can resolve our data interoperability problems. It is unlikely that we will compete easily with the US-based technology companies in a generic way as we do not control the entire software development stack, but Europe has an opportunity to take advantage of our verticals and datasets by taking a deep dive into them for specific, complex domains, and translating our learning from one industry to other industries.

GenAI is revolutionising software development not only in LLMs but also through so-called LLM-based agents. From a European perspective, the main opportunity they offer is to connect vertical AI with data-sharing ecosystems. This would create a new way of collecting and sharing data that could be used for specific verticals to train models, thereby engaging in a competition that is not about scaling out so much as on focusing in on certain application areas and taking advantage of high-level and procured data. If Europe can do data-sharing ecosystems better than the competition, then we can train models for vertical applications better than them, in which case we can do vertical AI for data-sharing ecosystems by solving the data interoperability problem, which then feeds a virtuous cycle of new AI-based agents for data-sharing. This virtuous circle has the potential to be very strategic.

Discussion

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From the floor

Are there any products, such as a third-party LLM, that will be released to address this?

Jakob Rehof

A lot is happening in the area of LLM agents. The big players already offer specialised models but the opportunity and challenge from the perspective of ecosystems – particularly from a European perspective – is to add value to the most useful models by verticalizing them for specialised purposes within the ecosystem. There are start-ups working on this, but they mostly focus on the agent area and there is less work that focuses on the core of trying to verticalize the LLM models themselves. There is a real opportunity for us to do something genuinely innovative. It appears that there is very little LLM-based technology for performing this kind of interoperability automation. Again, this is an opportunity. One reason why there is so little is, I believe, because this can only be done if you have access to the data. Getting to the data and forming the consortia that can procure the data, and doing the AI-based oriented research is not something that can easily be done in a lab at a university. It cannot easily be done in a large horizontally oriented tech company either. This is where I see our role.

Mario Campolargo

This work is very inspirational. There is huge interest in creating a European common market for public services. One of the challenges is semantics, particularly in a structure that is already quite developed. A semantic interoperability conference is held every year. Should we target them?

Jakob Rehof

Yes, I definitely think so. This kind of work has very high value and some progress has been made, for example on ontologies and knowledge graphs. I am happy that we are working with ANITI in Toulouse as well as with our colleagues at Airbus because they have strengths in logic-based ontology semantics. Bringing that together with AI to create a semantic backbone has real potential. This is a very modern topic in AI. It is an instance of reasoning. Logic-based methods led to rule-based systems, whereby everything had to be explicitly formalised in logic. That ran into a wall, which caused the 'AI winter', and then statistical machinery revolutionised everything. Now, the machine-learning people are starting to note that these machines cannot reason logically and it is becoming increasingly recognised that these models must be integrated with classical, logical models. There is a research agenda underneath this where we might be able to provide some interesting new lines of work.

Hubert Tardieu

Your presentation and Jeremy's presentation make this seem like an easy, logical piece of work, and Airbus and ANITI have been collaborating for many years. But gaining access to volumes of Airbus metadata has enabled you to take significant steps forward.

Jakob Rehof

Regarding the ontology topic and ANITI, it was very interesting in the workshops to see how much work Airbus is doing and has done on explicit data modelling, which also plays a significant role in the Gaia-X trust framework. There is a lot of work we can latch on to, which is important if the AI machinery is to operate on top of it. This is a significant opportunity. For people who work in machine learning, data is everything. When they see the opportunity to get their hands on real data, they get excited. This is extremely powerful, because the whole machine-learning research community is entirely research driven. Mathematical ideas are wonderful, but if you cannot demonstrate how they make a difference to interesting data, they will not get traction. Getting access to the data, metadata and application scenarios is really key and researchers were very keen to work on this.

What we learned

Éric Brousseau | Governance and Regulation Chair, Paris Dauphine-PSL University

Jakob Rehof | TU Dortmund, Fraunhofer Institute, and Lamarr Institute

Hubert Tardieu | Gaia-X

Joëlle Toledano | Governance and Regulation Chair, Paris Dauphine-PSL University

Eric Brousseau

We look forward to hearing your questions and reflections on today's presentations.

From the floor

It would be interesting to hear how we might imitate the capital risk model of the United States. We do not have a similar system in Europe. How can we access venture capital to fund ideas?

From the floor

There are a few factors. One is government support and regulation that enables experimentation into new ideas and creates opportunities for venture capital and private equity investments to support start-ups. These investment communities are willing to take substantial risks. A relatively small percentage of these investments are successful, but when they are successful then the numbers are extraordinary. These firms also bring in expertise at managerial and board level. Often, people who have good ideas do not have the skillset or experience required to manage a business, so these firms provide mechanisms to support them. There can also be personal or corporate tax benefits for initiating certain projects, even if they fail.

Eric Brousseau

Europe is missing a single market for capital, which means that it lacks leverage in terms of private capital to invest in small companies and start-ups. There are many reasons for this, including the fact that Europe invests in an effective public social safety net that does not exist in the US. The US manage their social insurance system another way, and pension funds and other mechanism trigger investment capacities which result into agile capabilities to support innovation.

From the floor

Universities in the US are also willing to invest. If a professor has an idea, it is not unusual for the university to put up the money in exchange for a share in the intellectual property. There is an ecosystem that brings together universities, private equity firms and government and helps to spur the necessary risk taking.

Eric Brousseau

That was the aim of the French Tech Initiative.

Hubert Tardieu

I was very happy to see the consistency of the messages here today, which emphasised the need to connect data spaces with artificial intelligence. It was interesting to hear an official representative of the European Commission mention that one billion EUR has been spent on data spaces over the last four years, including over 300 million from the Commission. It is natural to ask what has been achieved with that investment. We should not feel that this money has been wasted. It has been used to create the ingredients that will enable us to move forward. We are at a turning point in the data-sharing economy. Simplification, automated compliance, and 200 million EUR are on the table for the next generation of digital strategy. Nevertheless, we are taking things from the foundations and expanding upwards. Maybe we should work the other way around, asking what is global and working down from there.

I would like to congratulate Mario for identifying that we are now combining legal, technical, economical and governance topics that are all sophisticated, complicated topics in their own right, and expecting that everyone understands how they work together. Every year, the level of interconnection and complexity of these topics increases. It is time to create training programmes to explain these fields to engineers.

Lucas brought us another step forward in our understanding with his identification of six critical factors, which also link to Patrick's contribution. For many years, Caisse des Dépôts has had a responsibility to support investment in areas where standard financial equations do not apply. The fact that Caisse des Dépôts is taking on the challenge of fragmented data spaces shows that we must move from seeking funding for projects to seeking funding for investments, that is projects that are likely to succeed because they have been properly designed from the outset.

Anne's presentation was also extremely interesting. The fact that BoostAeroSpace is a great success but that 10% of its SMEs have an automated connection to the ecosystem raises important questions. She explained the underlying reasons for this, but there are clear similarities between participation in fragmented ecosystems and the reluctance of SMEs to join data spaces with larger companies.

Finally, the connection between data spaces and vertical AI, which Mario Draghi recommends as a way for Europe to regain its competitiveness, is something that we need to better understand. I am devastated to see that, after the US said they would invest 500 billion USD to create new computers and chip manufacturers without mentioning data, Europe is about to make the same mistakes. It is time to launch the next phase of data spaces to prepare vertical AI by 2030.

Joëlle Toledano

Rather than summarising what I have learned, I would like to share an impression. Some months ago, I heard Caisse des Dépôts mention the idea of incubation. There is a real humility in recognising that there are many things we do not know and need to try. I support the idea of organising a club to share solutions and common challenges. We need to test things and be agile in order to react to the realities outlined by Mario. We could, perhaps, organise something that enables us to share experiences.

Jakob Rehof

I am impressed by the progress that has been made in understanding the business models of ecosystems. The economic aspect of data spaces is very important. If we do not make progress towards a unified capital market, there will be limits to what we can achieve. We should think deeply about the US innovation and financing ecosystems and their relationship to US universities. We need to reflect on why Europe has nothing similar and how that could be rectified.

There is a pioneering aspect about this work on data ecosystems: we are taking something and turning it into value and profitability. We are innovating, but without the innovation being on critical the path of any single company's value chain. This is a fundamental problem. In Europe, we have companies with significant resources but this kind of tech innovation is not on the critical path of their value creation. It is not easy to pursue value creation with an economic rationale in that situation. We have to learn how to bring all these different parties together. When asking what has been achieved with the money that has been spent, it is important to consider the complexity of what is being attempted. I would like to see some pushback from the community in this regard. We cannot constantly be criticised when we are trying to do something enormously difficult. We must get better at communicating the level of difficulty and the unprecedented nature of what we are trying to achieve.

The topic of ecosystems is becoming relevant in Europe in the context of hardware acquisition. There are European projects for building up AI factories and so on. Vertical AI offers an alternative to trying to muscle through by scaling out and buying the next trillion-dollar infrastructure computer. But it also must mean putting mind over matter and mathematics over hardware. Even if that is the strategy, Europe cannot hope to keep up in the race if we are many orders of magnitude behind in the hardware realm. We must build out on that level, which again brings us to the problem that there is no entity with the deep pockets and value-creation logic to do that. If it becomes necessary to create hardware ecosystems in Europe, the things we are doing here could feed into an enterprise of that sort.

Eric Brousseau

The fact that many players in Europe are not considering the development of data-sharing ecosystems as a strategic imperative emphasises that their development is victim of the tragedy of the commons. Since it is necessary to invest to contribute to a future collective infrastructure, many stakeholders expect that the other members of the potential future ecosystems move first and start investing. Thus we witness a 'classic' problem of collective action.

Today, it was clear in many of the presentations that rather than seeking to build technical intermediary platforms to exchange data, the focus is now on building much broader ecosystems that are no longer simply about exchanging data but instead about transforming processes and organisations. It is a huge collective effort of innovation, which explain why it is difficult to have a single actor funding it, even if it has deep pockets. This is why governance and orchestration are so crucial to align interests and onboard participants.

Another dimension adds difficulty here: this is not simply a question of agreeing on a big plan, creating a product and launching it onto the market. Technology evolves and innovation is inherently risky. Those who succeed in innovation also fail a lot, and learn from their failures. One of the strengths of the innovation ecosystem in the US is that 95% of startups fail, but stakeholders and the eco-system of innovation learn from failures and recycle capital, skilled labour, and technology.

Fortunately, we are also learning from failures. We have learned that our original vision of how digital data-sharing platforms would work was not correct. This is now understood by regulators, governments and industry players. We have embarked on a process of systemic and collective innovation, and we are now developing the tools and organisations that will enable us to be successful and exploit the knowledge and learning that has been accumulated along the way.

The question of orchestration and the way onboarding of various type of stakeholders is organized is crucial. It is also clearer today that there are many possible business models for technical intermediaries. If you create value in an ecosystem the question is not to price data, but to develop mechanisms allowing the players benefiting from the value created by data-sharing to cover the cost of the digital intermediaries. This must be further developed in this second phase.

Ulrich Ahle, CEO of Gaia-X

The Gaia-X summit will be held in Porto on 20-21 November 2025. It will address economic aspects of data-sharing ecosystems and the establishment of sustainable operations.

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Eric Brousseau

On 18 November, we will organise a conference on data-sharing, engineering and boosting the development of vertical AI in the context of the Dauphine Digital Days. Industry-specific vertical AI initiatives have the potential to develop European competitiveness, productivity and inclusion.

Thank you all for joining us today!



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