Gaia-X magazine

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Foreword by Gaia-X CEO
Francesco Bonfiglio

gaia-x

Gaia-X: a vision and mission that is now realised

Enabling Sector specific data spaces through Gaia-X

Gaia-X National Hubs

Companies, use your data!

"When I took over the role to lead Gaia-X, I formulated a 5-year plan of trailblazing and putting together a vision and strategy surrounding bold concepts that would revolutionise the market in an unprecedented way."

TOGETHER TOWARDS A SOVEREIGN EUROPEAN DATA INFRASTRUCTURE in 2022

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FOREWORD – WELCOME OPENING

Dear Readers,

As the Chief Executive Officer of Gaia-X European Association for Data and Cloud AISBL, I am delighted to announce the publication of the inaugural issue of Gaia-X Magazine. *Francesco Bonfiglio*

When I took over the role to lead Gaia-X, I formulated a 5-year plan of trailblazing and putting together a vision and strategy surrounding bold concepts that would revolutionise the market in an unprecedented way. Since then, my team and all Working Groups at Gaia-X work tirelessly to deliver a new generation of transparent, controllable, and interoperable services that implement a common set of rules shared by hundreds of European and non-European players in the market. By far the most aloud voice of the market I have ever heard!

2022 is the Adoption year, meaning we are developing the core components of the Gaia-X architecture, which will enable the implementation of Gaia-X services in the market by our members. The Gaia-X Magazine, alongside the several Data Space events we are holding, our own flagship event, the Summit, and many other communication initiatives is another way to support the knowledge transfer of what we are doing and enabling

our community to make our vision, strategy, and results visible to the European and worldwide community.

Engaging with the community is necessary to convey our core messages and all the innovative concepts behind Gaia-X, so we decided that it should be an open-access magazine for the first year, released twice, with a spring and an autumn issue.

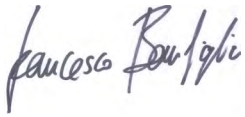
To that end, I am truly delighted to see practitioners, academic researchers, Hub members and entrepreneurs contributing to our first issue. Alongside this issue , the next one which equally present our Anniversary issues -the ones we would be looking back and seeing what we have done together during the Adoption year. This issue has successfully gathered a very interesting roaster of articles, which I invite you to read, and open the floor to all of our members and stakeholders to be an active part of the community in preparing content for the next releases that will indee provide valuable insight into the future of sovereign data exchange.

The inaugural spring issue of the Gaia-X Magazine features 19 (nineteen) articles by 30 (thirty) authors , truly demonstrating how broad and diverse our community›s interests have become.

On behalf of the Gaia-X team let me thank you all for your valuable contributions and, again, take this opportunity to invite more contributors to our next publication already under preparation.

We still live in a world of untapped fragmented data, incompatible and non-interoperable infrastructure run by exclusiveness and a lack of openness and transparency.

With our combined efforts, hand in hand, we can bring light to the thicket.



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EXECUTIVE SUMMARY

Vassilia Orfanou, CMO of Gaia-X
Editor: Robert Goia, Stakeholder Engagement Officer

3.1 A look into the future of Europe...

Francesco Bonfiglio, CEO of Gaia-X takes it away discussing his personal view of the Digital European future. The idea and plans to launch Europe into global dominance with data sharing and sovereignty in an economy controlled by Asia and America are exciting for all Europeans, but the viability and feasibility of these have to be tested. What are the reasons Europe is behind in digitalisation and the data economy? Is the current volume of investment enough to change the future of Europe and help it take a fair share of the market? What are the factors needed to facilitate the digital revolution being sought? These are some of the questions that are being asked. But the problem has always been that the EU and the rest of Europe don't share enough data and because of this, companies prefer to run their tests in countries where it is easy to access personal data. However, most of EU industrial data and applications are still running on-premises servers or .private cloud, because of the lack of trustworthy technology platforms

But Gaia-X is here with solutions; putting these concepts at the centre of its mission, it seeks to interconnect existing data and infrastructures, providing the necessary level of trust through an objectively verified set of credentials that

allows for transparency, controllability, and interoperability of digital services. Gaia-X is starting from the industry as the voice of the market as it introduces a breakthrough paradigm of data ethics, anticipating in some cases, and certainly riding and leading by example, the implementation of rules now being codified in the new code of conducts and regulations being issued in the recent months by the EC (DGA, DMA, DSA, DA, etc.).

3.2 Digital innovation based on European principles and values

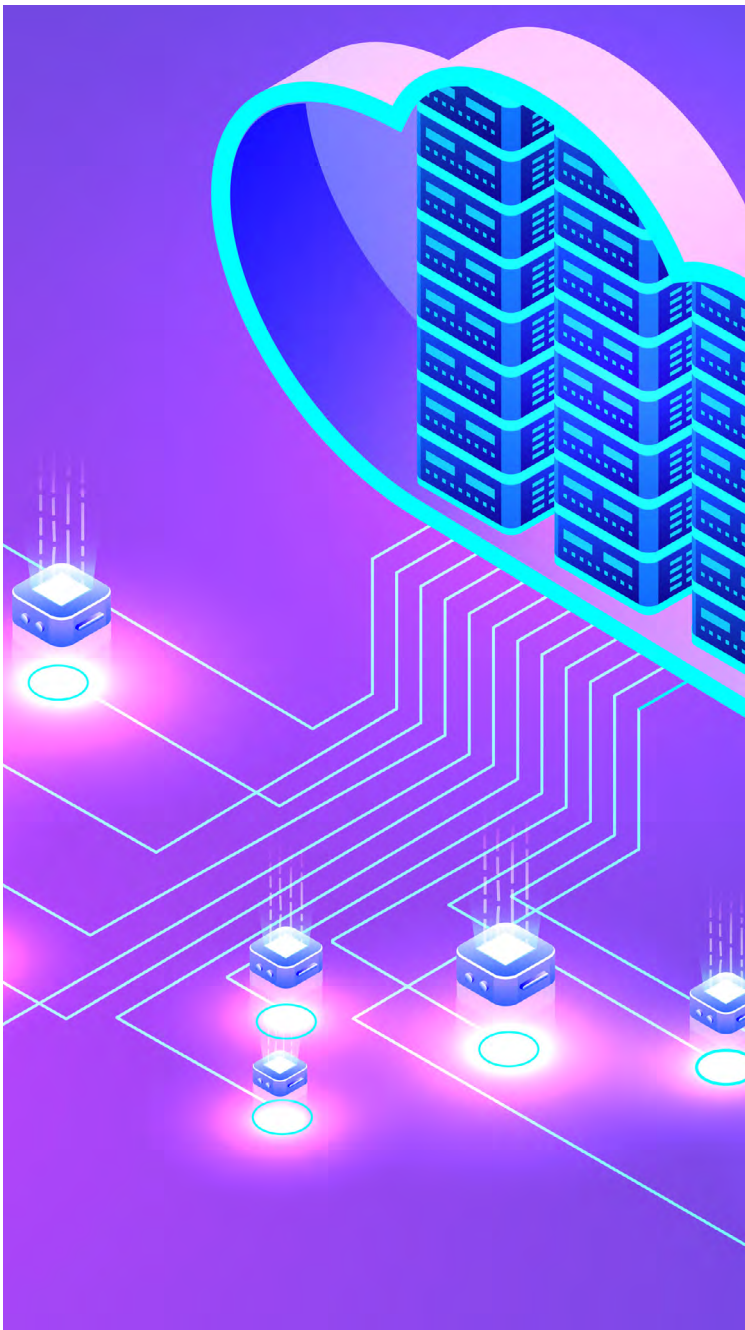
Jeroen Tas, Chief Innovation & Strategy Officer Phillips highlights that the Digital platforms and ecosystems have come a long way! Twelve years ago, in 2010, only Microsoft and Apple made it into the top 10 most valuable companies globally. Five other companies from extractive industries like oil and gas and mining emerged on the list but fast-forward to 2020, it is entirely occupied by tech platform businesses, and this is how far, tech platforms have broken into the global economic scene. However, the more pressing concern for Europe, which has brought about the Gaia-X project, is that the data economy has been dominated by these US tech platform giants such as Google, Amazon, and Microsoft and data security has not been guaranteed, as proven over the years. A critical point when dealing with data is its security, as it represents a great asset for companies; most cloud users currently entrust their data to the leading US providers mentioned, but questions have always been asked about the safety of the data there;

after all, US investigative authorities and secret services have the opportunity to access cloud data as the so-called Cloud Act obliges US companies to release data, even if local laws at the location of the data storage prohibit this.

So, data must also be released if there is no international mutual legal assistance agreement that regulates such cases, which is a concern for Europe. Therefore, the article highlights the need for an upgrade in the digital economy ecosystem and identifies Gaia-X as a project that comes with data economy solutions. It is a European cloud project whose goal is to help cloud providers offer their platforms according to the common Gaia-X standard and reduce companies' dominance from the far West in the data economy, especially in areas that affect Europeans. It was launched to enable European companies to store their data, share it, and utilise it for operational efficiency among companies in the industry.

3.3 Is Gaia-X an enabler of the Data Economy in Europe!?

Data economy is the recurring theme of Gaia-X and in the Gaia-X Magazine issue, Dr Christian Rusche, an economist in the `Digitalization, Structural Change and Competition´ research unit at the German Economic Institute (IW), talks about how data and the opportunities can bring about a more competitive European economy. According to Rushe, "Gaia-X aims at limiting the market power of dominant digital platforms, while, at the same time, offering a safe infrastructure to all enterprises to use their data and develop customised solutions for their business." Behind this cryptic name is a project initiated by Germany and France in autumn 2019. Since then, numerous organisations, scientists, politicians and around 270 companies, including corporations and start-ups, have been working on a set of rules for a European infrastructure in which data can be stored, processed, merged, and shared in a standardised way.



"The goal is a digital ecosystem in Europe that produces innovations and new data-driven services and applications," says Acting Federal Minister of Economics Peter Altmaier.

3.4 Addressing Digital

Digital Responsibility Goals

Gaia-X and the interrelation with European Rights and Principles

Contrary to several myths, operations of the Gaia-X project and its associating stakeholders are guided by principles and clearly defined structures. Andreas Weiss, (Member of the Executive Board & Lead for Digital Business Models), Jutta Juliane Meier (Founder & CEO of Identity Valley), Kai Michael Hermsen (Co-CEO of Identity Valley), Harald Wagener (Group Leader for BIH@ Charité - Center for Digital Health), and Prof. Dr. Björn Eskofier (Professor for Digital Support Systems in Sports and Medical Engineering) discuss about the necessary alignment with the goals of the United Nations' 17 Sustainable Development Goals (SDGs), and how leading companies and organisations under the Gaia-X umbrella are aiming towards a human-focused digital transformation by setting up seven digital responsibility goals (DRGs). These are the goals aimed at guiding companies, decision-makers and other stakeholders, like researchers and users, in order to innovate and develop reliable digital products.

The DRGs provide an opportunity for various stakeholders, decision-makers, and civil societies to create a plan and agenda on a common course of action towards dealing with human-centred digital transformation. The goal at the forefront of these DRGs is Digital Literacy, which aims to use knowledge, education, and comprehensive information for every decision-making and self-determination objective.

While DRG #2-6 are aimed at the data value chain, DRG #2 is related to Cybersecurity - all about technological

and personal data protection goals; DRG #3 is all about Privacy, which entails fair handling and understanding of how data and information are handled fairly, DRG #4 centres around Data Fairness, on responsible collection, processing, and evaluation of data. DRG #5 is named Trustworthy Algorithms, DRG #6, Transparency, which focuses on transparent communication, and finally, DRG #7, Human Agency & Identity, centres around the protection of identity as well as the preservation and protection of the identity of the human agency in the digital space.

4 Enabling Sector specific data spaces through Gaia-X

4.1 Reflecting

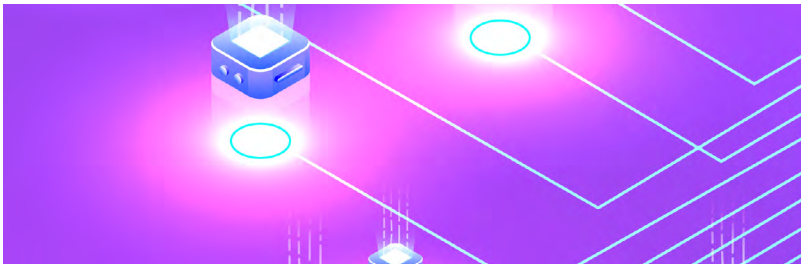
and shifting through the Gaia-X Operations

Dominik Rohrmus, Interim COO of Gaia-X discusses the current status of the Association's operations, and passing the floor to Roland Fadrany, the new COO.

As emphasised on several occasions, the objective of the Gaia-X project is to create, with other European countries and for Europe, its States, its companies, and its citizens, a data infrastructure in the form of a new generation network meeting the highest requirements in terms of digital sovereignty and promoting innovation; and all these reflect in the guiding principles and operational structure of the association.

In this article, Rohrmus reflects and provides an in-depth review of what the Gaia-X Operations looks like; talking about and providing graphical illustrations of the principles and structure of the Gaia-X Association, including the Gaia-X Intranet and Gaia-X Hubs.

The Gaia-X Project is intended to give birth to an open digital ecosystem in which data can be made available, collected, and shared in complete safety and confidence. The Gaia-X project will realise the design of such an infrastructure from a technical, operational, communications and economic point of view, and ultimately create a shared ecosystem of users and providers from organisations of public administrations,



public health, business, and scientific institutions and create an enabling environment and support structures.

Some of its guiding principles, according to Rohrmus, include compliance with European data protection regulations, openness and transparency, authenticity and trust, sovereignty and self-determination, free-market access and European value creation, modularity and interoperability, and usability. As for the structure, the 2022 Gaia-X Association Structure begins from the General Assembly, under which we can find the Governmental Advisory Board, the Board of Advisors, and the General Advisory Board.

While the Gaia-X member Intranet holds all member information, from Gaia-X deliverables to the operations, communication as well as the membership information, the Gaia-X Hubs are the central contact points that include ambassadors, supporters, and influencers which help in informing, increasing understanding, and clarifying issues on national basis.

4.2 Sovereign Cloud Stack (SCS) - An entirely open federative cloud and container stack for Gaia-X

Dr Manuela Urban, Co-Lead / COO Sovereign Cloud Stack at the Open Source Business Alliance - Bundesverband für digitale Souveränität e.V., and Eduard Itrich, Community Manager at the Sovereign Cloud Stack, Open Source Business Alliance - Bundesverband für digitale Souveränität e.V. discuss all about the Sovereign Cloud Stack (SCS) - an early supporter and technical foundation of Gaia-X. SCS are intended to ensure independence from external software providers and proprietary technologies. Data protection-compliant according to the EU GDPR, the Sovereign Cloud Stack is an entirely open-source cloud and container platform for Gaia-X. The project is part of the OSB Alliance and has received government funding. Launched in 2019, the SCS project received state funding from the Federal Ministry for Economic Affairs and Energy (BMWi) and is part of the OSB Alliance (Open-Source Business Alliance), which is responsible for developing and constructing the Sovereign Cloud Stack. The project creates alternatives to proprietary technologies and market-dominating cloud providers, while ensuring transparency, interoperability, and independence from actors across other legal areas to prevent political or economic influence.

The Sovereign Cloud Stack also allows the European cloud infrastructure to be federated as it is a network of collaborating providers, allowing compatible technologies and federative identity and access management to emerge without

a central authority to control. Furthermore, the federation promotes a variety of offers and geo-redundancy, while at the same time ensuring scaling services and migrating applications between different clouds are simplified.

4.3 Green Data Hub:
Using data to tackle the climate crisis together

Tobias Hofer, Project Communications at Green Data Hub, and Nina Popanton, Team Lead Data Intelligence Initiative (DIO) discuss about Utilising data in the European economy. This does not only have an economic value. In fact, the Green Data Hub has revealed how this can help to ensure a friendlier environment and tackle the climate crisis. The Green Data Hub, a platform for Austrian and European collaborators for green and sustainable data, focuses on a secure sharing and use of data sustainably in the European data ecosystem that is compliant with the standards set by Gaia-X.

The Green Data Hub seeks to use artificial intelligence and machine learning data to tackle climate change and advocates that local data resources, the innovations, and technical know-how of organisations and nations be brought together in a decentralised way to tackle climate crises. The Green Data Hub also addresses companies' reluctance to share data, so it has identified keys to managing this: the trustworthiness of actors; data sovereignty; and enacting solid rules that define the sharing, processing, and use of data.

The aim is to set up a national Gaia -X hub in each participating country, which will act as a mouthpiece for the user ecosystems and a central point of contact for interested parties at the national level for corresponding infrastructure components. In addition, they cover the regulatory standards specifically to legal and regulatory standards set in a particular jurisdiction. The international community of hubs aims to foster a dynamic, bottom-up ecosystem that helps identify relevant user needs, conceptualise use cases, and federate national initiatives.

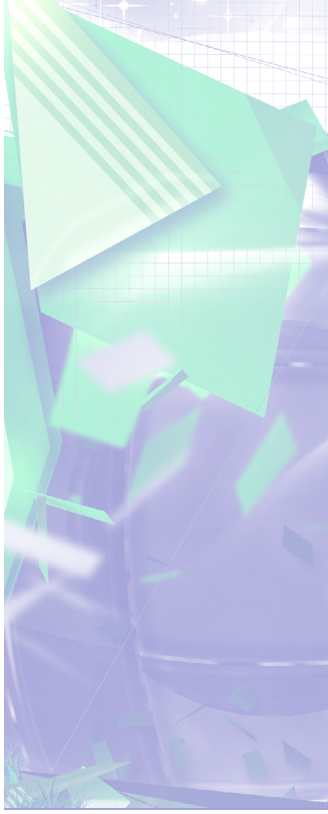
4.4 Agdatahub:

Providing a shared and sovereign technological infrastructure to guarantee the development of AgriTech in Europe

Sébastien Picardat, CEO of the Agdatahub Lighthouse project takes it away. He states that data encompasses all industries and so far in the development of Gaia-X, we have seen it in the planet sustainability sector, energy, tech, supply chain, and mobility sectors; but it is also quite crucial in the development of agribusiness and AgriTech.

Back in March 2022, Gaia-X chose Agdatahub as its flagship project to accelerate the transformation of European agriculture using the technology of the French company, Dawex - a data exchange platform solution that contributes to fostering sustainable and efficient European agriculture. Agdatahub, a European consent and data exchange platform operator, was selected as one of Gaia-X's seven flagship European pilot projects to create a data exchange platform based on transparency, trust, and openness. And now, Agdatahub provides tips on developing AgriTech in Europe by fostering shared and sovereign technological infrastructures.

Agdatahub facilitates the circulation of data from farm tech innovations and other valuable information for the entire agriculture ecosystem between the various players in the agriculture sector and the agri-food chain. To streamline the data exchange, Agdatahub uses API-Agro, an agric data exchange platform that has been a beneficial solution for AgriTech innovations. It also helps to secure data exchanges in AgriTech partnerships with Agriconsent, an innovation co-owned with the Orange Business Services and IN Groupe, which helps with digital identity solutions that link farmers' identities to their farms, hence, certifying who the rightful owner of a farm is and who can give consent to sharing and using farm data.



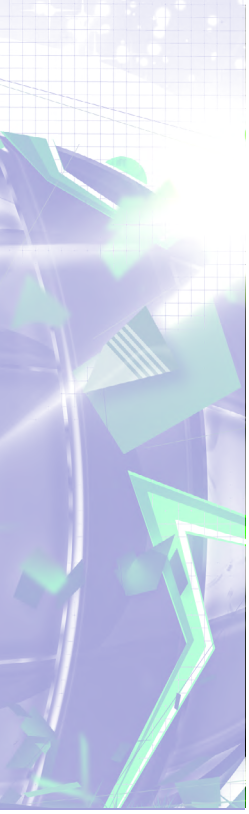
4.5 Energy Data Space
holds first Steering Committee meeting and stands its ground to bring important changes in the energy sector

Martine Gouriet is Director of Digital Uses at EDF Group, and together with Laurence Houdeville, Group VP – Global practice manager data at INETUM and member of the Energy Data Space discuss the importance of the Energy data space. In addition to several important projects affiliated with Gaia-X, specifically focused on data economy and environmental sustainability, the energy field presents an industry of interest in the data sharing and utilisation goals at Gaia-X. On March 16, 2022, the Energy Data Space held its first Steering Committee meeting, chaired by the Head of the Data Space "Energy" working group of Gaia-X and the Director of Digital Uses at French Electrical Company EDF, Martine Gouriet. The meeting was attended by over 40 members from 10 European countries. There were 60 participants from 23 organisations, 25 energy business use cases, and three projects funded.

The monumental goal of the Energy Data Space is meeting the carbon neutrality target before 2050 and helping to foster digital solutions that will bring about low carbon energy and energy efficiency. Participants in the meeting had a briefing on the overview of the data space, from its ambitions to its governance, roadmaps, use cases, and interoperability.

4.6 EuProGigant: Bringing Smart and sovereign use of data in the European manufacturing industry

Dr. Claudia Schickling, Project Coordinator EuProGigant Austria, and Markus Weber, Project Coordinator EuProGigant Germany, discuss the EuProGigant Lighthouse project. Following the call for an emergency in the use of data in the European manufacturing sectors, the Austrian-German Gaia-X lighthouse project has clearly demonstrated how companies can implement sovereign and secure data exchange, and now they can create business models driven by data. From a production perspective, EuProGigant knows how data infrastructure will make Europe's production and manufacturing industry more sovereign, performant, resilient, and sustainable. In fact and so far, 16 companies, universities and



research institutions have joined the Austrian-German lead project for Gaia-X and these project partners are involved in the project's execution, development, and implementation. Supported by the project-related industry committee, the Generations Advisory Board, and the Scientific Advisory Board, the goal is to demonstrate and scale a cross-location, digitally networked production ecosystem with resilient, data-driven, and sustainable value creation to strengthen Europe's pioneering role in the industry.

Finally, the central implementations of EuProGigant include machine connection and machine-related data processing; resilience in the value-added ecosystem for shared benefit fulfilment; multi-cloud connectivity for collaborative and predictive maintenance and energy efficiency. Most importantly, EuProGigant shows how small and medium-sized companies can independently connect to the European data infrastructure via the Gaia-X Federation Services. Engaging SMEs in this direction will make the difference.

4.7 Accelerating the Mobility Data Space: The data-sharing community for the Mobility Sector

Michael Schäfer, the Managing Director of the Mobility Data Space, has explained how data access is essential in creating digital products and services that make mobility safer, more sustainable, and more user-friendly. But unfortunately, data is often underutilised or unused.

> Those who have data available often don't use them, stressed Schäfer. And those who need them for new business models lack access to this valuable raw material.

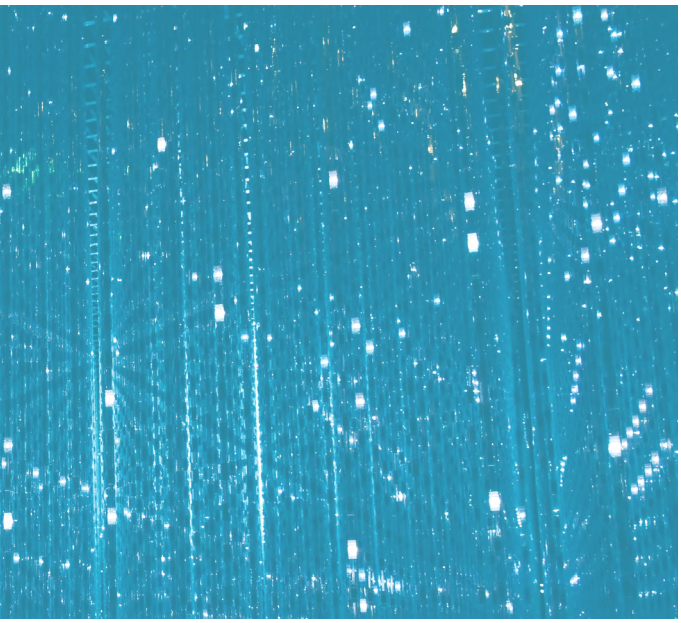
Schäfer, however, suggested that partners who want to leverage the transparency and trust Mobility Data Space and Gaia-X offer should be ambassadors. He recommended creating a sovereign digital environment where the participant is equal, explained how innovation could be triggered by exchanging ideas, concepts, and information, and stressed the importance of standards in organisations that want to get into the data economy.

4.8 Telecommunications:
the current and biggest challenges– perspectives from Proximus

Belgian mobile digital communication company Proximus, a first-day member of the Gaia-X under the lenses of Antoinetta Mastroianni, Chief Digital & IT Officer and Gaia-X VC Finance Director, Interim CFO Management, reveals the most significant challenge in the industry, mapping out its goals by focusing on the digital experience of its users. By 2025, the company's goal is to have modernised the architecture within Proximus to become a "super integrator" which offers all its services across the entire digital spectrum. The company has drawn up a very detailed five-year plan to realise its ambitions and this is based on seven essential pillars: in the first three, they lay the foundations for success by evolving their current monolithic architecture into a general-purpose system, creating space for clean data, and developing a sustainable service delivery model focused on quality and responsiveness. This solid foundation, the company says, will allow focusing on the four innovative pillars entirely, which involves optimising channels to ensure a natively digital user experience by continuing to improve their app, online store, customer service; enriching and developing its entertainment channels with new content, improving its customer experience by making the most of the potential of data and AI, and offering customers new products and services that go far beyond the scope of the traditional telecom operator.

On what role Gaia-X plays in Proximus' five-year plan, the company states that between 2022 and 2025, Proximus aims to build several use cases to highlight the value of Gaia-X and see themselves as adversaries in the data landscape. Furthermore, with its use cases, it wants to make companies aware of the possibilities offered by Gaia-X and motivate them to join.

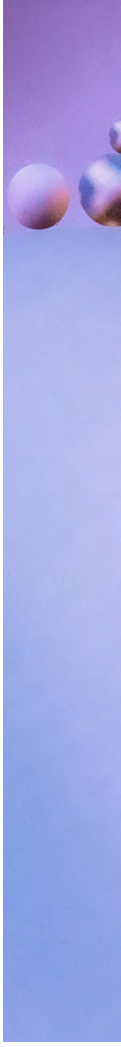
5 Gaia-X National Hubs



5.1. Creating value from data – The Gaia-X Finnish Hub perspective

In this piece, Denisa Mäki, the Coordinator of the Gaia-X Finnish Hub, The Finnish Innovation Fund Sitra, explains how Gaia-X aims to create a shared European data ecosystem, while strengthening digital independence and competitiveness in Europe. According to Maki, Gaia-X cross-sectional projects are being built across Europe, from Germany to Italy, France and the Netherlands, in collaborative environments with transparent rules in a bid to fuel innovation and offer opportunities to fight challenges and work towards a more responsible future while participating in the development of data economy in Europe. According to Maki, this "cross-national cooperation can improve efficiency and increase competitiveness and business processes through standardisation and access to data."

"A better understanding of data helps develop its use and better control our own data. In order to do that, data needs to be shared in a secure way, and the rights and interests of individuals and businesses have to be protected. She further explained how cross-border projects could create business models, and new solutions, among others, by using data sharing.



5.2 Smart Connected Supplier Network - up to twenty per cent increase in productivity for the average manufacturing company – The Gaia-X Dutch Hub perspective

In this case summary, Peter Verkoulen, Coalition Manager of the Dutch Blockchain Coalition (DBC) and coordinating the Dutch Gaia-X Hub discuss the importance of efficient data sharing on the success of the supply chains in the manufacturing sector. Given that today's global supply chains face unprecedented challenges, what we experience is profound change that is affecting both directions: both the supply and the demand side. As a result, customers, suppliers, and logistics service providers face enormous challenges when it comes to the efficient flow of goods and services. Therefore, transparency becomes essential in the event of major disruptions in supply chains. Furthermore, this is the only way to assess the effects on the other parts of the supply chain so that everyone in the ecosystem can plan and act accordingly.

Therefore, an initiative called Smart Connected Supplier Network (SCSN) is rising to the needs of manufacturers who need a solution that helps with data sharing needs for suppliers in the manufacturing chain. SCSN came because of the cooperation between more than 300 companies, from the SMEs to large OEM companies and their IT partners. Together, they have made a standard for data sharing, making information exchange more effective in manufacturing so that companies will leverage it to share and use data quickly, efficiently, and reliably to record more operational success.

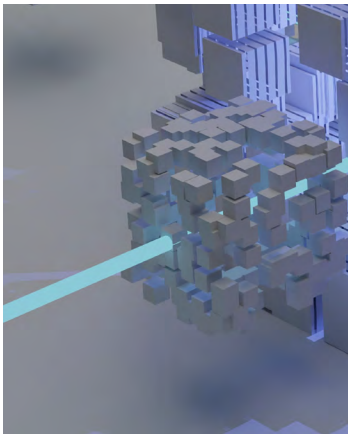
5.3 Orchestrating innovation ecosystems – A case study on the Financial Big Data Cluster

In this piece, the role of hub firms from a Financial Big Data Cluster perspective within the Gaia-X system is looked at.

Luisa Kruse, Senior Innovation Manager at Fintech Community Frankfurt GmbH (TechQuartier), Jonas Geisen, PhD at the FINDER project and Centre for

Organization Restructuring at Radboud University, and Dr. Sebastian Schäfer, Managing Director of Fintech Community Frankfurt GmbH (TechQuartier) highlight that the first thing worth reiterating is for Gaia-X to develop common infrastructures for a European data space in response to the increasing pressure on European business models globally, especially from US and Chinese companies and Gaia-X has begun delivering on its promises and goals through lighthouse projects such as the 'Financial Big Data Cluster' (FBDC). These hubs are driving Europe to a new paradigm for open innovation and thanks to the ever-increasing technological progress, the cost of information processing, storage, and communication costs have been driven down. Europe's focus on digital innovations, such as cloud data in its industries finally creates a newfound wealth of information, but the extractable knowledge imposes new challenges for organisations, which is always a good challenge. Now, organisations face the dilemma of deciding out of a plethora of thousands of optimal decisions.

Therefore, to help make the best decisions and reduce the risk of recurrent failure when innovating, firms are turning intra-Europe competition among firms outside their organisations into useful collaborations, thereby allowing the innovative processes to be less risky as resources can be utilised outside



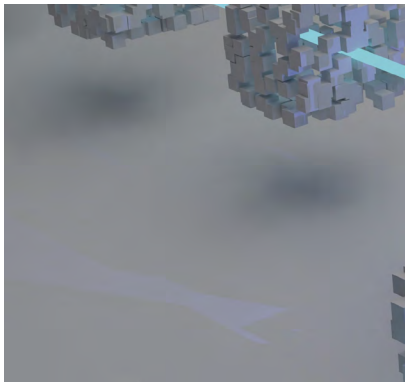
of organisational boundaries to allow organisations to have more solutions and make better decisions. The focus on the ecosystems for digital business in today's economy brings about questions on supporting collaborations among stakeholders and emphasises how vital ecosystem orchestration is in a flourishing digital business ecosystem.

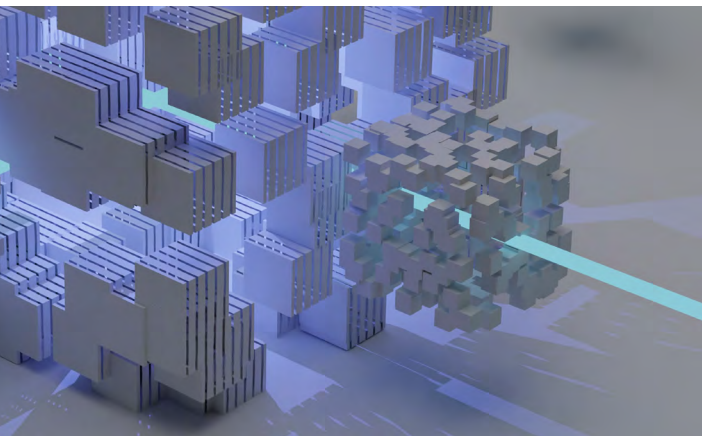
5.4 Austrian community sets sail for a pan-European data ecosystem – The Gaia-X Austrian Hub perspective

Safeguarding the aim of creating a useful European data ecosystem, on April 21, 2022, the Gaia-X Magazine reported the launch of the Gaia-X Austria hub in Vienna, Austria, after several months of preparations and intensive work with key stakeholders.

Helmut Leopold, Chairman of Gaia-X Hub Austria, and AIT Austrian Institute of Technology, together with the Gaia-X Austrian Hub discuss about the Association - an EU initiative aimed at strengthening digital sovereignty in Europe and beyond. The first goals for the national hub were defined by the Ö-Cloud initiative, which was established as a business location in May 2020 in cooperation with the Federal Ministry for Digitisation. The stakeholder working has also developed a detailed plan for implementing the hub.

The Austrian activities at the national and European levels are bundled and networked in the National Gaia-X Hub Austria, an open and secure data infrastructure with defined data rooms. This will contribute to national and European data sovereignty and strengthen Austria as a digital data location. The Gaia-X initiative is a response to the rapid development of cloud services associated with the current digital transformation and works around how data is stored, managed, exchanged, processed in the cloud, and used in both the public and private sectors.



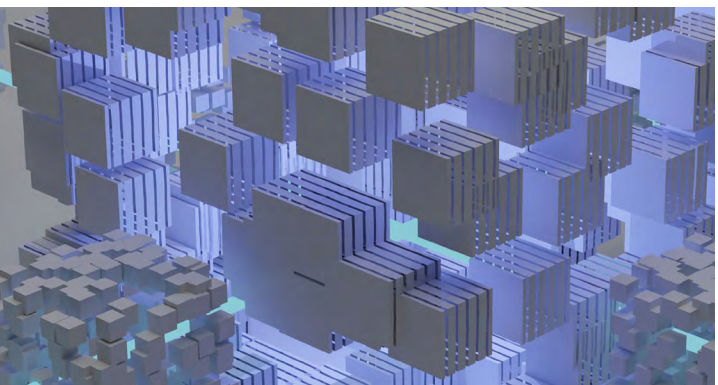


6 Gaia-X and the Private Sector

6.1 Companies, use your data!

Similarly, on the urge for more collaboration on data sharing and use, a digital economist at the German Economic Institute, Barbara Engels, has also urged organisations to use data to take advantage of the increased transparency, efficiency, and synergy effects they can realise through data management. However, she reveals that data management is not yet widespread, especially in Germany, her home country, and that the Gaia-X project is an excellent reason to begin sharing data intensively. According to Engels, "companies can increase their success if they use their own data. The data use allows them to analyse and improve their processes. It can also be advantageous for companies if they use data jointly with other companies as this makes supply chains more transparent and efficient, allowing them to respond flexibly to market changes."

According to her, companies are guaranteed the hypothetical benefits of data management, but still, most companies aren't ready, as a 2021 survey of 1,002 companies in the industrial service sector in Germany shows that only 29% of companies are "data economy ready". The research report reads that companies can increase their success by analysing and improving their business processes based on data.



6.2 Tellus: a federated network infrastructure for critical applications and alignment with Gaia-X

Alina Rubina, researcher at DE-CIX discusses the TELLUS project, an effort currently made to develop a Gaia-X-compliant interconnection platform and put together exemplary critical use cases from businesses and industries whose requirements for the Internet infrastructure in terms of latency, bandwidth, security, resilience, dynamics, and monitoring that significantly exceed the current economic and technical framework conditions. With the Tellus federated network infrastructure, various cloud platforms and third parties are connected via DE-CIX and Internet Service Providers (ISPs) to enable users to choose and switch – and thus digital sovereignty. And now, as part of the Gaia-X funding competition, the Federal Ministry of Economics and Climate Protection is supporting the project,

among other things with almost nine million euros in funding, providing Gaia-X network infrastructure for critical applications should be achieved. The funding is provided as part of the "Innovative and practical applications and data spaces in the digital ecosystem Gaia-X (Gaia-X funding competition)" and aims to provide a Gaia-X network infrastructure for critical applications via a Gaia-X compliant interconnection platform.

Project Tellus aims to be an overlay across cascades of cloud providers, connectivity service providers and cloud users. Integrated software instances and homogeneous interfaces should create the connections between the individual providers. For interactions between providers (cloud) and users (industrial companies) for critical Tellus applications, all elements of a provider cascade (corporate network, connection provider, network operator, Internet node, cloud provider) must be technically integrated, and the requirements in all end-to-end dimensions on the network side.

6.3 Discussing myths surrounding Gaia-X and setting the story straight

Gaia-X has achieved great success thus far, but it has also managed to draw up doubters and detractors who have come up with quite a lot of myths, noted Andreas Weiss, Head of Digital Business Models at eco and Director of EuroCloud Deutschland, eco and Thomas Sprenger, a copywriter and consultant in information technology, telecommunications, the cloud and digital transformation, in this piece. According to them, some of the most common myths and misunderstandings about Gaia-X include that it is just a new Euro-hyperscaler that does not stand a chance against the existing US clouds system; that Gaia-X has too many stakeholders involved, which makes the project slow, and cumbersome; that Gaia-X is a state-planned economy that stands no chance of success; and that the large pre-existing public clouds already offer the functions of Gaia-X and that it is a copycat project that cannot get anywhere on the market.

But the authors counter these by reflecting deeper on the goals and principles of the project, which is to end the dependence on a single foreign provider and to stop the dominance of digital cloud companies at least in Europe. They also mentioned that Gaia-X is not just a platform but an ecosystem that is pursuing common rules, standards, and open-source technologies among its stakeholders and members.

03

Gaia-X a vision and mission that is now realised

03

3.1

A LOOK INTO THE FUTURE OF EUROPE

Francesco Bonfiglio, CEO of Gaia-X

The decision to relaunch Europe in the global market was announced in 2020 by the EC through the Next Generation EU program, with an unprecedented focus on digitalisation

The European Data Strategy, and European Digital Decade programs then articulated how to create a new Digital Economy for Europe, driven by the creation of common Data Spaces within and across specific sectors and countries, enabled by safe, secure, and interoperable infrastructures crossing the boundaries of edge to cloud in a new seamless computing continuum.

Everybody started talking about digital sovereignty as the necessary transposition of this naturally political concept, into the opaque and anarchic, or often autarchical, realm of the web giants dominating the cloud market.

The European Commission, all member states and the key industrial players providing or using technology started speaking with one voice about the need for a new paradigm of controllability and autonomy over digital platforms, to boost the move of data to the cloud, increasing the rules for trust and flexibility, reducing the dependency from dominant North American and Asian players, subject to private or autocratic sovereignty models, and level the market playfield to re-establishing a role of leadership

for European players, in Europe, and globally.

Unexpectedly for all, the pandemic crisis accelerated the need for transformation, and moved the funding, from a traditionally EC centralised model, into a decentralised model, where each state is now responsible for its own recovery and resilience plans (RRF/RRP).

750 Bn EUR of RRF covers the whole strategy of recovery and resilience, with only two intervention areas – Digital and Green Deal – required to have a minimum threshold of investment.

So, the 150 Bn EUR investments for digital transformation, are now in the hands of local governments, that are imposing the clear challenge to work as much as possible together, across the Member States, to maximise synergies, minimise dispersions, and build harmonised, compatible, and integrated solutions within and across countries.

> ***Is this amount of investment sufficient to change the future of Europe? What are the critical success factors to make this miracle happen? And, most importantly, what are we – industries, governments, citizens – expecting for our future, out of this unrepeatable chance?***

Let me focus on the last question. Thinking that Europe will remain a leader in markets that have deeply changed in the last decades, without realistically looking into those change factors and possible future scenarios, this may be a recipe for failure!

The availability of raw material, the cost of labour, the logistics and finally, the worldwide distribution of the value chain of any industry in Europe nowadays, must be taken into consideration. Shall we become competitive thanks to a reduced cost of products, cost of raw materials, and cost of labour? Certainly not.

Accessibility to raw material, transformation, transportation, the dependence on always growing non-EU suppliers, and the fragmentation of smaller EU ones, the increasing cost of energy, largely controlled by non-EU producers and distributors, the lower cost of labour and the higher level of education of non-EU countries, in all sectors and particularly the STEM, will force EU to carefully choose the battles we want to fight and possibly concentrate on those we can actually win.

The good news is that the future of products and services, in any sector, is completely different from the present, and we already see the signs clearly. The economy of data is not only the volume of revenues produced by the technology business, but the much bigger and hidden value produced by the digital add-ons, or the brand-new products and services built on data.

This is enabled by the concept of Data Spaces – not Data Lakes, where large amount of data is collected for more or less post-processing purposes, but real-time virtual collaboration

spaces, where the data of each participant is enlarged and enriched by those of all others.

So, cars can consume less energy based on battery producers, be safer collecting brakes data, and demonstrate a smaller carbon footprint considering all elements of the supply chain equally. In the same way, medical records and research data from different institutes and hospitals can train federated AI models to reduce by factors the risks and costs of transplantations; define personalised care; build healthcare around the citizen, instead of a care delivery business around patients.

Similarly, energy producers can be effectively interconnected and distributed across grids within and across countries to optimise the balance of carbon and renewable sources and reduce the dependency to obtain energy sovereignty. Multiple banks can increase by factors the accuracy of their risk management and KYC, whilst reducing the cost of calculation by sharing their customer's data. There are endless examples of how the economy of data, driven by the creation of common Data Spaces, can revolutionise our lives.

These data exchanged across the value chain of smart cars, smart devices, and smart services in any sector, from retail to banking, insurance, energy, transportation, and healthcare, are the only raw material to start creating digital twins of the world we live in and digital add-on of the existing products and services. The price to market of these Digital products is proportional to the value perceived, no more than the cost of production.

This way, the EU can win the battle of competition, leveraging the heritage of experience in many sectors, like industry, and the quality of our data, given by the diversity, depth, detail, and historical records. The fragmentation and distribution of our market and suppliers can be transformed from a weakness into a strength, by providing internationalisation, localisation, distribution, accessibility and seamless integration across a new generation of digital services and products that can lead the new economy.

But there is a problem: the EU does not share sufficient data. Much data are already available in the market, for free (Open Data), or commercialised (like the new Shanghai Data Exchange). Pharma researchers prefer to run their tests in countries where it is easy to access personal data. 80% of EU industrial data and applications are still running on-premises servers or private cloud, because of the lack of trustworthy technology platforms.

Transparency, controllability, and interoperability of digital infrastructures are key ingredients to create the premises for a real EU Digital rebirth and to see

the EU leading at a global level in the digital economy future.

Gaia-X has put these concepts at the centre of its mission. The creation of an SW framework, capable to interconnect existing data and infrastructures, providing the necessary level of trust through an objectively verified set of credentials that allows for transparency, controllability, and interoperability of digital services, is the promise of our project and the long-awaited revolution in the digital world.

Gaia-X is starting from the industry, as the voice of the market, but it introduces a breakthrough paradigm of data ethics, anticipating in some cases, and certainly riding and leading by example, the implementation of rules now being codified in a new code of conducts and regulations being issued in the recent months by the EC (DGA, DMA, DSA, DA, etc.).

So, let's go back to the original questions: Do you believe these 750 Bn EUR are for free? Not at all. They are the debt of our next generations, so we must be responsible for our offsprings. Do you see the RRP as the secure way to return to the old normal? Certainly not. This is a one-way ticket into the new normal, driven by the already deeply unbalanced economies across regions, and accelerated by the pandemic into a complete reshuffle of the world we used to know just a couple of years ago.

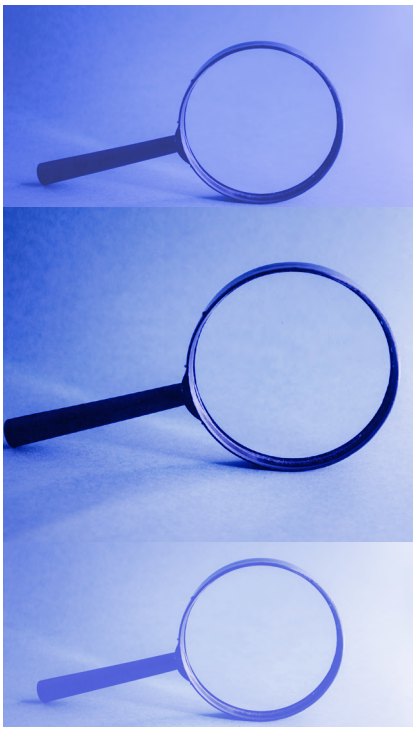
We should better be successful with Gaia-X, because it will determine our ability to control, instead of being controlled by technology, and there cannot be any economical or political sovereignty without technological autonomy.

Without a clear though challenging business planning, to create the necessary market demand and traction, any RRP projects might produce new infrastructure or services in a span of 5 years plus, that will not reach break-even. And without investing in the right markets, the loss might be driven by external factors of competition that any digital transformation cannot alter (labour cost, materials, logistics, etc.).

Let's then investigate the future and see what the potential scenarios are.

My prediction is that some market segments, where the EU was traditionally leading in the world economy, might have a slight or substantial decline due to those external factors, that already moved the economic axis of the world, but also because of the rapid disruption digital transformation is introducing.

The industrial manufacturing sector first, will be suffering from the dependence on material, energy, labour, and logistics that hold Asia as a stronger position and difficult to compete with. The quality of production has always been a differentiator, but with the large adoption of automation and robotics, production personnel will be replaced at 70%+, and being this technology available at the WW level, the difference in product quality between the EU and Asia will gradually dimmish, reducing the competitive advantage of European factories and products. The engineering and industrial intellectual property will remain a key strength for European companies, and it will be the area of investment to protect, develop and capitalise on IP, creativity, experience, and research. In a word, data!



Financial services have always been a strong market in the old continent, but they 'follow the money' (as the old motto says). We already see a strong fluctuation of capitals, from western and eastern countries into Europe, only partially counterbalanced by governmental investments. So, if large capitals, notably on innovation and startups, come significantly out of Europe, whilst European venture capitalists and private equities invest heavily out of Europe, then financial institutions will have to become more and more internationalised, less focused on local market peculiarities, branchless and digitised. Key business processes like risk management, of KYC, will benefit from or be localised.

Energy is the driver of any business and of our lives. It will become the real money of the future. The green revolution and the shift to renewable energy are needed and understood, but they will not replace our dependence on carbon, oil, and gas for the other two decades at minimum. This will create even more dependency on non-EU energy providers and distributors, and a need for much more open and distributed energy trading platforms and international integrated energy grids.

The examples could continue, but let's make a 'what if' analysis: what if the RRF does not produce the expected results in the next 5-10 years? As said, if the expectations are unreal, or if we are investing in the wrong direction, or rebuilding solutions that are already obsolete, it is a concrete possibility. It will be unlikely – if not impossible – to see the launch of yet another investment plan like this in the next decades. Therefore, if the RRF does not obtain what is expected, there will be no more public investments for a long time. Private investors and venture capitalists will drive the economy in the direction where they see the highest ROI and closest exits. Therefore, it is paramount to try to understand in advance where the EU can play a win and where there will be less probability.

My prediction is that in 5 to 10 years we will see the consolidation of three types of markets

- **Localised** – largely driven by local countries and territories, because of their peculiar connection to them.

  Healthcare, Circular Economy, Sustainability, Public Services, Social Services, Agrifood, Tourism, to name a few.

- **Commoditised** – run at global levels with no specific localisation, but largely driven by countries or region with the stronger localised markets

  Industry, Financial, Energy

- **Emerging** – new markets that can be tackled in any specific localisation, largely driven by the power of data, and that can also leverage commoditised markets from other regions

  Digital Products (Smart Cars, Smart Banking, Smart Insurances, eCommerce/ Smart Retail, etc.), Orchestrated Factories (Factory as a Service, Addictive Manufacturing, Cloud Brokering, Connectivity Brokering, etc.), Federated Intelligence (SaaS/Algorithm Marketplaces, Data Marketplaces, AI as a service, etc.)

Localised markets will be largely bound to local data. In the healthcare, as an example, the ability to exchange data across the value chain, from patient to hospitals, labs, and pharma, is so peculiar and connected to a specific territory, that a globalised approach will not work, but local federation can connect one another creating federated ecosystems.

Commoditised markets are already visible as we speak. Cloud is an example, and we are now considering the move to the cloud as a necessary step to re-establish digital competitivity, which is true, but Cloud will never be a localised market, nor it will create per se any market competitivity.

Instead, it will enable the creation of new solutions, new business models and new markets, through the creation of new products and services based on data and algorithms at scale. The same commoditisation concept will occur to other 'facilities', like industrial facilities, or energy facilities, in such a way these resources, capital intensive to be built and maintained, will be sold

in ‘white labelling’ to assemble new ‘virtually’ dedicated factories, banks, insurances, etc. The commoditisation is a paradigm introduced long ago by the cloud, but per se applicable to any ‘factory’ and capital intensive business, so it will transform the old way to build and maintain own factories, into making them an asset (as a service) to build and quickly start the creation of new factories reducing CapEx to zero. The 5G (and subsequent) will do the rest, making any factory located anywhere seamlessly integrated with the design and commercial departments.

Emerging markets are those driven by data and data spaces. They are the new economy field, where brand new products and services can be created. They will leverage the existing data spaces and expand them to enrich the base of ‘raw material’ to work on. This emerging market will be accessible by virtually any company of any size, from any location. This is where the EU can play the role of leadership we deserve and want, because of the richness of our data, because of the heritage in the ‘old’ economy we can leverage, and thanks to projects like Gaia-X enabling the necessary pre-requirements to make this happen: federation across the value chain, distribution versus centralisation, transparency, controllability, interoperability of services to enable secure data and infrastructure exchange.

Gaia-X has built a new window on the future and is paving the way to a new EU economy of data to recover, resist and transform:

Leveraging the fragmentation of our territories and market players, and transforming it into a market differentiator, through the paradigm of ‘federation’.

Leading as thought leader in the move from ‘sovereignty’ into ‘controllability’ of services and technology, translating a generic and legal concept into tangible and objective elements of trust.

Reducing dependencies from large centralised non-EU providers, thanks to the ‘distributed’ cloud paradigm, and marking with it a double score, through critical mass (through federation) and performance (adapting to data gravity).

Creating the premises to regain a significant portion of the EU digital market and leadership role in the global digital market, aspiring to move to a high two-digit figure from the current 5% TAM as measured in 2019.

Where do we want to win?

For sure in all markets, but taking account of the peculiarities, the impacts, and the priorities. Amongst all the following are for example somewhere we need to be in control as much as possible, as they will condition the future of our society:

- **Education** – there will be no future without filling the gap in education with non-EU, and Asian countries. The current model of education is changing due to the pandemic, and this can be an opportunity to ride the wave of change and build new education platforms that are closer to the students, and make education continuous, affordable, effective, and contextualised. Given the future of the world is driven by technology, the future of education is at risk to be hijacked by dominant technology players that will drive the demand. It is paramount to protect the human capital and invest in the future generation of engineers that can preserve the ability of the EU to drive the change, and not follow the market demands.
- **Healthcare** – no future without safety and health. The demand for healthcare will be largely fulfilled by digital services to withstand a physiological increase in requests, reduce the response time, increase the responsiveness and presence, and increase the quality of diagnosis and treatments. The use of digital in healthcare, together with education, will create the strongest awareness and perception of value in the citizenship, bringing digital to a further level of need, and the importance of a trusted platform, a request from the civil society, not only the industry and government.

- **Smart Cities** – the articulation, complexity, differentiation, and cultural richness of the EU is unique and find their expression in our cities. They become a unique playfield to implement smart services that are relevant to the people. EU is already leading in smart cities and can become a reference

thanks to the implementation of trusted services that will in turn increase the awareness and demand, by European citizens and not only, for trusted, ethical, secure, transparent technologies to manage their lives.

- **Circular and Sustainability** – the quality of our products, territories, and cultures, can be enriched thanks to the transparency introduced by the ESG and the ability to show the difference and the higher level we can produce in the EU (think about food, wine, tourism, culture, etc.). The only way to trace the characteristic of a service or product and testimony its level of sustainability is through the creation of data spaces, where all actors contributing to the production and delivery of that good, share their information to provide a clear and transparent picture of its composition, production processes, etc. Even though now ESG is seen more as a required marker, or a small additional value, in time will become the main driver for choosing products and services that have a lower impact on the planet. Here, we have the chance to win the battle of cost of labour and raw material like other economies will be incentivised to do given their current market dominance.

In conclusion, I see a future where 50% to 70% of the value of products and services in any sector will be produced, directly or indirectly, through data spaces, thanks to the creation of digital twins of the production environment to improve the production cost and quality, and, most importantly, through digital add-on products that will drive the price to market to make it proportional to value perceived by the users, and less by the cost of production.

Consequently, 70% of our employment, education, capital, and entrepreneurship initiatives, will be driven directly or

indirectly by digital platforms and technologies, and regaining control of them is, therefore, paramount to keeping control of our future.

Technology will undergo a paradigm shift, moving from a tool to automate our old life, into a new metaverse that will transform and change our lives.

Data ethics, as the need to rely on platforms and technologies that are trustworthy, reliable, secure, and controllable, is, therefore, our key objective and we need to start working on it now to ensure the future will be in our hands and not in those who are now incumbent and dominant following a purely speculative scenario.

What is the future of Gaia-X?

As outlined in the Vision and Strategy document, the 5 years outlook of Gaia-X targets a hype cycle where, from year 1 to year 5, we want to produce an inversion of the current trend, from a scenario of the dominance of non-EU players, minimal penetration of cloud adoption in EU, minimal data share and exchange, and minimal market quota retained by EU players, to a new scenario of pervasive adoption of the Gaia-X services to implement a governance and control layer on top of existing technology stacks, enabling and accelerating data exchange across EU actors through the creation of common data spaces, and regaining leadership in the market of digital through the disruption of a new model based on federation, decentralisation, distribution and trust, to regain a substantial quota in the EU market and become a global player.

In Year 1 we set up what Gaia-X is and wants to be. In Year 2 we want to start the adoption of Gaia-X to enable the first market services. In Year 3 we expect to create the market traction that will pull Gaia-X services to the EU and in Year 5, to a completely different position.

The awareness of our mission and the advantages of

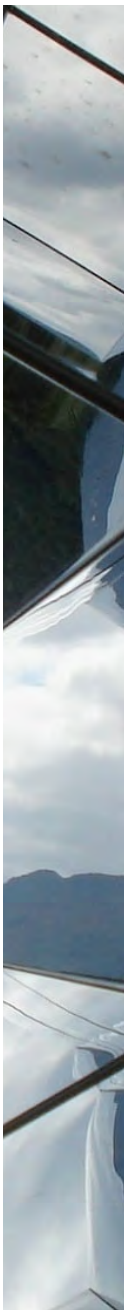
our approach must be known by the largest possible public, from industries to governments to civil society, as the impact of the change Gaia-X is producing, goes in the direction of a new concept of digital ethics that is missing and much expected and deserved by our citizens.

The channel for the success of Gaia-X is the market adoption, that must occur through the Gaia-X regional hubs, the support of governmental initiatives, yes, but most importantly, the scouting of the most impactful and concrete projects that can produce business outcomes (R&D is important but clearly out of scope in this sense).

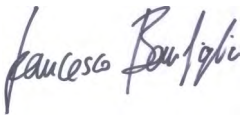
The roadblock to success is in our ability, within the association, in understanding the need for speed and the necessity to establish, even though within an association, a strong and clear push for business results. The roadblocks outside the association are the several conflicts of interests that see the possibility to build an alternative for the EU - a potential disruption, even for EU companies that have already decided to partner with non-EU giants.

The credibility of the Association will come only through the results and actions visible to the outside world, and this credibility will drive the ability to continue to execute in a closed-loop manner.

Year 2 is therefore the year that will mark the line between our mission statements and our realistic willingness to deliver.



About the author
FRANCESCO BONFIGLIO



Francesco Bonfiglio joined Gaia-X in March 2021 as the new CEO.

With more than 30 years of experience in the business of consulting and information technology, Francesco brings his knowledge of the cloud and data market needs, and his vision on how Gaia-X should revolutionize it. Independent Advisor since 2020, he has spent his previous professional life as an executive in many Italian and Multinational contexts. Formerly Chief Executive Officer for ENGINEERING D.HUB (Hybrid Cloud and Digital Transformation company within the largest Italian System Integrator Group), Vice President for Technology Services at AVANADE and Managing Director within the ACCENTURE Group, Chief Technology Officer for HEWLETT-PACKARD EMEA, SW Factory Director at UNISYS, Technical Director and Methodology Evangelist at RATIONAL SOFTWARE amongst his positions. With a background in Electronics Engineering, he started his career in the late 80s as an HW/SW Engineer working on some of the most advanced Military R&D projects, from the Sonar System for the Italian Navy (ANSQQ14IT) prized during the Gulf War for the mine-hunting performances, to the Eurofighter Fighter Aircraft (EFA), still one of the most advanced examples of technology in the Military field. Francesco had a bottom-up career, covering all roles within IT, from developer to top executive, from R&D to business units' leader. An early supporter of the need for continuous innovation, he is a big fan of the startup ecosystem, an active member of evaluation commissions, and is a board member and co-founder of FOOLFARM.com, the first example of a Startup Studio in Italy. Amongst other roles, Francesco has represented the IT world and then became Vice President of Confindustria (Italian Trade Association) for Valle D'Aosta. Living in Italy, in the countryside outside of Milan, married and father of three sons, he loves music and played in several independent live and record productions since the 80s. Francesco believes in the power of collective intelligence, lateral thinking, and teamwork, as a propeller for transformation, in the business as well as in the whole life!

3.2

DIGITAL INNOVATION BASED ON EUROPEAN PRINCIPLES AND VALUES

Digital platforms and ecosystems

Jeroen Tas, Chief Innovation & Strategy Officer Phillips

Twenty-twenty was the year that the top ten most valued companies were tech platform companies. In 2010 there were only two, Microsoft and Apple, and five were in extractive industries, such as oil & gas and mining. As historian Yuval Noah Harari observed, "Where once the main sources of wealth were material assets, such as gold mines, wheat fields and oil wells, today the main source of wealth is knowledge". There has been a huge shift in value and company valuations across virtually all sectors towards tech-based platforms. Hindsight is indeed twenty-twenty. It is time to look forward.

Platforms are the technical foundation of digital ecosystems. They form the digital infrastructure for organisations to collaborate and bring producers and consumers together. It allows companies to compete by taking out friction in the market and offering integrated sets of products and services to consumers (B2C) or businesses (B2B). Most ecosystems that emerged in the last decade are

based on digital platforms that operate in the Cloud.

The best way to understand platforms is to look at the ecosystems that they support. Digital ecosystems involve a degree of interdependency between members, and easy-to-implement-and- consume ways to share services and data. They use one or more platforms to tie products and organisations together. The most successful ones of the last decade have been 'monolithic' platforms, operated by large players: Google, Apple, Amazon, Facebook, or Tencent's WeChat in China. Other well-known examples that have come to dominate large sectors of industry are AirBnB and Booking.com in hospitality and Uber and Lyft in mobility.

These companies present digital natives that make heavy use of a constant stream of feedback from their customers and consumers. This allows them to personalise transactions and experiences, improve daily and anticipate emerging needs. Amazon, Airbnb, and Google have all grown by disintermediation, open access and hyper-scaling. They thrive on the network effects, as articulated by Robert Metcalfe in the early nineties: "the value of a network is proportional to the square of the number of connected users of the system". With two nodes you have one connection, with 100 nodes 4,950. There is even a second effect, as seen with the iPhone: more apps attract more consumers, and more consumers attract more producers (app developers).

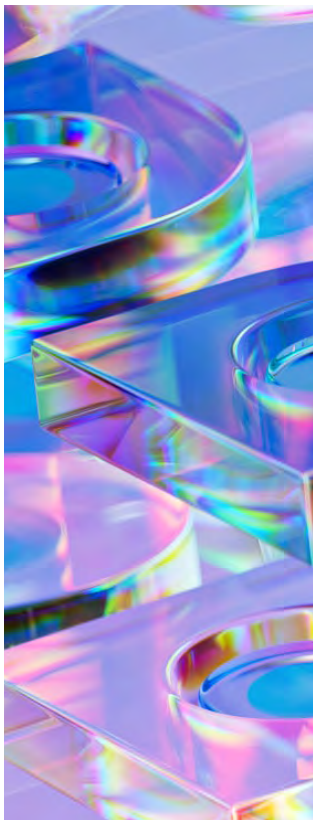
Open data spaces

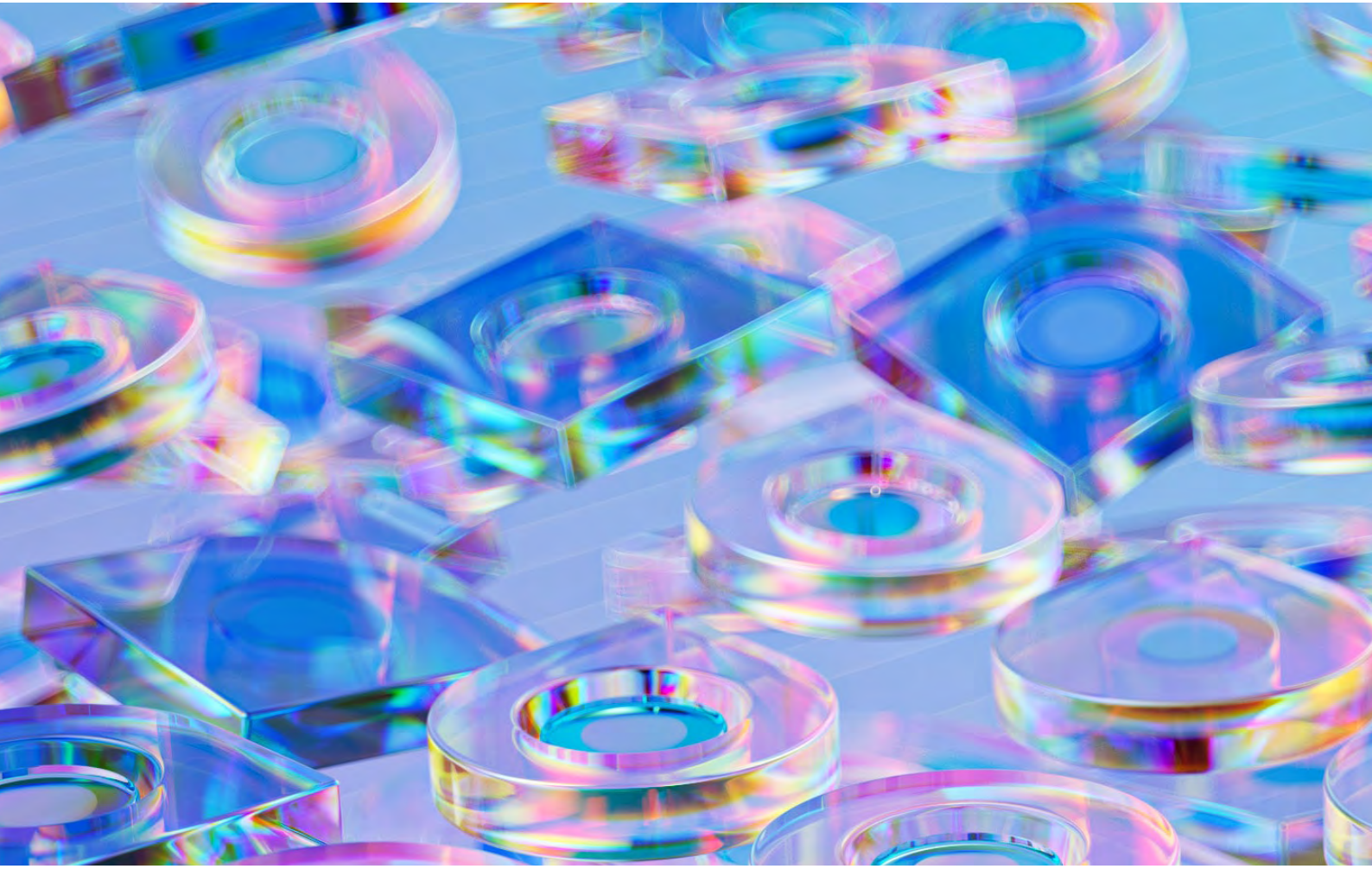
Traditional product companies use control of the value chain to create a competitive position and deliver quality interactions. This is an inefficient and highly constrained way to gain the right insights and translate them into value. The big change on the path of digital evolution is the shift from optimising internal resources and creating competitive barriers to harnessing technology and data while collaborating in an ecosystem to create sustainable customer value. As had been said: 'supply economies of scale' are giving way to 'demand economies of scale'. Demand economies of scale are driven by efficiencies in anticipating demand and aggregating personalised experiences that createvalue for the user. To create platform-based ecosystems we can take different

approaches. The tech giants have mastered the art of turning data into customer insights, easy-to-consume services, continuous customer-driven innovation, and business optimisation by acquiring massive amounts of data and monopolising their space. They operate on a tightly controlled stack with openness at the edge. Both Apple and Google have millions of apps in their app stores, but they set the rules, the apps run on their stack, and they take their share of the action. Another approach taken by some countries is to protect their own local heroes by restricting access from international players. Both, in my view, limit the innovation potential. The massive opportunity that digital platforms and AI offer should be open to all.

What if we found a new way to enable virtual innovation, where small, medium and large companies can collaborate on shared projects and still set their own rules?

What if there was another way? What if, instead of the monolithic or protectionist models, we took a collaborative approach to innovation by enabling a new kind of open data space? Not a single cloud, or multiple clouds that each have their own rules, but a networked system of different players sharing a set of common rules and software, where small and medium-sized companies (SMEs) from different countries can collaborate on shared projects alongside multinationals and research institutions. This federated model would enable players to choose who stores their data and where, how that data is processed, who it can be exchanged with, and for what.





We have sophisticated value chains in many industries, including the automotive sector, aerospace, life sciences, energy, finance, and agriculture. But we lack the digital underpinning. And despite thousands of initiatives, the results are scattered and have created a fragmented landscape with substantial limitations to scale. Thus, potentially putting Europe in the shadow of the digital economies of the US and China. We need to upgrade these ecosystems for the digital economy.

The economic engine of Europe runs on small and medium enterprises that have found their niches in global supply chains. We all speak different languages and have different laws and regulations, yet we work together well. When the moment calls for it, we can stand together. The future value of many industries lies in insights and optimisation through data and AI. We have to deploy the feedback loops that will shorten cycles, remove friction, and increase access to markets. In other words: We need internet for data, a semantic web that allows data spaces to be interoperable and federated. So how would that work in practice?

Shared goals.
Independent choices.

First, let's look at mobility innovators: Imagine if all traffic lights, cameras, connected cars, roadworks, public transportation, and traffic data could be accessible in one federated data space. This could help optimise individual routes but also the flow both in real-time and overtime. It would also provide invaluable information to the automotive industry about where and how people move. And if all suppliers to the car industry could share anonymised data and easy access to markets, this would improve traceability, quality, and sustainability.

Healthcare is another industry that would benefit hugely from shared data spaces. For me personally, this could be life changing. In a recent blog, I talked about my daughter Kim, who suffers from type I diabetes, and her experience with disjointed healthcare and the gaps in the system. Extrapolate her experience to millions of patients and you've got a huge amount of waste in a healthcare system that cannot afford it. Having a digitally underpinned network of health providers, researchers and innovators would bring both clinical and cost advantages. Even within one hospital, data is not aggregated longitudinally for a patient, let alone across a health system or multiple health systems. Yet the burden of disease is equally pressing across the EU. Costs and demand continue to rise, and capacity is constrained.

> **As long as you're on board with secure, open, and sovereign use of data, then you're welcome from wherever you are in the world.**

Gaia-X: An open

approach to Cloud and Data

Enter Gaia-X was founded with the aim to create a federated open data infrastructure based on European values for data and cloud sovereignty. The initiative combines individual platforms and different ecosystems that all follow a common set of rules and policies and deploy a common open source software to enable federation. This model works in any sector and across them and lines up well with the federated nature of EU societies and economies.

Despite the diversity of the stakeholder landscape, we are making tremendous progress. As the economist Theodore Levitt once said: “Creativity is thinking up new things. Innovation is doing new things.” It’s time for us to start doing. The automotive industry has already launched Catena-X and a similar initiative for healthcare will follow suit, alongside agriculture and energy.

A digital future

that’s both open and fair

In my career, I’ve worked for big players like Philips as well as my own startups. So, I know how powerful an ecosystem like Gaia-X could be to both. What we need now is more hands-on deck.

> **Gaia-X represents the beginning of a new movement for data ethics and innovation in Europe.**

Francesco Bonfiglio, Gaia-X’s CEO, said. I totally second that, and truly believe we can make a difference for all European citizens. The more people can join the movement, the faster we can create a digital future that’s both open and fair. Personally, I cannot wait until we enjoy the fruits of the initiative . But first, let’s get the data spaces up and running. Data spaces that are sovereign, not beholden to any big player and open to everyone. We will be creating a level digital playing field operated on EU principles and values. This is today even more important as a counterweight to those geopolitical players strutting their military and economic might.

About the author
JEROEN TAS

Jeroen is a Dutch entrepreneur and senior executive in the healthcare, information technology and financial services industries. In February 2017, he assumed the role as Chief Innovation & Strategy Officer at Philips Healthcare. Tas is also a member of the executive committee at Royal Philips.

Prior to his current role, he was named CEO of Connected Care and Health Informatics in February 2016, a cluster of five Philips business groups focusing on patient monitoring and therapeutic care, population health, healthcare IT, healthcare transformation services and the development and deployment of the Philips HealthSuite cloud platform. Before that, Tas led the Philips Healthcare Informatics Solutions and Services Business Group.

3.3

IS Gaia-X AN ENABLER OF THE DATA ECONOMY IN EUROPE!?

Dr Christian Rusche, Economist, Research Unit Digitalization, Structural Change and Competition, German Economic Institute[1]

Data and the opportunities they bring are important factors for the competitiveness of the European economy. So far, however, most European enterprises rely on products of non-European enterprises when it comes to the handling and analysis of their data.

Gaia-X aims at limiting the market power of dominant digital platforms, while, at the same time, offering a safe infrastructure for all enterprises to use their data and develop customised solutions for their business.

From an economist's perspective, goods can be categorised according to two basic features: Rivalry in consumption and excludability. An apple, for example, has rivalry in consumption and excludability. Once eaten, no one else can eat it (rivalry) and when I bought it and it is in my hand, I can exclude others. Because data can be copied and shared at virtually no cost, there is no rivalry in consumption

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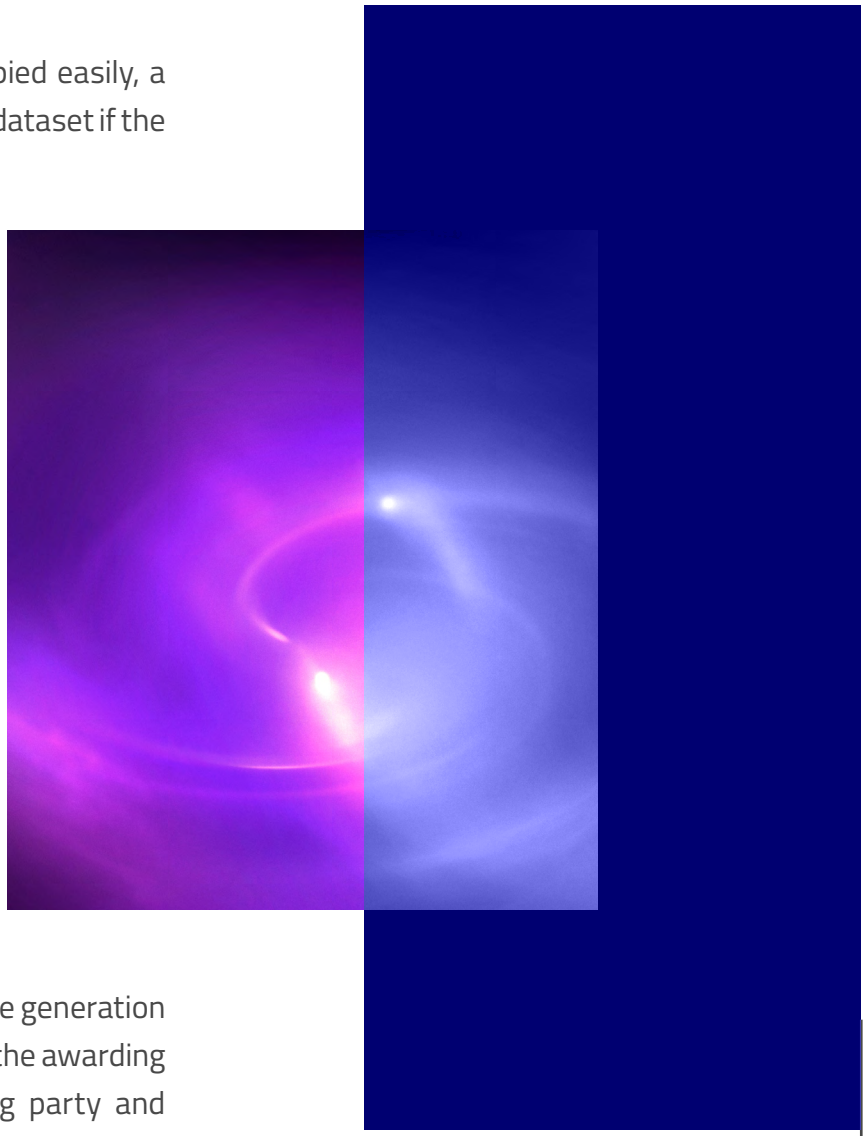
(Rusche/Scheufen, 2018). This entails that the same dataset can be used by different persons without negatively affecting the use by another user. But data can contain business secrets, personal data and other important information. This requires a careful treatment of the data itself and a careful decision on with whom to share data.

Furthermore, since data can be copied easily, a purchaser is only willing to pay for a dataset if the same or a comparable dataset is not available at a lower cost or even free on the internet. For monetising data and, therefore, for the incentives to generate a dataset in the first place, restricting the access to data and the safety of the shared data is crucial.

Accordingly, there is a trade-off between sharing data with as many people as possible to maximise the enhancement of their opportunities in the whole economy, while still giving the generating players the choice with whom to share data at which terms of use, to incentivise the generation of datasets. This trade-off leads to the awarding data sovereignty to the generating party and creating a safe environment that allows for as many transactions as possible because of uncertainty about the transaction partners is reduced.

Another important factor in the data economy is the ability to extract valuable information from data (Krotova et al., 2019). The generated data must be used for new and improved processes, products, or services. Cloud computing has developed into an important factor for this value-creating process because using external resources of cloud providers allows the enterprises to concentrate on their core business model while still running an IT-Infrastructure that is flexible and constantly updated.

In a survey from 2020 under decision-makers



and consultants of enterprises, the majority saw the benefits of cloud computing in the enabling of new business models, more flexibility, and less time-to-market (PwC, 2021). But the majority also saw more requirements for the security and risk management of enterprises.

Accordingly, the same that holds for the whole data economy, also holds for cloud computing: enormous opportunities, especially for new

business models, face increased challenges for data protection. Any initiative that, against this backdrop, wants to boost the development of the European data economy must therefore enable the use of data while, at the same time, reducing the risks for participating enterprises and their data.

Why Gaia-X is the way forward in the EU?

That such an initiative is necessary, as can be seen from the digital economy in the EU. The EU is a very attractive market with dense digital infrastructure, but still, non-European digital enterprises dominate the European Market and the markets worldwide (Büchel/Rusche, 2021). This also holds for the market for cloud services. Based on turnover and the number of services used, especially Amazon (AWS), Microsoft (Azure), IBM and Google dominate. The share of these four on global turnover in 2019 amounted to more than 40 per cent (Statista, 2021). In Europe, this share is even higher. Regarding Cloud as Infrastructure, the shares in the first half of 2020 were 53 per cent for AWS, 9 per cent for Azure, 6 per cent for Google and 3 per cent for IBM (KPMG, 2021). Accordingly, these four US companies stand for more than 70 per cent of the European cloud market.

Many enterprises refrain from using opportunities concerning data because of security reasons (Röhl et al., 2021). Furthermore, if they want to use the opportunities, there are confronted with big digital enterprises and possible competition issues, like lock-in effects or unfavourable terms of use. This is the setup for Gaia-X, which is not the attempt of some European countries to build their own (cloud) infrastructure to enhance competition.

Instead, Gaia-X tries to combine existing infrastructure to create a safe and federated data ecosystem based on reliable rules. This entails an

ecosystem that grants data sovereignty to the users and incentivises them by this data security to share their data. This increased availability of data and respective services foster innovations (Gaia-X, 2021a, 2). The aims for Gaia-X are quite ambitious. By 2024 more than 40 per cent of the small and medium-sized enterprises in Europe are supposed to use Gaia-X and due to Gaia-X, the European platform economy will have a share of 10 per cent worldwide (now four per cent) in 2025 (Bonfiglio, 2021).

To reach the goals, Gaia-X focuses on three main activities (Gaia-X, 2021b, 3). It specifies an architecture (standards, components, design principles etc.) that allows for a functioning federated data economy. The second main activity aims at the creation of open-source tools, if they are not available so far, to implement the architecture. The last activity sets up services that are needed for the trust of the participants and the functioning of the dataspace. That means services that certify the various components of the Gaia-X infrastructure and represent their reliability.

To show the value added by Gaia-X for a European data economy and to describe the project, the main activities of Architecture and Federation Services are analysed in detail. But before, a closer look is necessary to know what is defined as a participant. A participant is an 'item relevant for the operation of a domain that has recognisably distinct existence', furthermore the participant is onboarded and has a Gaia-X self-description (see Federated Catalogue under Federation Services) (Gaia-X, 2021c, 14; ISO/IEC 24760-1).

Note that the end consumer is, in general, no participant of Gaia-X. Instead, providers of data or services are participants of Gaia-X. These participants, however, can, due to Gaia-X, make a more valuable offer to end consumers, for example, if their data is protected or new services based on improved data sharing are created.

Architecture

Architecture not only encompasses the mere specification of components, application programming interfaces (API), components or standards, but

also design principles. These principles represent the core values of Gaia-X and the basis of its data infrastructure. There are three design principles (Gaia-X, 2021c, 10):

- **Federation:** The autonomous entities are tied to a federated infrastructure. To this end, standards, frameworks, and legal rules are used. Accordingly, different smaller systems are combined to create a larger system. Since network externalities can be utilised, this also means that the value of the bigger system to the users is higher than the sum of values of the parts. A key issue in this respect is interoperability. Only this feature allows for the establishment of a federated system and limits the consequences of market power because there are no lock-in effects. Federation also means that there is not only one data space. The federated infrastructure allows the creation of data spaces for any business or use case.
- **Decentralisation:** This principle describes that there is no central entity. The participants work together at the lowest possible level in a self-organised manner.
- **Openness:** This describes that Gaia-X is open to every participant that wants to participate and adhere to the rules. Furthermore, this also encompasses that Gaia-X is open to innovations and changing needs of its participants. Accordingly, Gaia-X advances with demand and evolving technologies. Transparency of the principles, standards etc. are also included.

Federation Services

As indicated by its design principle Federation, Gaia-X offers the opportunity to create dataspaces based on specific use cases or business models. These dataspaces are called Gaia-X Federations.

Federation Services are a range of services that are necessary to empower a Federation to become operational (Gaia-X, 2021a, 4). The Federation Services aim to deliver four outcomes. These are Identity and Trust, Federated Catalogue, Data Sovereignty and Compliance. For each of these outcomes, a set of services will be provided. Regarding the Federated Catalogue, every federation will have its catalogue. Every catalogue will be the repository of its federation and contains self-descriptions of the participants and their data or service offerings.

What will the future will bring for Gaia-X

The future of Gaia-X is still to be determined. On the one hand, the structure of Gaia-X is still unfinished and the design principle of Openness implies advancement of Gaia-X based on demand and technology. The 'core of the organisational structure' (Gaia-X, 2021d) of Gaia-X is the Belgian Gaia-X European Association for Data and Cloud AISBL (Association Internationale sans but lucrative). This association was founded in January 2021 and now has more than 340 members. Becoming a member of the Gaia-X association or participating in the provided working groups, still, allows every enterprise to influence Gaia-X according to their specific needs. Furthermore, it is the aim to implement a hub in every participating country (BMWi, 2021). The hub pools the specific needs of the economy and forwards this information to Gaia-X and allows for the design of Gaia-X based on the demand.

On the other hand, it is now necessary to demonstrate the advantages of Gaia-X for a wide range of uses. Gaia-X is a federated infrastructure that lays the ground for a wide range of Federations. Accordingly, Gaia-X is not a single data space, instead, it is up to the enterprises to use Gaia-X to create their data space that represents their needs and allows for new or improved products and processes. Successful prototypes and low-level access are important to foster uptake by enterprises. Only if Gaia-X lays the ground for successful applications in as many sectors as possible, it will become a success. If this does not happen, Gaia-X will likely be the standard for some niches. Although end consumers are not directly connected to Gaia-X, the advantages for them and their data can also be an important pull factor that encourages use. Accordingly, effort invested to foster Gaia-X has also to concentrate on such end consumers.

About the author
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Dr Christian Rusche was born in 1984 in Sangerhausen, Germany. He studied Economics in Magdeburg and obtained a Diploma in 2010. Afterwards, he worked as a research assistant at the chair of Microeconomics at the Technical University of Dortmund where he obtained a PhD in Economics in 2015. Since 2016 he is an economist in the `Digitalisation, Structural Change and Competition´ research unit at the German Economic Institute (IW). His research focuses on competition effects of digitalisation with a special focus on data and the impact of digital platforms.

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3.4

REFLECTING ON DIGITAL RESPONSIBILITY GOALS:

Gaia-X and the interrelation with European Rights and Principles

Andreas Weiss, Member of the Executive Board & Lead for Digital Business Models, eco Association of the Internet Industry

Prof. Dr. Björn Eskofier, Professor for Digital Support Systems in Sports and Medical Engineering, Head of Machine learning and Data Analytics Lab | University Erlangen-Nuerenberg.

Kai Michael Hermsen, Co-CEO, Identity Valley

Jutta Juliane Meier, Founder & CEO, Identity Valley

Harald Wagener, Group leader, BIH@Charité - Center for Digital Health

The Digital Responsibility Goals

– WHY?

The necessity for a human-centred digital transformation, rights and principles

Digital technologies have the potential to improve people's lives, but technological innovations and the use of innovative technologies must be geared more towards taking responsibility for the well-being of people and society as a whole - especially when it comes to the healthcare sector. In this regard, guidelines and laws are indispensable, but the dynamics of technological development equally challenge social developments and the ethical dimension in dealing with digital technologies.

Likewise, the internet and digital technologies bring negative side effects. For example, in many places in the world, especially in totalitarian states, the internet is restricted, regulated, monitored, and used for their propaganda, while fake news and hate speech poison the atmosphere and make social discourse more difficult.

Oftentimes, critical decisions about the future of digital developments are made without a clear framework. Trustworthy, ethically sensitive, and sustainable guidelines that focus on the benefits for people are missing. The Digital Responsibility Goals (DRGs) aim to define this framework and work towards a truly human-centred digital transformation.

The Digital Responsibility Goals

– HOW?

We provide a human-centred digital transformation framework

Leading organisations and companies are committed to the United Nations' 17 Sustainable Development Goals (SDGs). Following the same logic, addressing the digital dimension, the 7 DRGs aim to guide decision-makers, companies, and other stakeholders, such as researchers and users, to develop trustworthy digital products and services.

The DRGs provide an opportunity for various stakeholders and decision-makers from businesses, regulators, academia, and civil society to form a common agenda and plan a common course of action to deal with a human-centred digital transformation.

Digital Responsibility Goals

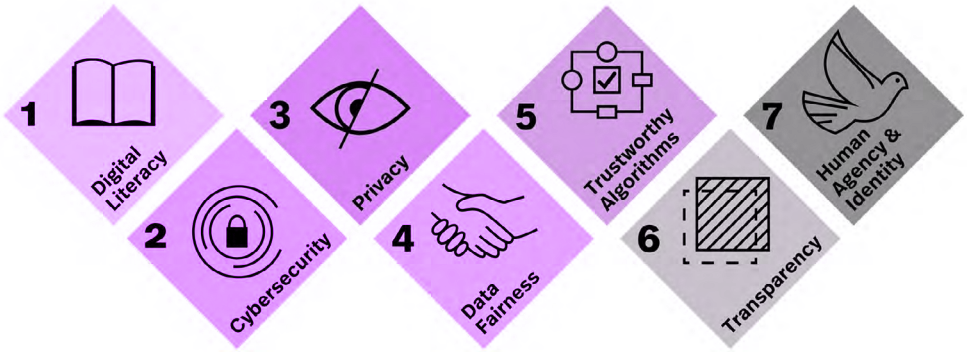


Figure 1: The 7 Digital Responsibility Goals

The Digital Responsibility Goals
– WHAT?

We measure a human-centred digital transformation step by step

DRG #1 "Digital literacy" is at the forefront of the DRGs, as only knowledge, education, and comprehensive information can form the basis of all self-determination and decision-making. This includes access to the technological infrastructure itself. Goals 2 to 6 of the DRGs are oriented along the data value chain - from the security of the system (DRG #2 "Cybersecurity") as the technological basis, to the protection of personal data (DRG #3 "Privacy") - as a European promise - and fair handling, a new understanding of how to deal with non-personal information and data (DRG #4 "Data Fairness"), responsible collection, processing and understandable evaluation of data (DRG #5 "Trustworthy Algorithms") and transparent communication of behaviour (DRG #6 "Transparency"). Finally, the DRGs form a big social bracket - the protection of our identity, as well as the preservation of human agency (DRG #7 "Human Agency & Identity") in the digital space. In the representation of DRGs, people and their identity are elevated from their previous positioning as marginal figures to the sovereign bracket and at the same time to the centre of digital transformation.

Developed in a consortium consisting of leading academics, NGOs, and industry experts, the DRGs cover 7 areas, where we see scope for commitments that go beyond compliance with existing laws and regulations. We have already described 5 guiding criteria per Digital Responsibility Goal in order to make the responsible behaviour measurable:

Figure 2: The Digital Responsibility Index shows the status of each Guiding Criteria of each DRG

The Digital Responsibility Goals

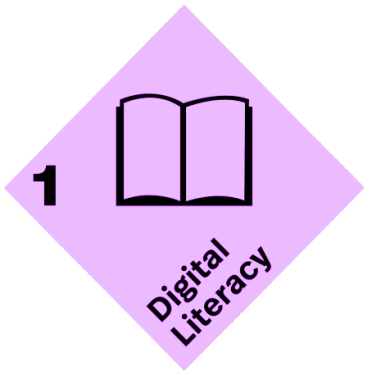
– WHAT?

Guiding Criteria and Examples

DRG#1 Digital Literacy and accessibility of technology as the fundamental basis for trust and acceptance of digital innovations: starting with the individual. Digital competence and access to digital products, services, and processes are prerequisites for the acceptance of digital technologies. They are the basis for all other goals of the Digital Responsibility Goals; enable the assessment of the trustworthiness of offerings and put humans at the centre. They are what makes the multi-layered human identity in the digital space possible in the first place.

These are the 5 guiding criteria of

DRG#1 Digital Literacy:



- **DRG#1.1**

The information offered for digital products, services, and processes must be designed individually and in a way that is suitable for the target group.

- **DRG#1.2**

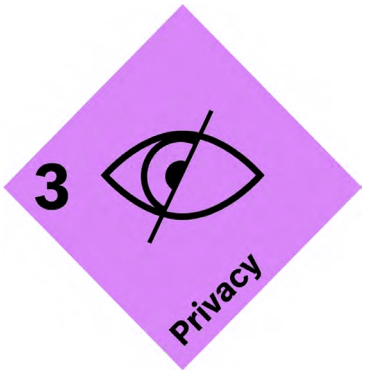
Access to digital products, services, and processes must be reliable and barrier-free.

- **DRG#1.3**

The acceptance of digital products, services, and processes must be proactively considered in design and operation. This includes measures on equity, diversity & inclusion.

- **DRG#1.4**

Education on the opportunities and risks of digital transformation is essential - everyone has a right to education on digital matters.



- **DRG#1.5**

The education and information offered should be designed to create awareness of related topics such as sustainability, climate protection, and diversity/inclusion (for example along the UN SDGs) where applicable.

Example of a successful implementation of DRG#1: “DRG4GovTech”

In the design and operation of an authority website for the electronic application of a car license plate, principles of accessibility were implemented in accordance with DRG guiding criteria #1.2, for example in accordance with BITV 2.0 (Barrier-free Information Technology Ordinance). This includes perceptibility, usability, comprehensibility, and robustness for the relevant target groups.

DRG#2 Cybersecurity as the crucial foundation and basis of secure digital technologies. Cybersecurity arms systems against compromise and manipulation by unauthorised persons and ensures the protection of users and their data - from data collection to data utilisation. It is a basic prerequisite for the responsible operation of digital solutions.

These are the 5 guiding criteria of

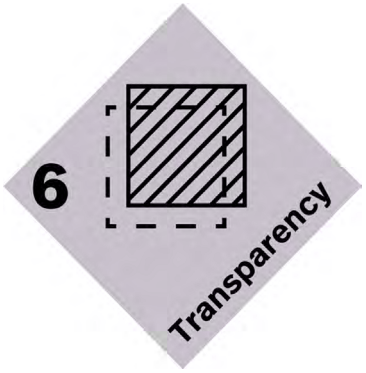
DRG#2 Cybersecurity:

- **DRG#2.1**

Developers, providers and operators of digital products, services and processes assume responsibility for cybersecurity. Users also bear some of the shared responsibility – awareness (see DRG#1) is essential here.

- **DRG#2.2**

Developers, providers, and operators of digital solutions are responsible for appropriate security measures and are constantly developing them further. Products, services, and processes are designed from the outset to be resistant to compromise and abuse by unauthorised persons (security by design).



- **DRG#2.3**

A holistic view and appropriate implementation are considered along the lifecycle, the value chain, and across the entire service or solution.

- **DRG#2.4**

Developers, providers, and operators of digital products, services, and processes must account for how they provide security for users and their data while maintaining necessary trade secrets and information security.

- **DRG#2.5**

Business, politics, authorities, civil society, and science must jointly and collaboratively shape the framework for cybersecurity with appropriate objectives, measures, and targets. This requires open and transparent cooperation (for example according to principles of "responsible disclosure").

Example of a successful implementation of DRG#2: "DRG4Finance"

A bank offering online services has been certified ISO 27000 to - in accordance with DRG guiding criteria #2.2 - demonstrate it possesses a robust security system based on appropriate measures to prevent unauthorised access to private information, internal systems, and networks. Ultimately this helps minimise the risk of security breaches, making the company more reliable and reputable in the eyes of potential customers.

DRG#3 Privacy as a European promise: Privacy is part of human dignity and a prerequisite for digital self-determination. Protection of privacy - with a consistent purpose limitation and data economy - allows users to act confidently in the digital world. Privacy by design and default enables responsible data usage. Users are given control and providers must account for how they protect privacy.

These are the 5 guiding criteria of

DRG#3 Privacy:

- **DRG#3.1**

Operators and providers of all digital products, services, and processes must take responsibility for protecting the privacy of their users.

- **DRG#3.2**

When dealing with personal data, strict purpose limitations and data economy are observed.

- **DRG#3.3**

Privacy protection is considered throughout the entire lifecycle. Privacy protection is the default setting.

- **DRG#3.4**

Users have control over their personal data and its use - this includes the rights to access, rectify, erase, restrict processing, object, avoid automated decision-making and ensure data portability.

- **DRG#3.5**

Providers must account for how they protect users' privacy and personal data - while maintaining

necessary trade secrets and information security.

Example of a successful implementation of DRG#3: "DRG4ResponsibleTech"

An online search engine assumes responsibility for protecting the privacy of its users in accordance with DRG guiding criteria #3.1. Privacy protection is clearly anchored in the organisation, and sufficient financial resources are available for

additional expenses incurred as a result. Responsibilities for privacy protection in the organisation are clearly defined, with a clear mandate at the highest organisational level.

DRG#4 Data Fairness: A new understanding of data and data fairness: it's about fair competition. Non-personal data must also be protected and handled according to its value. At the same time, suitable mechanisms must be defined to make data exchangeable between parties and applicable. This is the only way to ensure balanced cooperation between different stakeholders in data ecosystems.

These are the 5 guiding criteria of
DRG#4 Data Fairness:

- **DRG#4.1**

When collecting data, proactive care is taken to ensure that it fairly reflects and represents the context in which it is collected.

- **DRG#4.2**

In digital ecosystem structures, the mutual exchange of data between all parties involved must be clearly described and regulated (data governance). The goal must be fair participation in the benefits achieved through the exchange of data.

- **DRG#4.3**

Developers, providers, and operators of digital solutions must clearly define and communicate the purpose (wherever possible) with which they use and process data (including non-personal data). Exceptions are approaches like "open data".

- **DRG#4.4**

Data is designed "FAIR", especially for use cases relevant to society as a whole - "FAIR" stands for Findable, Accessible, Interoperable, Reusable.

- **DRG#4.5**

Data providers must be equipped with mechanisms to control and withdraw their data - they shall be able to have a say regarding the usage policies.

Example of a successful implementation of DRG#4: “DRG4GovTech / DRG4Mobility”

In line with DRG guiding criteria #4.4 a municipal government has a dedicated strategy to ensure the use of data based on the “FAIR” principles. It takes several dedicated measures with the aim of bringing data, including traffic information, environmental data, and economic indicators to the public and promoting its use.

DRG#5 Trustworthy Algorithms “Trust by Design” - through trustworthy algorithms: Once the data has been collected, it must be processed with the goal of trustworthiness. This is true for simple algorithms, as well as for more complex systems up to autonomously acting systems (AI = Artificial Intelligence for example).

These are the 5 guiding criteria of

DRG#5 Trustworthy Algorithms:

- **DRG#5.1**

Algorithms, their application, and the datasets on which they are based are designed to provide the highest level of fairness and inclusion.

- **DRG#5.2**

The individual and overall societal impact of algorithms are regularly reviewed, and the review is documented. Depending on the results, proportional measures must be taken.

- **DRG#5.3**

The results of algorithmic processing and their occurrence are comprehensible.

- **DRG#5.4**

AI systems must be designed to be reliable and precise to be able to withstand subtle attempts to manipulate data or algorithms. It must be possible to reproduce results where possible.

- **DRG#5.5**

AI systems must be designed and implemented in such a way that independent control of their mode of action is possible.

Example of a successful implementation of DRG#5: "DRG4Industry"

A startup that develops and markets AI tools for industrial applications implements measures to maintain fairness and inclusion in accordance with DRG guiding criteria #5.1. These include active measures to increase diversity in developer teams and the establishment of an AI Ethics Board.

DRG#6 Transparency must form the basis to guide the actions of all stakeholders in the digital supply chain to create trust: Openness and Transparency make the difference. Proactive transparency for users and all other stakeholders as to which principles underlie digital products, services, and processes, as well as transparency on the digital solution itself and its components, is created. Principled behaviour is an important building block for building trust.

These are the 5 guiding criteria of

DRG#6 Transparency:

- **DRG#6.1**

To gain the trust of users, organisations establish transparency about their digital ventures and solutions - for the final digital products, services, and processes as well as the organisation, business models, data flows, and technology behind them.

- **DRG#6.2**

Transparency is implemented in interactive communication (for example, between providers and users), and mechanisms for interaction are actively offered.

- **DRG#6.3**

The use of digital solutions is designed to be transparent wherever there is a digital interaction between people and the digital solution takes place (for example, the use of chatbots).

- **DRG#6.4**

In addition to transparency for users, transparency should also be provided for professionals – while maintaining the necessary business secrets and information security.

- **DRG#6.5**

Organisations must outline how they will make transparency verifiable and thus hold themselves accountable for their actions in the digital space.

Example of a successful implementation of DRG#6: “DRG4Health”

In a tool for diagnostic imaging in line with DRG guiding criteria #6.1 it is made transparent to doctors upon use that image recognition and analysis is used for diagnostic purposes in healthcare. Furthermore, this is also clearly communicated to relevant patients in the doctor-patient conversation.

DRG#7 Human Agency & Identity are critical guideposts and the precondition for digital development. Digital products and services must be human-centric, sustainable, inclusive, and developed under human oversight. It is about each and every one of us. Even in the digital space, we must protect our identity and preserve human responsibility. Preserving the multi-faceted human identity is a prerequisite for any digital development. The resulting digital products, services, and processes are human-centred, inclusive, ethically sensitive, and sustainable, remaining in human care at all times. Only in this way can digital technology promote the well-being of humanity and have a sustainable impact.

These are the 5 guiding criteria of

DRG#7 Human Agency & Identity:

- **DRG#7.1**

The preservation of the multifaceted human identity is a basic requirement and must be the basis for any digital development. The resulting digital approaches

are always user-centric - they respect personal autonomy and dignity, limit commoditisation, and open new perspectives.

- **DRG#7.2**

Sustainability and climate protection must be part of digital business models and implemented in practice (especially in accordance with the UN Sustainable Development Goals).

- **DRG#7.3**

Digital products, services, and processes promote responsible, nonmanipulative communication. Where possible, communication takes place unfiltered.

- **DRG#7.4**

Digital technology always remains under human authorship and control - it can be shaped throughout its deployment.

- **DRG#7.5**

Technology may only be applied if it is of use to individuals and mankind and promotes welfare.

Example of a successful implementation of DRG#7: "DRG4ResponsibleTech"

In line with DRG guiding criteria #7.5, a technology company conducts an impact assessment on the effects of the technology of facial recognition. Discovering the risk of malicious and unfair use, it decides to clearly limit the use of that technology to dedicated, risk-mitigated use cases and transparently communicates that decision.

The Digital Responsibility Goals and Gaia-X

An analysis

Together with our cooperation partner, the eco association of the internet industry, we did an analysis of the European digital project Gaia-X by the end of 2021. Examined along with the seven Digital Responsibility Goals. Including derivation of possible synergies and fields of action.

One of the key initiatives to establish digital ecosystems is Gaia-X with its firm promise to be open, transparent, sovereign, fair, independent, inclusive, free, federated, innovative and evolutionary.

ANDREAS WEISS

Member of the Executive Board & Lead for Digital Business Models

eco Association of the Internet Industry

The editorial on our Gaia-X analysis by the eco association

"We are shaping the Internet" is the mission of eco - Association of the Internet Industry. A mission that we have been pursuing for more than 25 years. The Internet has taken on tremendous importance in our economy, our society and our daily life and has become a synonym for nearly everything that happens in the digital space.

But everyone who is acting for, with and on "the Internet" shares responsibility for this space. This leads us to the question of how to balance this responsibility and of whom is in charge of which specific issues. Let us learn from similar initiatives like the Sustainable Development Goals as a blueprint to achieve a better and more sustainable future.

In this sense, the Digital Responsibility Goals (DRG) are a logical extension to address the further development of digital services for a better and fair digital future. We appreciate the conceptual approach of providing guidance and measurable criteria for the evolution of digital responsibility. It is worth mentioning that the future development of the DRGs must be a joint exercise by all stakeholders to shape the goals.

The eco Association stands for digitalisation and sustainability all while promoting responsibility on the Internet. One of the key initiatives to establish digital ecosystems is Gaia-X with its firm promise to be open, transparent, sovereign, fair, independent, inclusive, free, federated, innovative and evolutionary.

As you can see, some of these values are directly related to the core objectives of the Digital Responsibility Goals. So, we asked Identity Valley to provide a first assessment of how Gaia-X is meeting the current iteration of the Digital Responsibility Goals. Their assessment shows that Gaia-X is on the right path and addresses key elements, but there is also room for improvement.

Regarding the document on the "Guiding Criteria and Orientation for Digital Responsibility", in conjunction with the following analysis of how Gaia-X meets the DRGs, as an invitation for joint improvement by industry, politics and civil society and as an alignment for an approach to digital transformation that serves people.

We hope for an open, but at the same time focused exchange on how European values can be lived in practice as the basis of clear digital policy goals and guiding criteria - for a responsible and trustworthy digital practice.

JUTTA JULIANE MEIER

Founder & CEO ,Identity Valley

The editorial on our analysis by the nonprofit organisation Identity Valley

Digital technologies have the potential to improve people's lives. At the same time, the Internet and digital technologies bring negative side effects. Technological innovations and the use of innovative technologies must therefore be geared more to the well-being of people and society in the future than is already the case today.

As a benchmark for players in the digital space, the Digital Responsibility Goals attempt to define this framework and work toward a trusting, ethically sensitive

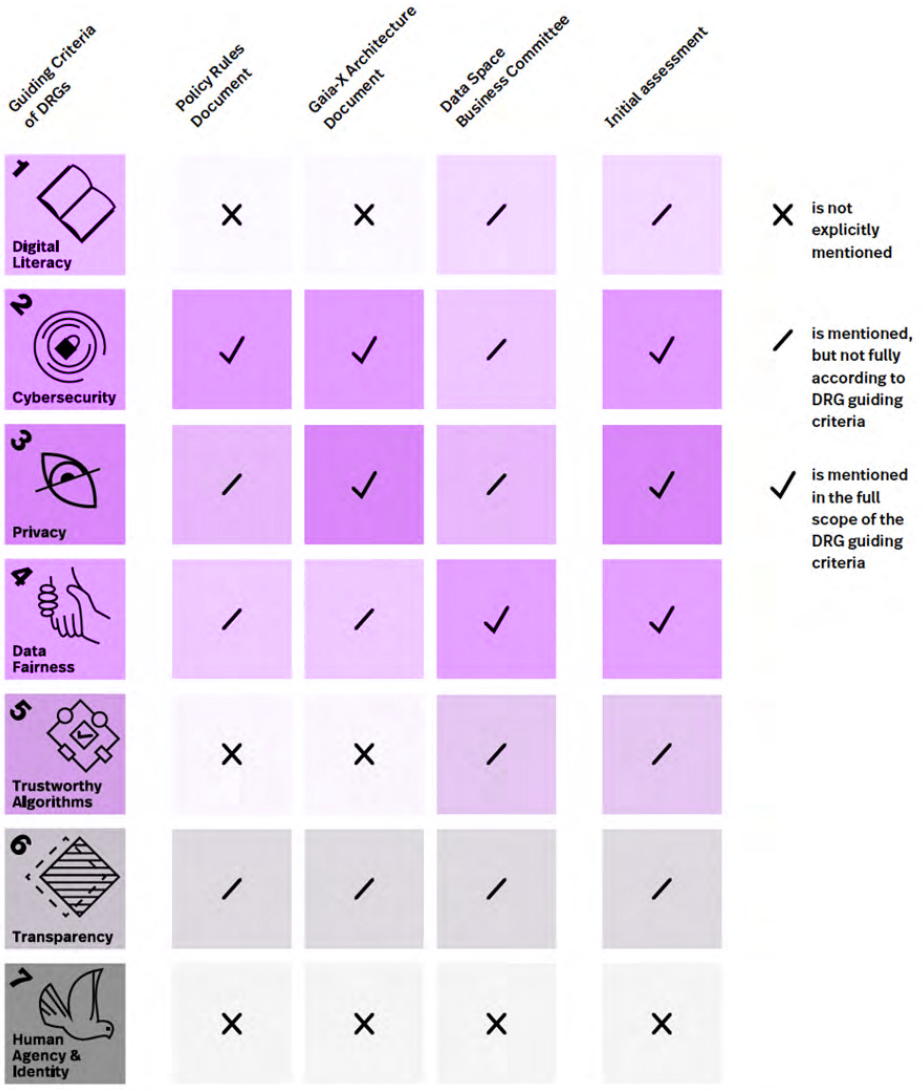


Figure 3: Initial assessment of Gaia-X documents in relation to the 7 DRGs, as of January 2022 - based on documents published to date.

and sustainable digital transformation among decision-makers. The Digital Responsibility Goals pursue an integrative and combined approach of all relevant actors to promote trust in digital technologies and business models. The Digital Responsibility Goals are accompanied by a guideline to measure the degree of successful value-based digital transformation, strengthen the responsibility of digital players and give participants clear guidance for their digital strategies.

With regards to the weighting and the order of the DRGs, there will certainly be different opinions and starting points for further discourse depending on the perspective, which we are expressly looking forward to. The current proposal was developed based on previous discussions with a wide range of experts and also in response to a number of existing and equally promising approaches to (mostly corporate) digital responsibility.

Based on the logic of the UN SDGs, the DRGs are also about presenting very complex tasks for society as a whole in a simplified framework for action using target images as orientation, initiating responsible

action at all target levels, and enabling and accompanying their progress in a comprehensible manner.

Acting along the goals is, of course, desired at all levels and does not have to be done chronologically from 1-to 7. Rather, the aim is to create awareness and sharpen attention for challenges and opportunities in the necessary fields of action - to shape our sustainably responsible digital space for our society.

The European digital project Gaia-X aims to create a federated open data Infrastructure based on European values of data and cloud sovereignty. The goal is to design and implement a data-sharing architecture, setting common standards for data usage, best practices, tools, and governance mechanisms.

In doing so, Gaia-X addresses important issues of digital practice, such as the imbalances and monopolisation tendencies in many markets, as well as the pervasive focus on profitability as the overriding principle, rather than values such as privacy and security. Likewise, there is the question of a balance between a profit maximising way of doing business and the development of common technical standards, the operation of open platforms and vendor-independent solutions. Gaia-X addresses these challenges with its value-driven data architecture for building sovereign digital systems that comply with European values and standards.

The Digital Responsibility Goals got applied to the European digital project Gaia-X for the first time by end of 2021. This analysis is intended to provide food for

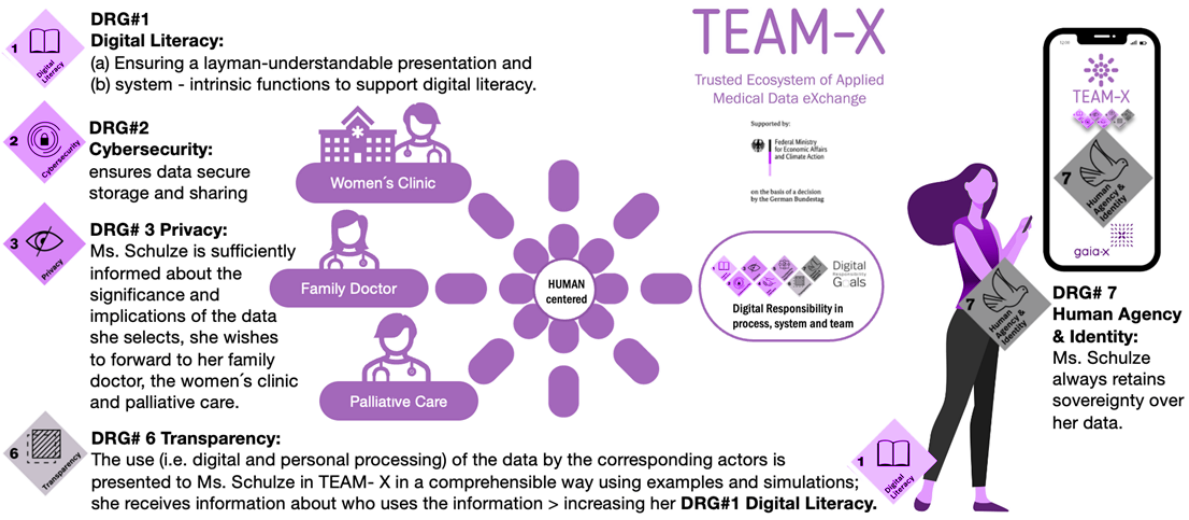


Figure 4: Digital Responsibility Goals, Gaia-X and TEAM-X - accompanying Ms. Schulze, diagnosed with breast cancer

thought and identify open questions. We hope for an open, but at the same time focused exchange on how European values can be lived in practice as the basis of clear digital policy goals and guiding criteria - for a responsible and trustworthy digital practice.

Gaia-X analysed along the Digital Responsibility Goals

Summary by eco association and Identity Valley as of February 2022

The nonprofit organisation Identity Valley (IDV) Research gUG (haftungsbeschränkt) conducted an initial assessment of the European Gaia-X project in terms of digital responsibility based on the Digital Responsibility Goals. Specifically, this involves comparing the value proposition of building sovereign data ecosystems according to European values and standards. Gaia-X primarily addresses B2B and B2G interactions, which pose different accountability questions than, for example, end-customer services. In this context, the Digital Responsibility Goals are appropriate for examining digital responsibility in the European digital ecosystem of Gaia-X.

The sustainability debate, for example, shows that companies are facing social debates for business reasons5. Likewise, technology is multi-use, and a clear stance needs to be defined on what is desirable to use and what is not - especially for a project with the high public interest and far-reaching impact on diverse industries like Gaia-X. Based on the Digital Responsibility Goals, Identity Valley comments on the current state of implementation of Gaia-X in this Analysis to formulate recommendations for action for the design of Gaia-X regarding digital responsibility.

This first assessment of the status of Gaia-X regarding the Digital Responsibility Goals was made based on current (as of January 2022) existing publications on the part of Gaia-X. Along with the 7 Digital Responsibility Goals, an initial review of the three documents mentioned in Chapter II and currently publicly available on the part of Gaia-X was conducted - representative of the orientation and guidelines of the Gaia-X entity as well as the ecosystem.

This is a first insight into the direction in which Gaia-X is currently developing. The goal is to highlight open issues and potentials in Gaia-X with respect to digital responsibility. This first commentary is therefore not to be understood as a final evaluation.

The metrics for analysing the Digital Responsibility Goals are jointly developed along with the guiding criteria with partners from science and research, industry, politics, and civil society piloted and established considering theoretical and practical methods as well as real industry use cases. The authors of this paper understand the measurability and quantification of ethical evaluation standards have raised significant theoretical and practical questions in previous undertakings. This current undertaking is applying these criteria to a large digital project for the first time to inspire an open, goal-oriented exchange on the question of how digital projects, could put values into practice and work towards a more responsible and trustworthy digital space.

HEALTH-X dataLOFT

The following figure serves as a simplified representation of the first assessment in the following chapter IV. It rates the three documents along with the seven Digital Responsibility Goals by analysing how many of the guiding criteria are explicitly mentioned in the said document. The total evaluation shows the highest achieved rating of any of the three documents, as all of them individually are part of describing Gaia-X and its policies, architecture and uses cases as a whole. For example, the colour of the overall rating turns more intense as soon as one of the documents is fulfilling the criteria in a particular category:

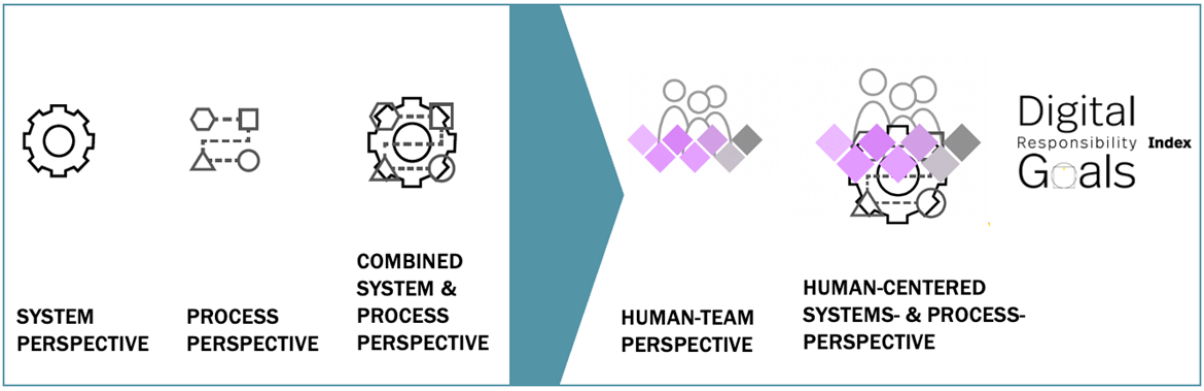


Figure 5: Depiction of integration of Digital Responsibility Goal Approach to TEAM-X.

Panel-Discussion and Download of full papers:

https://www.gxfs.eu/panel-discussion-on-digital-responsibility-and-gaia-x/

The Digital Responsibility Goals and Gaia-X

Testing the concept in TEAM-X

The proof of concept is currently developed. Within the research project of TEAM-X – Trusted Ecosystem of applied medical data exchange, funded by the German Federal Ministry for Economic Affairs and Climate Action, two Gaia-X use cases will be developed in the areas of women's health and in the care sector.

As part of this research project, the DRGs will be put into practice through a dedicated management system, responsible leadership training, monitoring, reports, and other methods for the first time in the health vertical: DRG4Health. The DRGs are anchored in the project proposal and the consortium, they are committed to by the team, are included actively in use case definition and are a key part of the project management for example by being integrated into tools (e.g., GitLab-based issues tracking) and templates (e.g., project-one-pagers). The DRGs not only combine the systems and process-perspective within TEAM-X but also add the human dimension through a human-centred perspective. This is how the DRG Index will be generated in an overall holistic approach along with all DRG Criteria.

User benefits – meet Ms Schulze

The Digital Responsibility Goals and Gaia-X

Testing the concept in HEALTH-X dataLOFT

Health-X dataLOFT, the Legitimised, Open, and FederaTed health dataspace, puts people in the centre of discovering, controlling, and using their health data. The goal is the development of transparent, cloud-based applications in highly relevant areas of health care like prevention, healthy ageing, and clinical care using Gaia-X standards to build a legitimised, open and federated health data space. Interconnecting the health sectors and integrative use of data is supported by the adoption of the Medicine Informatics Initiative (MII) and legally binding standards for public health insurance in Germany.

Identity Valley is one of the representatives for citizens and patients on the patient advisory board, which is frequently consulted to ensure the citizen-focused design and implementation of the HEALTH-X dataLOFT platform. The DRGs are a welcome toolset to qualify and quantify the results of this project in easily relatable and applicable concepts.

HEALTH-X dataLOFT demonstrates utility through four Use Cases showing the opportunities arising from combining data of the primary and secondary health sectors: Self-Determined Daily Health, Clinical Companion, Personalised Health Services, and Secondary Use/Data Donation. The platform enables innovative business models. Citizens and patients retain transparent access to, and control

over their health data and determine who can use them for what purpose, including data donation for medical research. These use cases will also be tested by citizens to ensure their viability using established user experience methods, and the DRGs will help quantify aspects of the use cases not easily covered using these established methods.

Summary and Outlook

As a target picture to shape a sustainable human-centered digital transformation, the DRGs offer an opportunity to promote greater responsibility in the digital space across sectors. Responsible behavior and responsible leadership all along the data life cycle is at the core of establishing trust. By adhering to the framework of the DRGs, and implementing it with a dedicated management system, building trust will no longer be a random by-product, but a pro-active and targeted achievement.

The DRGs provide a framework to mobilise companies and organisations to invest in digital trust continuously and scalable while pursuing their business interests, sustainably and responsibly. The DRG approach aims to be ingrained in both the business model and organisation from end-to-end.

Especially the need for healthcare companies to implement a QM-System according to the ISO 13485 makes it easy for them to integrate the DRGs in their processes. Applying for a CE mark with their product should make it also necessary to not only go through the Conformity Assessment Procedure but also to declare DRG conformity. We will evaluate these concepts within TEAM-X and HEALTH-X dataLOFT and look forward to identifying opportunities within even more projects built on Gaia-X.

Regarding the urgent need for awareness to assess trustworthiness through these promising European activities, it is crucial to communicate and convey the responsibility enhancing characteristics of a given digital solution in a way that citizens, users, and consumers, as well as policymakers, business leaders, academia, regulators, and/or standardisation organisations (like IEEE/ISO) can easily understand and comprehend. This importance of clear communication is of course

especially true in the doctor-patient relationship.

Any development towards more digital responsibility does not happen in isolation inside an organisation only but also takes place in an ecosystem if not the wider environment and on a societal level, therefore we are very thankful to be part of the Gaia-X Hub ecosystem.

The European Union has also taken a first positive stride with its publication of the European Digital Rights and Principles, but further development is needed.

Based on the DRGs for a more responsible and human-centred digital transformation, more and more actors come together. They jointly shape the living organism of the DRGs, bring them into action, and further develop them towards measurability. Be part of it and please reach out to us.

Our activation plan depends on an interactive and engaging ecosystem, that wants to put the user, the human, back in the centre of digital innovations. It is about collaboration and it is about putting perspectives together from different sectors to find solutions that can create a more sustainable and trustworthy world. We need responsible leadership. More than ever.

- Jutta Juliane Meier

Voices on the

Digital Responsibility Goals

"Europe can, and should, create rules for living, working, and communicating in the digital space that our citizens can rely on. The Digital Responsibility Goals are a valuable benchmark for this."

PROF. DR. ANGELIKA NIEBLER

Member of the European Parliament

"We need to be more courageous to shape the digital space in a way that it serves humanity and strengthens democracies. The Digital Responsibility Goals offer such a framework and should become a norm in Europe."

ILSABE VON CAMPENHAUSEN

BMW Foundation Herbert Quandt Executive

"Collaboration with our industrial automation customers can only remain successful if we ensure that the exchange of information is based on trust. That´s why Identity Valley´s Digital Responsibility Goals are so important."

CURT–MICHAEL STOLL

Vice-Chairman of the Supervisory Board FESTO SE & CO. KG

"People will only trust machines and algorithms if they can be confident that their identity and that of others will be protected. With the Digital Responsibility Goals Identity Valley works towards responsible action and therefore promotes the building of this trust as the basis for Digital Transformation."

DIETMAR HARHOFF

Director Max Planck Institute for Innovation and Competition

"When I read this research, I found it extremely interesting because it's the translation of the social responsibility into digital responsibility, where our world is transitioning from a physical ecosystem into a digital or augmented ecosystem. So, it makes perfect sense."

FRANCESCO BONFIGLIO, CEO, Gaia-X

Identity Valley Research gUG (haftungsbeschränkt)

It promotes and calls for more Digital Responsibility. As a nonprofit organisation, Identity Valley engages thought leaders in academia, policy, and industry for a values-based future of the Digital World through networking, lobbying and communication. Identity Valley advocates for a data economy based on trust, privacy, and personal identity, derived from the humanistic tradition of Europe.

In this, the organisation is partly a response, partly an evolution of Silicon Valley. It is about both the possibilities of technology and the accompanying assumption of responsibility – by companies, institutions, and states. In the process, the uniqueness of multi-faceted human identities replaces

"Silicon," until now probably tech´s most important raw material. It evolves from the question "What can technology do?" to the question "What should technology do?".

Identity Valley sees itself as a central point of contact on the topic of value-based digitalisation and sets ethical standards to do so. Building trust by taking responsibility is a central goal of Identity Valley. The organisation was founded in Munich in 2020, consisting of the nonprofit parent company

“Identity Valley Projects UG (haftungsbeschränkt)” and the nonprofit subsidiary “Identity Valley

Research gUG (haftungsbeschränkt)”.

Since January 2022, the headquarters have been located in Unkel, the birthplace of the founder Jutta Juliane Meier and former residence of seminal figures in German political history such as former

German Chancellors Konrad Adenauer and Willy Brandt (winner of the Nobel Peace Prize in 1971), industrialist Fritz Henkel, and a great German poet of the 1848 European Revolution, Ferdinand Freiligrath.

„Und seine Zukunft bildet selbst das Volk, das souveräne!“

-Ferdinand Freiligrath – aus „Die Todten an die Lebenden“, Köln 1848

„And its Future forms itself the People, the sovereign!“

-Ferdinand Freiligrath – from „The Dead to the Living“, Cologne 1848

The Identity Valley credo:

It’s all about trust.

Identity Valley

About the author
ANDREAS WEISS

Andreas Weiss is responsible for the eco business unit "Digital Business Models" and member of the Executive Board of eco – Association of the Internet Industry. He is active for eco since 1998, initially for the competence group E-Business & Logistics and further on E-Business. Since 2010 he is assigned as Director EuroCloud Germany and since 2019 Board Member of Trusted Cloud Competence Network. In general he is engaged in various projects for Artificial Intelligence, Data Privacy and GDPR as well as security and compliance of digital services. Since 2019 he is engaged to specify Gaia-X and coordinates the development of the Gaia-X Federation Services.

About the author
KAI HERMSEN

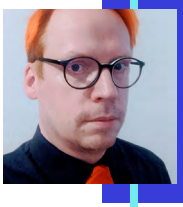
Kai Hermsen is a "trust in tech" activist. He believes all people need to understand current digital topics and how they impact their lives, to enable trust in technology and good stewardship of our societies. In 2021 he joined Identity Valley and together with all its partners, he actively drives the transition towards a more responsible digital space. Previously he has worked on matters of cybersecurity and trust in different positions in the industrial sector and as co-founder of a technology-oriented non-profit.

Foto credits: Kathleen Hermsen

About the author
JUTTA JULIANE MEIER

Some time ago Jutta studied economic sciences and business administrations with a focus on Marketing (Innovations) and Organization, but as a curious mind she decided working in a field that wasn't even existing when she started. Jutta worked as an independent consultant focused on digital strategies since Steve Jobs introduced the first iPhone. Being a single mom with an even more curious son she traveled to Silicon Valley a lot in order to understand the mind- and toolset over there and was thinking about a European way of a human-centered digital transformation ever since. Consequently she founded the non profit organization Identity Valley in 2020. Identity Valley is meant as a response and an evolution of Silicon Valley. Evolving from "What can technology do?" to "What should technology do?". Today - oftentimes - critical decisions about the future of digital developments are still made without a clear digital strategy or framework. The Digital Responsibility Goals - described in this Gaia-X Magazine -, where developed together with a consortium – consisting of academics, NGOs, and industry experts and define this framework and work towards a trustworthy, human-centered digital transformation. The credo of Identity Valley is: It's all about trust. Junta's credo is: Digital Revolution needs Digital Responsibility.

Foto credits: Jutta Juliane Meier



About the author
HARALD WAGENER

Harald Wagener worked in the IT industry for 20 years, building and operating large scale and distributed Cloud infrastructures. In 2020, Harald Wagener joined the «Health Data» research group as Group Leader Cloud for the Cloud team in Berlin. His focus is on the Berlin node of de.NBI Cloud and European Life Science Cloud efforts.

Photo Credits: Harald Wagener

About the author
PROF. BJOERN ESKOFIER, PHD

Some time ago Jutta studied economic sciences and business administrations with a focus on Marketing (Innovations) and Organization, but as a curious mind she decided working in a field that wasn't even existing when she started. Jutta worked as an independent consultant focused on digital strategies since Steve Jobs introduced the first iPhone. Being a single mom with an even more curious son she traveled to Silicon Valley a lot in order to understand the mind- and toolset over there and was thinking about a European way of a human-centered digital transformation ever since. Consequently she founded the non profit organization Identity Valley in 2020. Identity Valley is meant as a response and an evolution of Silicon Valley. Evolving from "What can technology do?" to "What should technology do?". Today - oftentimes - critical decisions about the future of digital developments are still made without a clear digital strategy or framework. The Digital Responsibility Goals - described in this Gaia-X Magazine -, where developed together with a consortium – consisting of academics, NGOs, and industry experts and define this framework and work towards a trustworthy, human-centered digital transformation. The credo of Identity Valley is: It's all about trust. Junta's credo is: Digital Revolution needs Digital Responsibility.

Foto credits: Jutta Juliane Meier

04

Enabling Sector specific data spaces through Gaia-X

04

4.1

REFLECTING ON THE Gaia-X OPERATIONS

Dominik Rohrmus, Interim COO, Gaia-X

The Gaia-X Association operates based on principles. The most important principles are Transparency, Inclusiveness, Openess, Democracy, Empowerment and Continuous Improvement.

These principles are the base for the member interaction, their inclusion and the active member contributions in the Groups of the Association. The onboarding of members, the democtrtic process of the Assocaion Groups are described in the Intranet of the Association. The Association was restructured in 2022, is founded on these principles and supports their execution in its everyday day life. A major element is the empowerment of the Groups. Their responsibility on the deliverables of Gaia-X over their lifecycle is a major topic. The Groups are at the core of all Gaia-X discussions and deliverables. These range from the description and prioritisation of technical & functional requirements to cataloguing of the applied data space technologies.

Within the Gaia-X Association there are three committees: the Technical, the Policies and Rules and the Data Spaces and Business which are shown in the organisational chart below:

The Technical Committee focus on the architectural and trust framework elements as well as their evolution.

Gaia-X Structure 2022

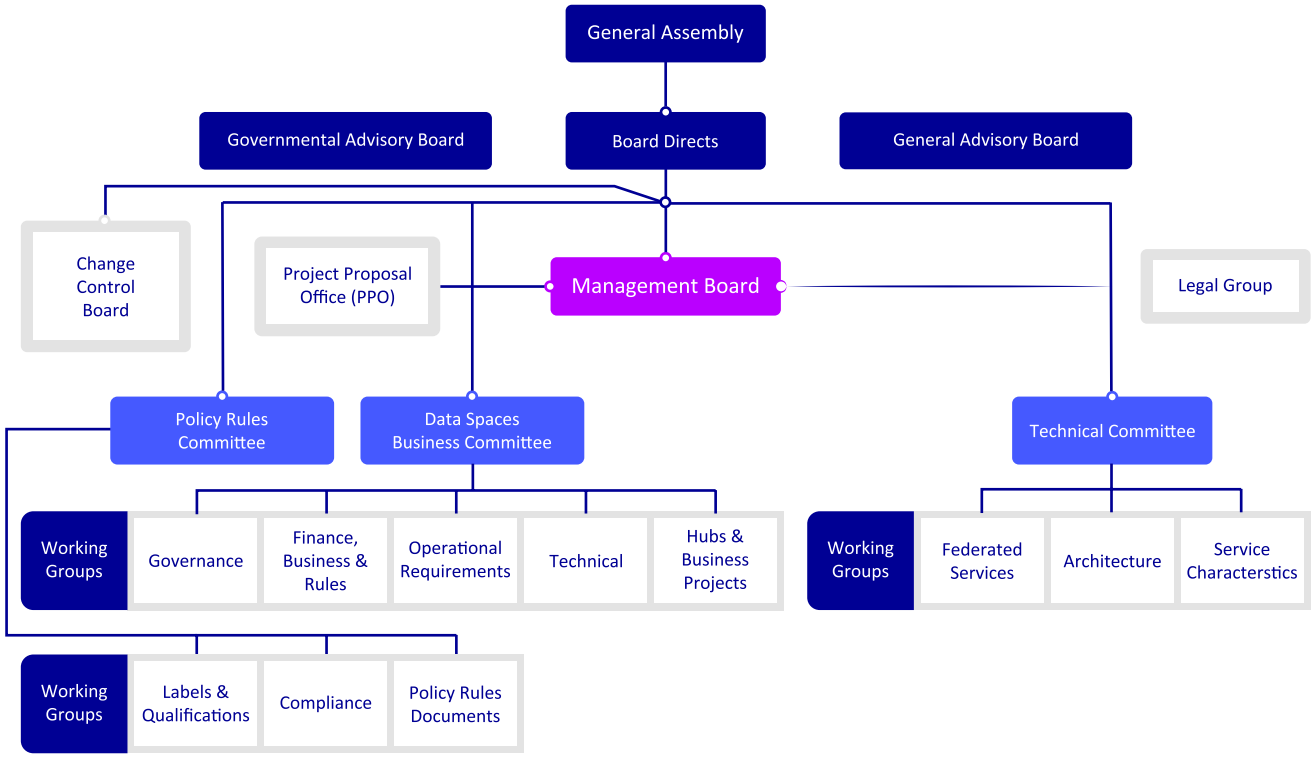


Figure 6: Gaia-X Structure 2022

Moreover, service composition is another architectural element that showcases how to assemble services in such a way as to create new services with. Nonetheless, the self-descriptive element is another key component of the Technical Committee's focus, as it exemplifies how to build digital trust at a scale with measurable and comparable criteria in the trust framework.

The Policy and Rules Committee creates the deliverables required to develop the Gaia-X framework. Three working groups are included in this committee, and these relate to compliance requirements, labels and qualification processes, credentials matrix, contractual agreements, and more.

One of the working groups involved here is the Labels and Qualification working group which is defining the E2E process for labels and qualification, from defining and evolving the level of labels to the process for defining new labels and identifying and certifying existing certification authority bodies (CAB).

Moreover, the Credentials & Trust Anchors working group is tasked with developing and maintaining a matrix of credentials and their verification

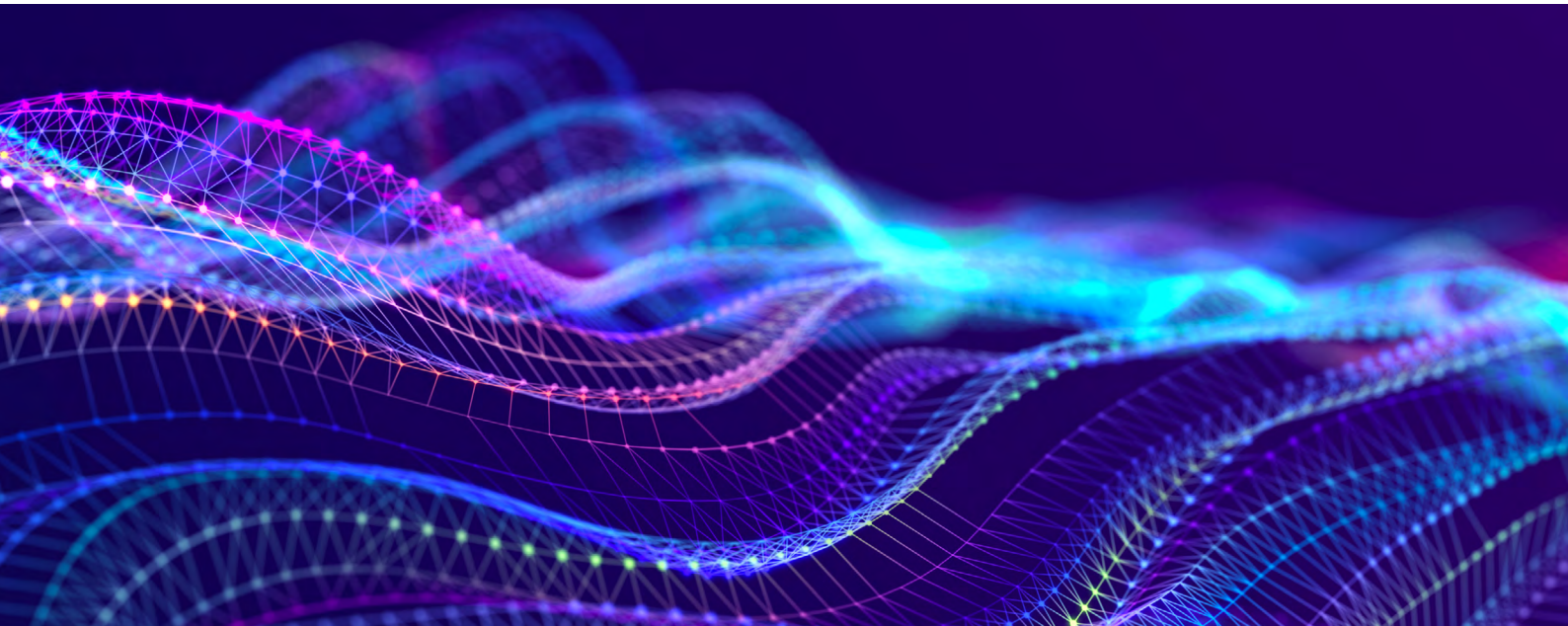
methods. This will enable the implementation of compliance through automation, contractual clauses, certifications, and methods alike.

Lastly, the Compliance working group is collecting compliance requirements from all sources in order to build a unique compliance requirements tool. This will safeguard the compliance that stakeholders need in order to maintain transparency and digital sovereignty within the European Union.

The Data Spaces Business Committee helps the Association to expand and accelerate the creation of a new Gaia-X services in the market by establishing groups within different sectors for a coherent structure. In this regard, the working group Finance is focusing on business modelling and supporting the project office of the Association. The Technical working group, however, analyses the technical requirements that are needed to be framed from a business perspective, whereas the Operational Requirements working group is dealing with the business requirements of data spaces. In this regard, an important working group is the working group Hubs , which holds close contact with all Gaia-X Hubs. This working group supports collecting and creating the Gaia-X use and business cases by maintaining the international list of all use cases and data, which will help coordinating the entirety of Gaia-X hubs.

Gaia-X Intranet

The Gaia-X member Intranet (https://members.gaia-x.eu/) is the important source for all member information that covers the own account, the Gaia-X deliverables, the operations, the communication and the membership information. The Intranet



is continuously updated, hence providing the latest Gaia-X business relevant information.

In the section myAccount, and as it may be seen below, each member of the Association can find their personal list of participants in the Group of the Association and can apply to join a Group. Access to the Intranet is granted through the DCP member account credentials.

Gaia-X Hubs

The Gaia-X Hubs are the central contact points to inform, increase understanding, and clarify any question on a national basis around Gaia-X. They work and act independently from the Gaia-X Association as the think tanks, ambassadors, influencers, and supporters of Gaia-X. A workspace especially dedicated to their efforts was designed on the Gaia-X platform insofar as to facilitate easier communication between the hubs

The Association and the national Gaia-X Hubs closely cooperate in several areas, as explained in the Hub Handbook. One important field is the Gaia-X Vertical Ecosystems that apply the Gaia-X deliverables in their specific domain. The goals and tasks of the Vertical Ecosystems are networking and collaboration among Gaia-X Association members include the networking and collaboration among Gaia-X Association members in the Vertical Ecosystems, as well as Identifying open standards related to Gaia-X. The Vertical Ecosystems are responsible for creating and developing the data spaces and projects, such as the Gaia-X use cases. Each vertical ecosystem shall be linked to the corresponding vertical in the Gaia-X Hubs and shall be equally linked to several Hubs internationally. Moreover, the creation and maintenance of position papers and white papers on Data Spaces following the document process as these are defined in the chapter 'Publications and Deliverables' of the Association's Operational Handbook. The processes for the creation and publication of the documents are owned and maintained by the working group Hubs of the DSBC.

Vertical Ecosystems and Gaia-X Hubs relation

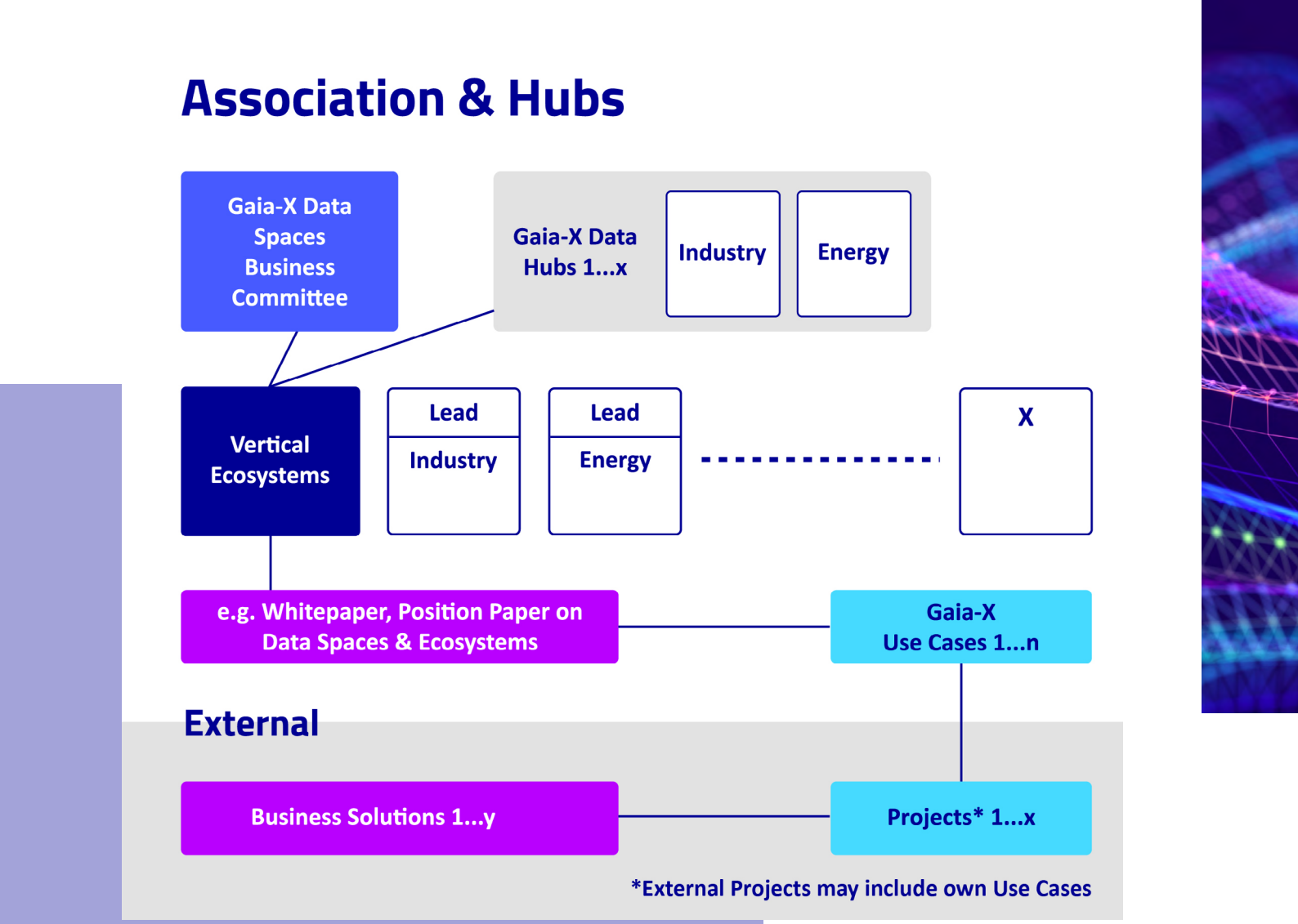
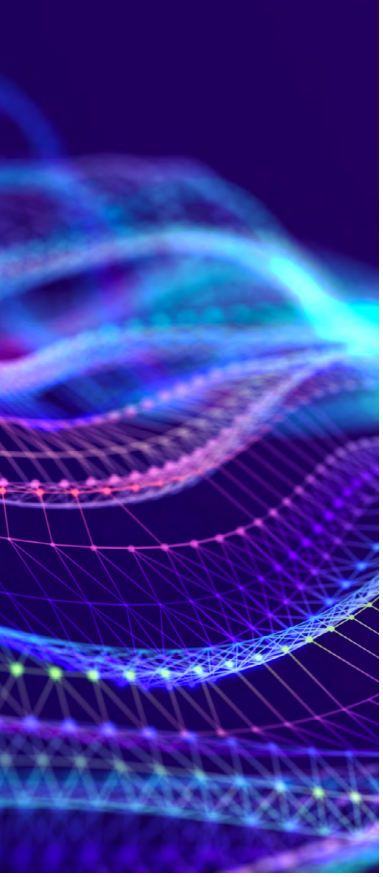


Figure 7: Relation of the DSBC committee, the Hubs, the Vertical

The Vertical Ecosystems of the DSBC are linked to the Gaia-X Hubs. The collaboration in Verticals ensures the application of Gaia-X deliverables in specific domains. As illustrated in the figure above, they create and maintain documents like white papers or position papers.

The use cases of Gaia-X are related to these deliverables. Several Gaia-X use cases build the content base of the joint document creation and document maintenance. The use cases of Gaia-X may have a solid project and business relation to ensure their market applicability. Therefore, external projects which are built on real business needs and solutions build the basis surrounding the Gaia-X projects. By following this process, the business relevance of Gaia-X use cases, as well as the Gaia-X community inclusion, can be ensured.



The relationships are depicted in the figure below.

Major use cases of Gaia-X are its lighthouse projects. These frontrunner projects are early adopters of the Gaia-X deliverables and establish the data spaces and their ecosystem in a similar way. The lighthouse projects are selected based on criteria set by the DSBC which are detailed in the lighthouse criteria document https://community.gaia-x.eu/f/14448760. The working group Governance of the DSBC establishes the criteria catalogue and ensures its application.
A compilation of specified lighthouse projects is provided below:

Gaia-X Program and Requirements Management

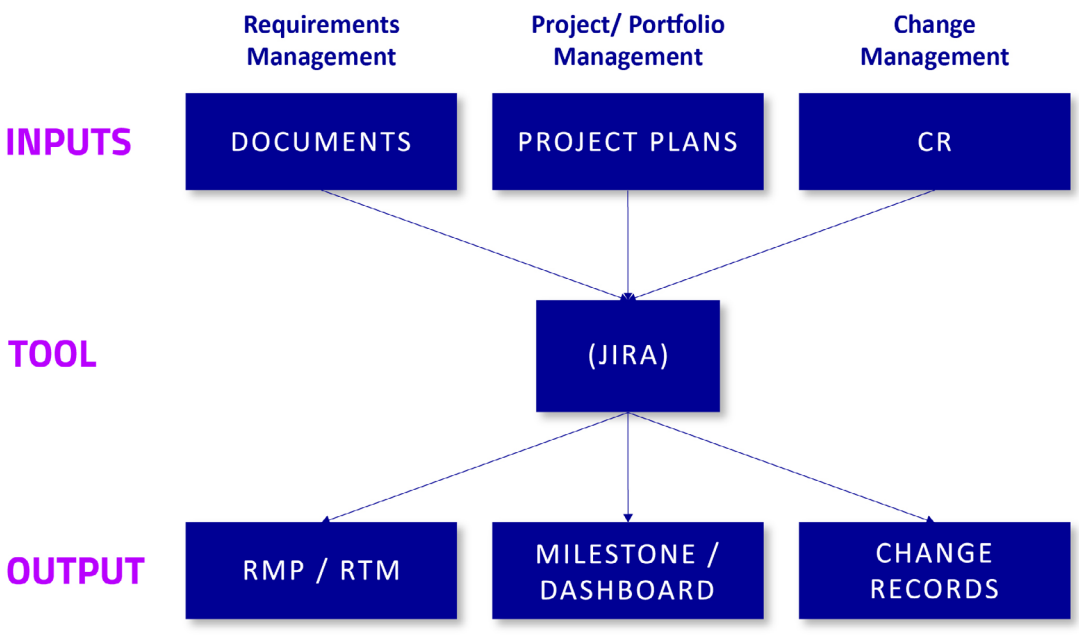


Figure 8: Agile process of the Association's deleverables

The Gaia-X Program and Requirements Management is the core of the delivery management of the Association. An appropriate understanding of the needs and requirements will allow the creation of products desired by the market. The deliverables of the Association are the de-facto standards and the open-source references implementation. They are managed in an agile business approach (Figure 8).

Of great importance to the Association is the principle of member inclusion and transparency. In addition, the market and use case demand integration in Gaia-X is crucial.

For this purpose, easy tooling and access for several requesters are established.

A Self-Service portal for Requirement input and Issue requests (https://gaia-x.atlassian.net/servicedesk/customer/portals) is open to all Association members, the Gaia-X Hubs, the Gaia-X lighthouse projects and the Gaia-X use cases. By this member open, user-friendly, intuitive and convenient 24/7 portal the demands are collected centrally to be entered in one backlog of the Association. The formulated business needs are assigned to Gaia-X Groups that are responsible for the Gaia-X deliverables. All requirements are collcted in one backlog and managed openly, efficiently and transparently.

The demand and requirements process is illustrated in figure 9. The process starts with the requirements formulated by the Gaia-X use cases (e.g. lighthouse projects), the Gaia-X Hubs, and most certainly, the Gaia-X members:

The requirements are analysed, split, and addressed to create deliverables by the Association's Groups in an agile manner. Matching these to deliverables of the Association is hereby of utmost importance. Therefore, it is necessary to create agile teams that will respond to complex requirements during sprints.

Catena-X Automotive Network

Automotive Supply Chain

agdatahub

Agriculture

EuPro Gigant

Manufacturing, Industry4.0

smart connected supplier network

Electronics Supply Chain

Provider

Mobility Data Space

Mobility

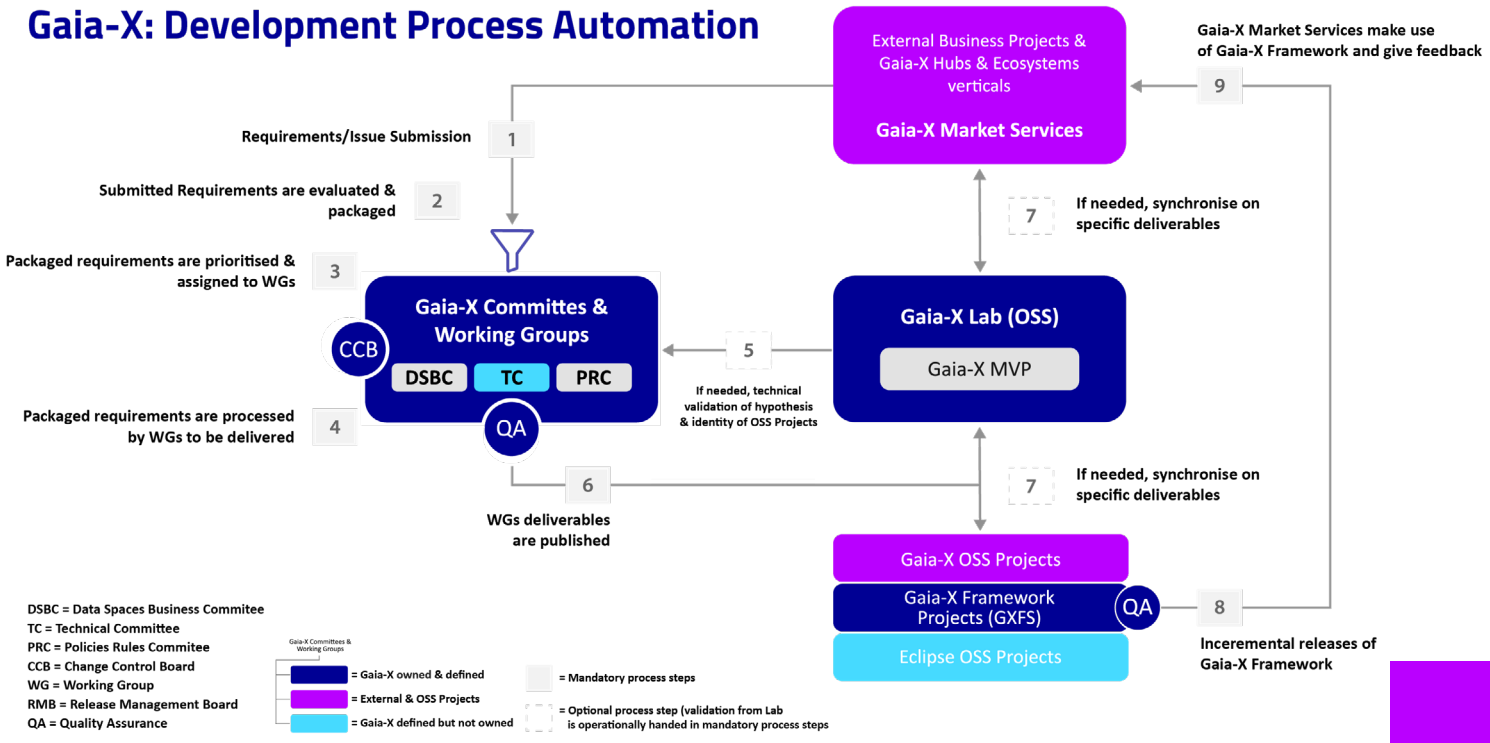


Figure 9: Demands and requirements process

All deliverables are associated with the Association's Groups that create and maintain the deliverables over their life cycle. This ensures a seamless delivery of Gaia-X to the market, leading to the successful uptake of Gaia-X. One of the Gaia-X program's most important element is the close cooperation with the parties involved to develop common solutions based on the identified requirements and demands. An important step is not only to understand and identify the requirements but to work together on solutions that meet the market needs and contribute to the Gaia-X framework.

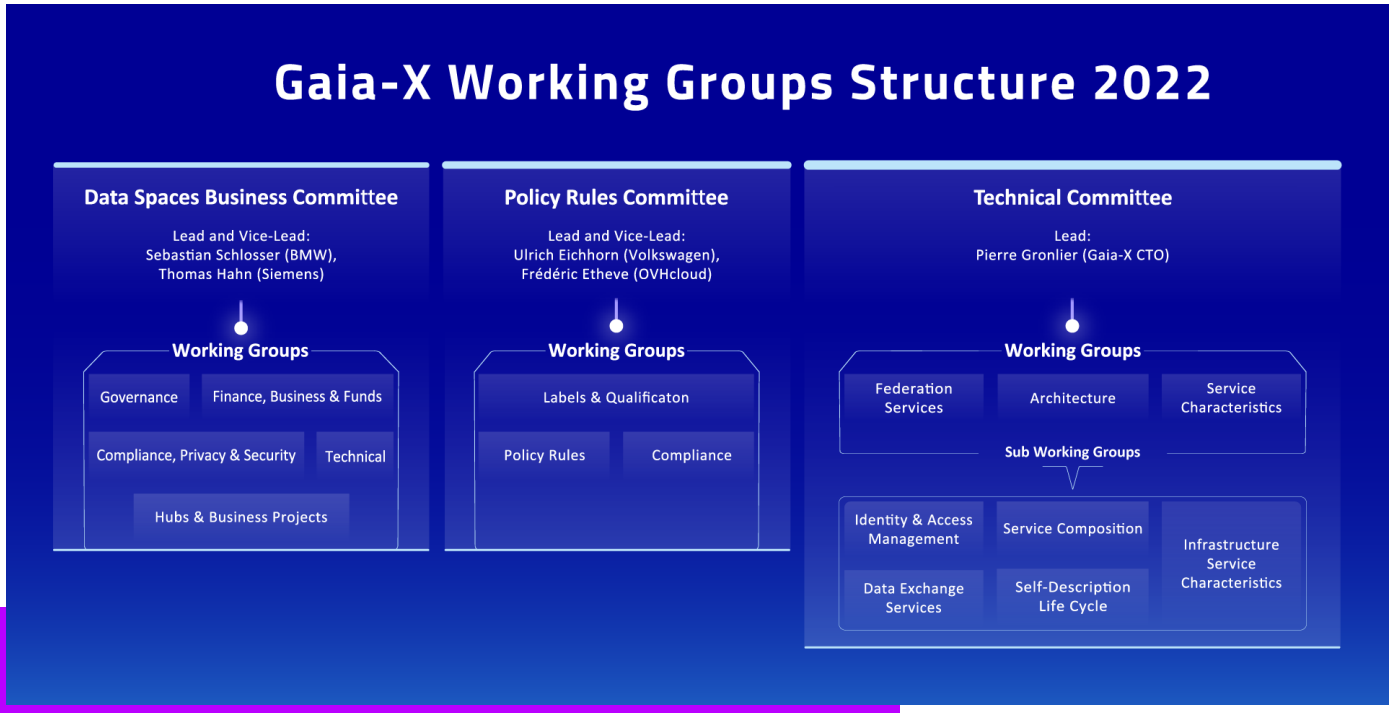


Figure 10: Gaia-X Deliverables and the responsible Associations Groups

About the author
DOMINIK ROHRMUS

Dominik Rohrmus studied Electrical Engineering at TU München (1996) and obtained his PhD in the area of AI and features in Mechanical Engineering (Dr.-Ing.) from TU Chemnitz. He worked for German small and medium enterprises (SME) in the field of industry and health care before he re-joined Siemens in 2005. Since then, he worked with increasing responsibilities in the area of manufacturing and production development at Siemens in Munich, for example as Head of Research Group Shop-floor Equipment and Future Standardization for Siemens factories worldwide. In 2016 he was nominated CTO of the German non-profit and pre-competitive Labs Network Industrie 4.0 e.V. (LNI 4.0) where he also participated with a SME focus on IDSA's Reference Architecture document (2018). In early summer 2021 he has been chosen COO of the GAIA-X European Association for Data and Cloud AISBL.

4.2

SOVEREIGN CLOUD STACK (SCS)

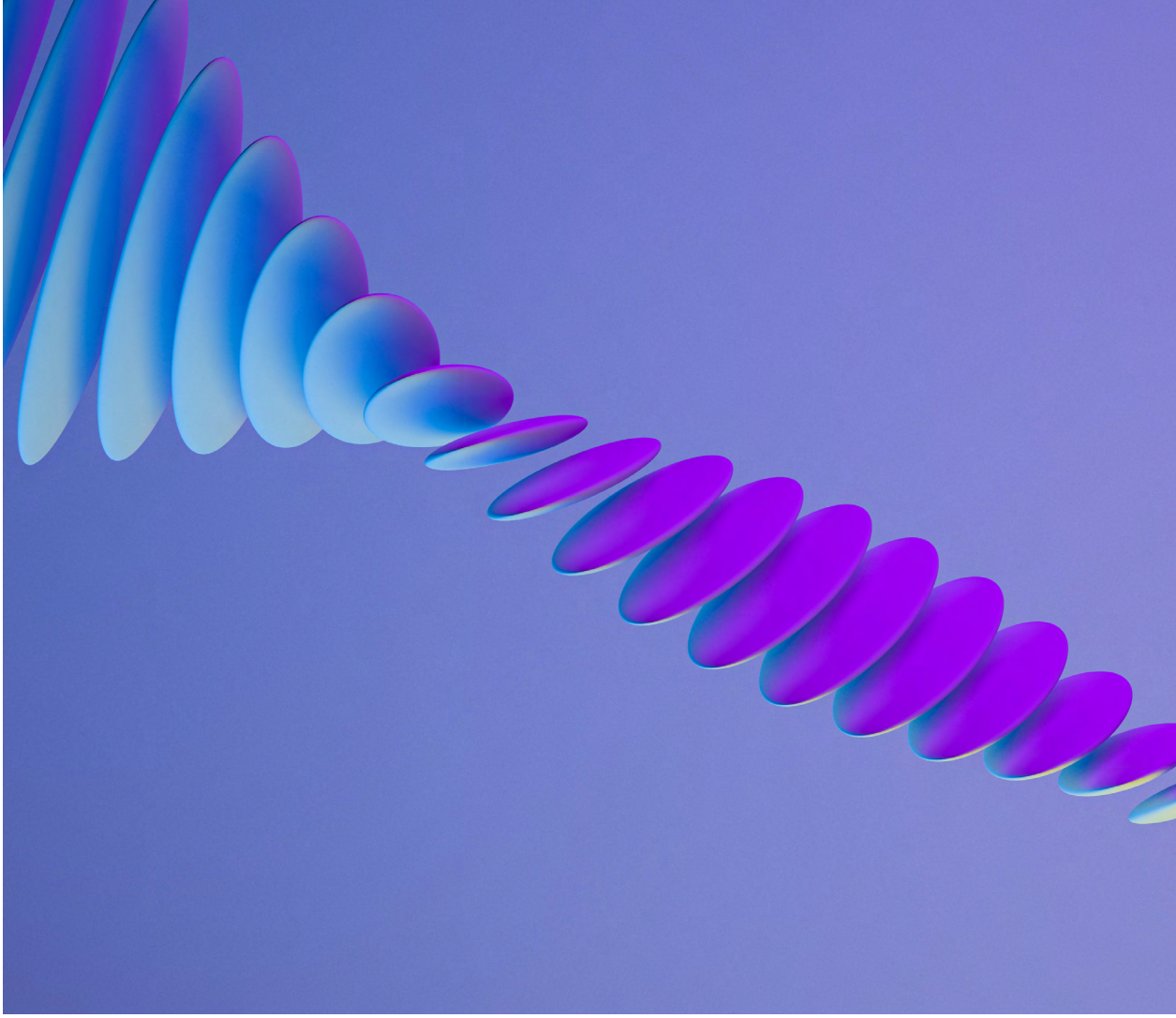
An entirely open, federatable cloud and container stack for Gaia-X

Dr Manuela Urban, Co-Lead / COO Sovereign Cloud Stack, Open Source Business Alliance - Bundesverband für digitale Souveränität e.V.

Eduard Itrich, Community Manager Sovereign Cloud Stack, Open Source Business Alliance - Bundesverband für digitale Souveränität e.V.

Early supporters of Gaia-X

The Sovereign Cloud Stack (SCS) is one of the very first lighthouse projects that have been granted funding by the German Federal Ministry for Economic Affairs and Climate Action. The spiritual fathers of the project, Peter Ganten, Chairman of the Board of Open Source Business Alliance, the German association for digital sovereignty, and CEO of Univention GmbH, Kurt Garloff, Open Source expert and cloud



technology pioneer with long-standing experience in the IT business, Rafael Laguna de la Vera, Director of the German Federal Agency for Disruptive Innovation, Christian Berendt, CEO of OSISM GmbH and Oliver Mauss, CEO of netgo group GmbH, has long been convinced of the necessity:

> **We need an independent data infrastructure for Europe. They have therefore been strong supporters of the Gaia-X project right from the start.**

For Gaia-X, it is clear that only Open Source guarantees true digital sovereignty and the highest technological standards by transparency, collaborative work and participation, the freedom of one's own control and independence from single players with a dominant market position. This view has received strong support from a recent study commissioned by the European Commission on the impact of Open Source.

Sovereign Cloud Stack

[1] The study clearly states that Open Source is a significant factor for economic growth and development in the EU and worldwide. EU members are therefore strongly recommended to systematically promote Open Source knowledge and practice in the business sector as well as in the public sector and in vocational and academic education by all means.

Following this vision, they set up the SCS project as a thoroughly Open Source, community-driven endeavour. SCS aims at providing the means as a common good to develop and sustain an ecosystem of providers of highest-quality, compatible and thus federative cloud infrastructure and services.

The vision

Imagine that there are many small, medium-sized, and even a few large cloud infrastructure providers competing with each other for the best quality, the highest security, the lowest prices, the best performance, the best customer support and the most innovative solutions. In doing so, however, they build on a common basis that they jointly develop and refine as open source. This common basis is neutrally developed and coordinated within the framework of Gaia-X. Thanks to strong standardisation, certification and high transparency requirements, the respective offerings are highly compatible with each other. Thanks to the federation of user identities (by means of the Gaia-X Federation Services) and secured high-performance network connections (with the help of the Gaia-X Interconnect project), the clouds of the

1 https://digital-strategy.ec.europa.eu/en/library/study-about-impact-open-source-software-and-hardware-technological-independence-competitiveness-and

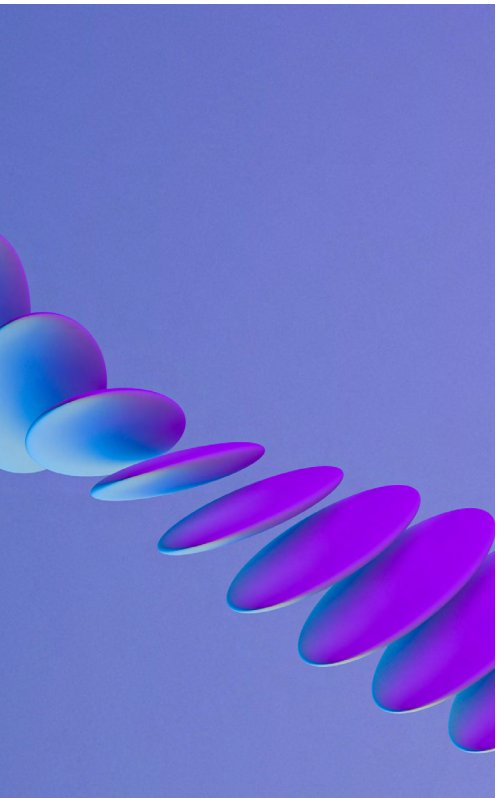
federated providers can also be used like a large shared virtual cloud. Private clouds in data centres of companies or public IT operators can also be implemented in this way and are compatible and - if desired - federative with public clouds. A divergence of individual providers from the common standards would be highly unattractive because they would then lose compatibility with the rest of the market and many of their customers.

To build such an ecosystem, three pillars are needed:

1. a comprehensive open-source technological toolbox, (that implements)
2. common standards and,
3. the building and sharing of operational knowledge.

1. The technological toolbox

The SCS project uses existing and proven open-source software components, such as Kubernetes to build an Infrastructure as a Service (IaaS) and a Container as a Service (CaaS) layer. The challenge is to combine these consistently to form a complete stack, extend them if necessary and ensure sustainable maintenance, validate them, make them easy to operate and provide them automatically for use by cloud infrastructure operators. The toolbox uses fully open software licenses, not open core. The software is developed in an open development process with open design discussions and decisions by an open community. This ensures that the software really can be used and influenced by the recipients, thus also ensuring the freedom of its consumers. The transparency of the code and the development process is an important ingredient to ensure that the code can be trusted.



In doing so, SCS follows the Four Opens of the Open Infrastructure Community. SCS works closely with the upstream projects from the Open Infrastructure Foundation, the Cloud Native Compute Foundation and other open source communities. Most of the

SCS source code comes from these communities – when we improve, amend, and change things, we seek contact with these communities to contribute to our changes back.

A key element of the technological toolbox is automating the life cycle management of all components: Basic infrastructure services such as the database, message queue, ..., the operational stack (monitoring, patching, logging, metering, ...), the identity management stack (LDAP, keycloak, ...), the base virtualisation layer (KVM, ceph, OVN), the VM layer (OpenStack core services) and the Kubernetes tooling are all covered by this. We use a containerised deployment driven by Ansible. The containers at the base layer however are managed using classical Docker/Podman – we explicitly control placement etc. here and do not see the highly dynamic capabilities of Kubernetes at this layer as an advantage. This is of course different in higher layers that change much more often depending on the customer's needs.

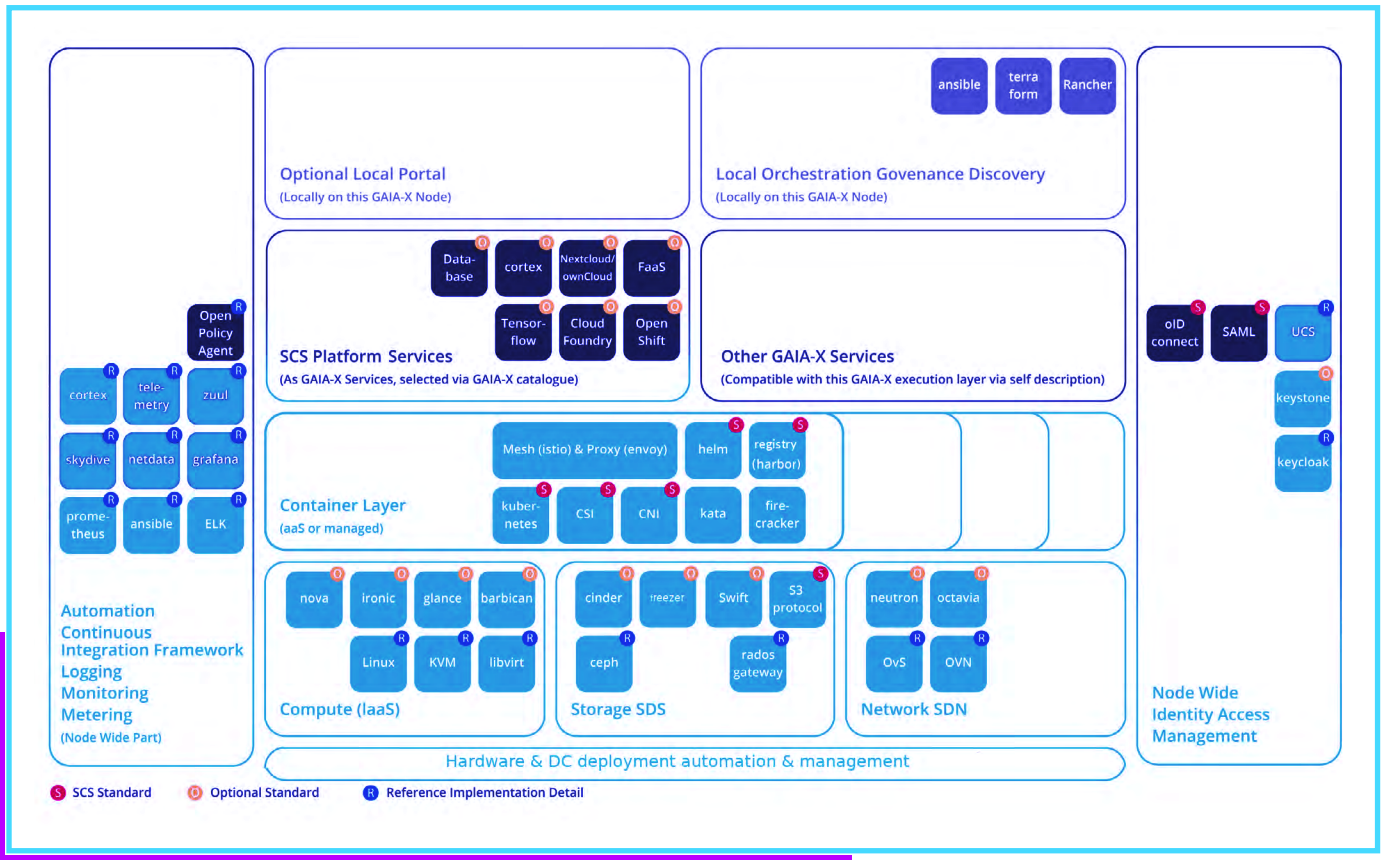


Figure 1: SCS Architecture

2. Common standards

Certifiable standards are a prerequisite to obtain interoperability and federatable services and thuscreating a vivid ecosystem on top of SCS technology. SCS, therefore, aims to define common standards that are precise enough for the software to work without additional effort on other SCS based infrastructures. The SCS standards are a collection of upstream standards enhanced with specific choices that are not specified upstream. We are working on providing conformance tests so that changes can be validated w.r.t. their impact on compliance.

We also work on (optional) standards with operational topics; transparency with respect to monitoring and root cause analyses in case of issues are immediate customer benefits.

Quality and security tests are also part of the testing, so conformance with e.g., security standards can also be continuously assured.

SCS Architecture

The core OpenStack services are mainly used to be a strong multitenant foundation for managing many k8s clusters – the real service here is k8s aaS – we are offering the k8s cluster API as the interface to manage k8s clusters; providers can of course use it internally as well to create managed services. Exposing the OpenStack layer is optional from an SCS standardisation point of view. If it is exposed, we however have standards to cover it, so we can deliver compatibility at this layer as well.

Note that the technology choices that are not part of the mandatory standard (S) may not necessarily be final. The SCS Platform Services are not part of the base SCS project ("SCS-1"), However, we have plans prepared to extend SCS into this space "SCS-3".

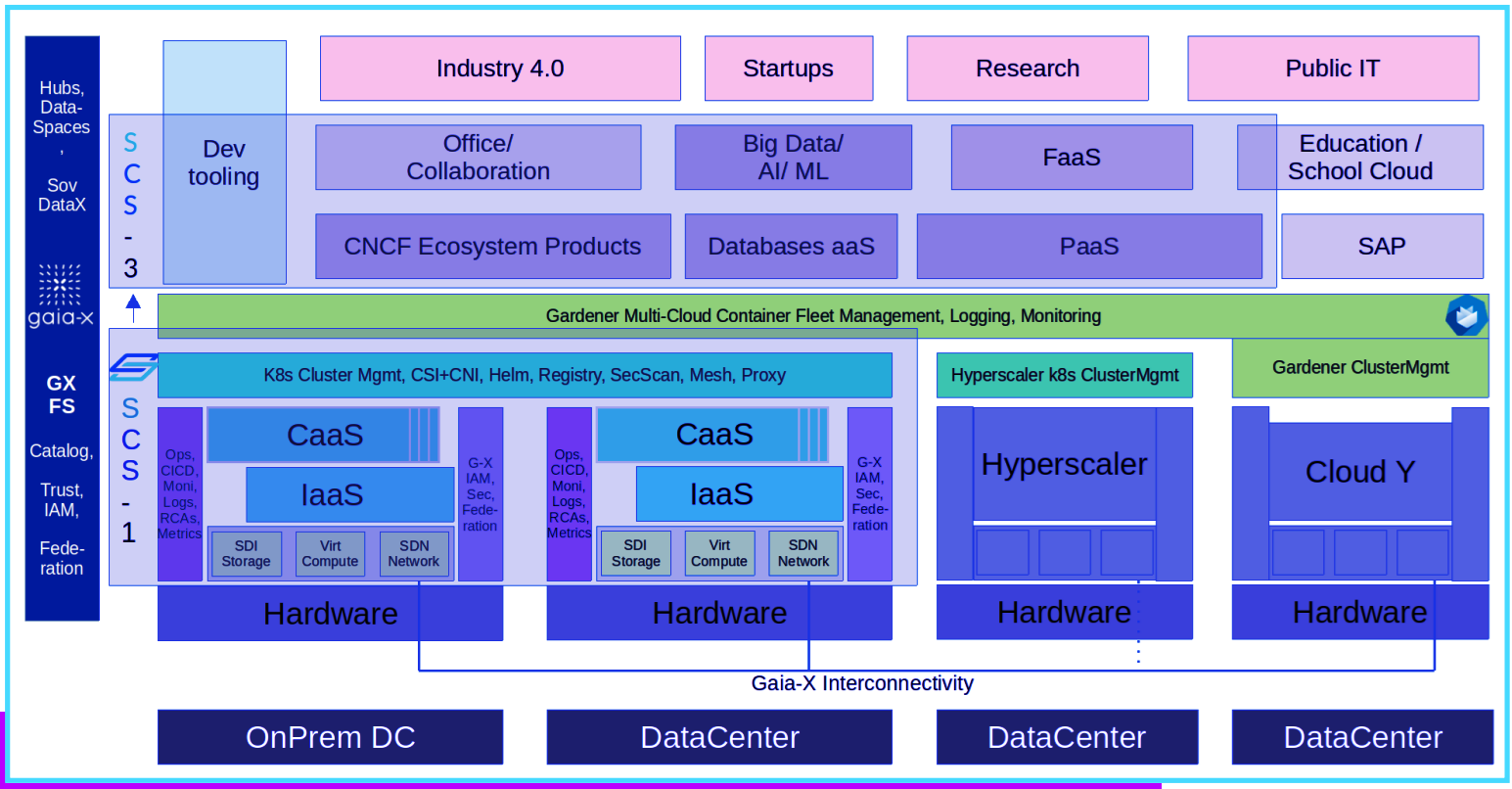


Figure 11: Whitepaper on digital sovereignnty

Acatech on the whitepaper on digital sovereignty. The first edition contains an older version of the picture though.

3. Building and sharing of operational knowledge

Unlike source code development, openness with regard to operational processes, problems and best practices is not a common practice. Many operators see know-how in this area as a potential advantage and do not want to share it easily. In some cases, the illusion of being error-free is to be conveyed to partners and customers. But a poor error culture hinders processing and improvement in the long term. This is fatal for the operation of complex distributed systems, such as cloud platforms. Some companies have understood this and at least show trust-building openness when dealing with errors - see, for example, working through the failure of Azure on 29.2.2012 or the Open Telekom Cloud in November 2017.[2]

Transparency around operational issues makes the quality of individual providers visible. This transparency will be required for a certain SCS certification level (see below). This also makes the quality visible to users - which in turn is a very strong motivation for SCS and operators to treat it as a high priority.

2 European Data Protection Supervisor. 2020. EDPS Public Paper on Outcome of Own-Initiative Investi- gation into Eu Institutions' Use of Microsoft Products and Services. Publications Office. https://doi.org/ doi/14519/10.2804.

We also believe that by sharing and documenting best practices for operating cloud and container stacks, the difficulty to provide high-quality cloud services internally or publicly is vastly reduced. The SCS project is therefore committed to collecting, structuring, and exchanging knowledge about complex operational topics and making them available.

SCS's involvement in Gaia-X

Digital sovereignty is a key goal of Gaia-X. We believe that many scenarios that require sovereignty at the data level cannot be achieved well without control over the infrastructure.

SCS thus intends to make it a lot easier to provide sovereign infrastructure. As such it has been included in the Gaia-X effort. SCS is an (Open) Work Package connected to the (meanwhile resolved) Provider Working Group of the Technical Committee of the Gaia-X.. SCS members were also involved with the Architecture of Standards efforts.

SCS members still support many efforts of Gaia-X, such as the Federation Services Working Group, the Service Characterisation Working Group, and the Minimal Viable Gaia Piloting Group. The Gaia-X Hackathons continue to provide a large amount of value by bringing together different groups by working together on implementing real code. In addition to pursuing their own streams on automatically providing sovereign infrastructure and automating the creation of self-descriptions for them (using the discoverability capabilities), infrastructure (mostly k8s container clusters) from PlusServers' SCS deployment was provided to all the other workstreams.

There is a close link with the Gaia-X Federation Services (GXFS) effort. Both share the vision of providing SCS with GXFS on top as a platform for sovereign data services. SCS partners support GXFS with infrastructure to validate the GXFS implementation.

Furthermore, SCS is involved in other Gaia-X lighthouse projects either indirectly through its community members or directly by providing infrastructure.

What has been achieved so far?

Since the beginning of the project in 2021, SCS has been continuously developed and is now productive in its third version (Release 2). The IaaS layer heavily relies on OSISM as life-cycle management solution and has been supplemented by tools for automating Kubernetes cluster management, as well as providing important operations tooling.

The first two partners, OSISM and PlusServer are using this from the beginning for their productive clouds (betacloud by OSISM and PlusCloudOpen by PlusServer). PlusServer obtained for its PlusCloudOpen a C5 certificate of the German Federal Office for Information Security (Bundesamt für Sicherheit in der Informationstechnik).

R0 focused on a fully automated testbed deployment, whereas R1 brought the management of Kubernetes containers based on the k8s Cluster API. Both through the conformance tests of the Cloud Native Computing Foundation using sonobouy, and in real-world use during the first Gaia-X Hackathon on August 30 and 31, 2021, the maturity of SCS's k8s cluster management was tested and determined ready for production use.

Furthermore, sovereign operation through monitoring and logging was established by providing blueprints for Prometheus exporter, rules and Grafana dashboards that can be used by providers after appropriate customisation to ensure low-threshold, high-quality operation of their own SCS platform and by centralised logging. With the integrated identity and access management solution Keycloak, authentication against Horizon, the OpenStack standard web interface for using an SCS Cloud, can additionally be realised with OpenID Connect. This enables federation across multiple cloud service providers, in line with the vision of Gaia-X. For automated distribution of the Sovereign Cloud

Stack on physical hardware, the ironic service can be installed using OSISM. To enable prior testing of the automated deployment, a virtual BMC service has been integrated, so that bare metal deployments can also be tested in the testbed.

The highlight of the actual R2 (released in March 2022) is that the technical foundations for connecting to the Gaia-X Federation Services (GXFS) have been completed, so SCS is ready to serve as an infrastructure layer for GXFS.

For more technical details visit our github Docs.

On the path to digital sovereignty

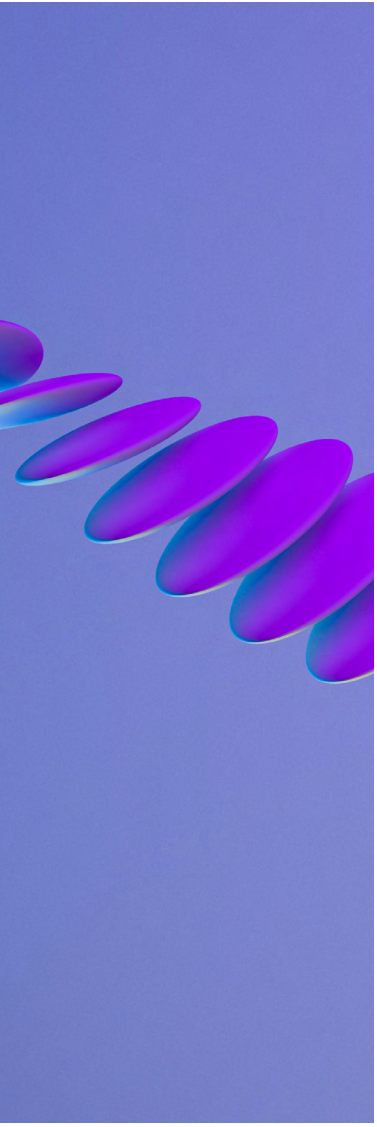
Many attempts have been made to define the term “digital sovereignty”. For instance, after extensive discussion in society, politics and among experts, at the German “Digital Gipfel” 2018 it was postulated:

> **Today, digital sovereignty is an important aspect of general sovereignty, which refers to the ability to use and design digital systems, self-determination over aggregated and stored data, as well as over the related processes.**

Regarding the technology SCS provides and its practice in doing so, we identified four levels of digital sovereignty that we consider to be relevant for SCS:

1. Legal compliance

Current discussions around digital sovereignty commonly arise from the use of cloud offerings that transfer or process sensitive data outside of the EU where the protection of data according to European legal standards cannot be guaranteed. A common remedy is to create franchise agreements with local trustees who operate the software in their respective jurisdiction. While this approach addresses the compliance with legal standards, neither self-determination nor sovereignty over the means of production are given. Even if local security institutions audit every single modification coming from the outside software provider, these offerings still need a high presumption of



trust between software vendor, local franchise partner and customer. Are security updates provided to the trustees in a timely manner? Is operational knowledge around the technology (which may originally not have been designed to be operated by third parties) sufficiently shared and documentation appropriately maintained? These and more questions arise as soon as considering more than just the legal dimension of digital sovereignty.

2. Freedom of choice

When building digital services on top of infrastructure, the services will leverage the interfaces, automation capabilities, and higher-level services from the infrastructure in order to work well and to be efficient in development and operations. This invariably makes the developed services dependent on the infrastructure. The dependence makes it hard to move these services to different infrastructure. The switching cost can easily become prohibitive and create a lock-in effect that makes it extremely hard to ever redeploy the services elsewhere.

This can be mitigated in several ways. In the best case, all the interfaces, automation capabilities and higher-level services are standardised well and can be implemented independently by a variety of software solutions and infrastructure operators. This is the case with Open Standards and Open Source Software. In somewhat less ideal scenarios, the interfaces and solutions are not standardised across vendors, but at least the software is easily available and can be and is operated independently by many providers, so all these providers can offer compatible solutions. The consumers of these services could also opt to deploy the software themself and operate the infrastructure in-house if no external provider meets their needs. However, in the absence of open standards and available open-source implementations, even with a sufficient choice of providers, there remains a complete dependence on the software vendor.

3. Technological transparency and participatory development process

With regard to sovereignty over the means of production, it is mandatory to preserve self-determination at the technological level. At present, when hardware is abundant and compatible with any software, it is the latter that currently creates dependencies. Proprietary licenses and vendor lock-in effects can create dependencies that ultimately contradict a self-determined usage of this technology.

The answer to this problem is a global movement that originated in the late 1980s:

"The open source movement has brought the world a new way of developing software", as Dirk Riehle points out in his plea "The Unstoppable Rise of Open Source". Open source is a "development method for software that harnesses the power of distributed peer review and transparency of process. The promise of open source is better quality, higher reliability, more flexibility, lower cost, and an end to predatory vendor lock-in." (Riehle 2013)[3]

Only the freedom to inspect, adapt, use, and share the underlying technology and an inclusive and participatory development process grants sovereignty in the sense of self-determination. From a strategic perspective in the sense of digital sovereignty, however, securing these freedoms requires much more than just the corresponding licenses.

With regard to the general availability of software, it is indispensable to sustain strategically important building blocks by a sufficiently active and open community that develops software according to the principles of the "Four Opens"[4].

The flip side is that it requires skills and knowledge to actually be able to practice this self-determination.. While open source makes the skill building possible, the required amount of knowledge can become prohibitive to actually exercise these possibilities.

4. Operational transparency and knowledge sharing

The greatest software is useless if it cannot be operated confidently. But for this to happen, skills and knowledge must be built up, fostered and sustained. In an increasingly competitive market for skilled people and increasingly complex IT systems, this is becoming an ever-greater challenge for individual businesses, as well as for governmental organisations. How can we operate digital infrastructure

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[3] Riehle, Dirk. 2013. "The Unstoppable Rise of Open Source / Der Siegeszug von Open Source." It - Information Technology 72–171 :(5) 55. https://doi.org/doi:10.1515/itit.2013.9005.

[4] The "Four Opens" are a set of principles guidelines that were created by the OpenStack community as a way to guarantee that the users get all the benefits associated with open source software, including the ability to engage with the community and influence future evolution of the software. See https://openinfra.dev/four-opens/

and services in a self-determined, secure, and qualitatively excellent manner?

While software as a means of production has been and is being increasingly collectivised thanks to the open source movement, many companies are still hesitant to share their operational knowledge as they consider it their business case. How sovereign can an organisation act, if precisely this important knowledge only adds to the lottery factor?[5] In our opinion, the answer to this is the collectivisation of operational knowledge, just as it is being practised for many years with software code. We need to build communities that collaborate on exchanging and recording this experience and the tooling built to simplify the automation of operational processes. Cooperation also on operational issues delivers the highest available quality standard and thus an infrastructure that is robust against mistakes. The technological and scientific development of the past, on which today's progress is based, impressively proves the benefits of cooperation.

SCS Certification

In order to realise the vision of the SCS project, the SCS certification levels will build on the aforementioned levels of digital sovereignty: The level "SCS-compatible" will guarantee the technical standards in order to achieve compatibility of SCS-based services. This allows freedom of choice by fostering interoperability between different SCS cloud offerings. The basis for this certificate will be not only SCS-specific conformance tests but also conformance tests according to CNCF and OIF.

The level "SCS-open" is supposed to guarantee complete technological transparency according to the "Four Opens" of the OIF and the collective maintenance and further development of the stack components.

"SCS-sovereign" as the highest achievable standard will guarantee that the provider adheres to commonly developed standards of operational transparency and knowledge sharing.

How to get involved?

As mentioned above, SCS is developed in an entirely open process in an open community. We follow the Four Opens of the Open Infrastructure Community. We work closely with the upstream projects from the Open Infrastructure Foundation, the Cloud Native Compute Foundation and other open source communities. Most of our source code comes from these communities – when

[5] The lottery factor, also referred to as bus factor, is a measurement of the risk losing key technical experts that kept information and knowledge unavailable to the rest of the organisation.

we improve, amend, change things, we seek the contact with these communities to contribute our changes back.

We use Github/SovereignCloudStack to manage the code we are using – our own code mainly consists of the automation and integration that glues the used upstream projects together in a consistent and manageable way. Add documentation and CI tests to the mix.

To install your own SCS code, so you can study, test, change it and contribute to it, we refer you to our Github SCS Docs repository.

We have created a Contributor Guide that documents some of the policies and processes we have chosen.

If you want to join the effort, we encourage you to get in touch with us. We will do a short onboarding session and invite you to weekly virtual team meetings.

We also appreciate occasional feedback from people – feel free to raise issues on github or better open PRs. Don't forget to use DCO (Sign-off) to ensure we can use your contribution in a legally safe way.

We are an open and welcoming community. Expectations towards the behavior of community members are expressed in our Code of Conduct.

Parts of the development work is awarded as service contracts to suitably qualified companies or independent entrepreneurs. All contracts are put out to public tender. An overview of the building blocks planned to be put to public tender is depicted below. For details visit our website at https://scs.community/tenders/.

The SCS project will continue to work on standards for the sovereign infrastructure that supports the Gaia-X principles and provide a modular fully open reference implementation for the infrastructure layer. It will provide the required capabilities to support the federation services and building data services that will enable the rule-based data sharing that unlocks so many innovative use cases without compromising the compliance, openness, transparency, choice, interoperability, freedom of scope that full digital sovereignty encompasses.

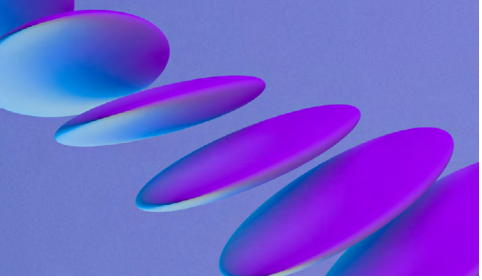

Table 1: List of public tenders for development packages

#	Name	Description	Start date	Closing date
1	OpsTooling, CI Tests Infra/IaaS, Metal as a Service, Life Cycle Management	1 Lot	30-07-2021	20-08-2021
2	Ops Best Practice Knowledge Base, CSP Transparency	2 Lot	tba	tba
3	Storage Technology	3 Lot	tba	tba
4	Networking	3 Lot	tba	tba
5	K8s aaS Integration	5 Lot	tba	tba
6a	Container Network and Storage Integration	6a Lot	tba	tba
6b	Container Meshing and Proxy	6b Lot	tba	tba
6c	Container Registry / Scanning	6c Lot	tba	tba
6d	Container Monitoring / IaC / CI / Deployment Automation	6d Lot	22-12-2021	19-01-2022
6e	Container Tracing & Audit	6e Lot	tba	tba
8	User Management & Federation	8 Lot	28-02-2022	22-03-2022
9a	Infra Scanning / Isolation / Policy Management	9a Lot	tba	tba
9b	Supply Chain Security	9a Lot	tba	tba
9c	Penetration Testing	9c Lot	tba	tba
10	SCS certification	10 Lot	12-11-2021	07-12-2021
—	SCS certification	10 Lot	12-01-2022	27-01-2022
11	Server Hardware Installation	11 Lot	tba	tba

Supporting companies and organisations

/https://scs.community

About the author

EDUARD ITRICH

Eduard Itrich is an open source and infrastructure evangelist currently empowering the Sovereign Cloud Stack community at the OSB Alliance (Open Source Business Alliance). After graduating from university, he was part of a software development team and responsible for the release management of a Linux enterprise distribution. Following up his two-year parental leave, during which he orchestrated his twin daughters rather than continuous deployment pipelines, he became the head of digitization and IT of a medium-sized town in southwestern Germany. In his spare time, he hangs around at Section77 e.V. — a local CCC affiliated Hackspace in Offenburg — and enjoys playing around with electronics.

About the author
DR MANUELA URBAN

Dr Manuela Urban is Co-Lead and COO of the Sovereign Cloud Stack project at Open Source Business Alliance - Bundesverband für digitale Souveränität e.V., the business association of the German open source economy. Previously, she was the managing director of one of the three major federal and state research institutions in Berlin, Germany. She has more than 25 years of experience from various leadership positions in science management in the university and non-university sector, where open, global collaboration to master great challenges and sharing of resources, especially digital infrastructures and data, has always been common. Digital transformation has been a major topic of her work since long. Manuela holds a PhD in Biology and a Master of Business Administration.

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4.3

GREEN DATA HUB

Using data to tackle the climate crisis together

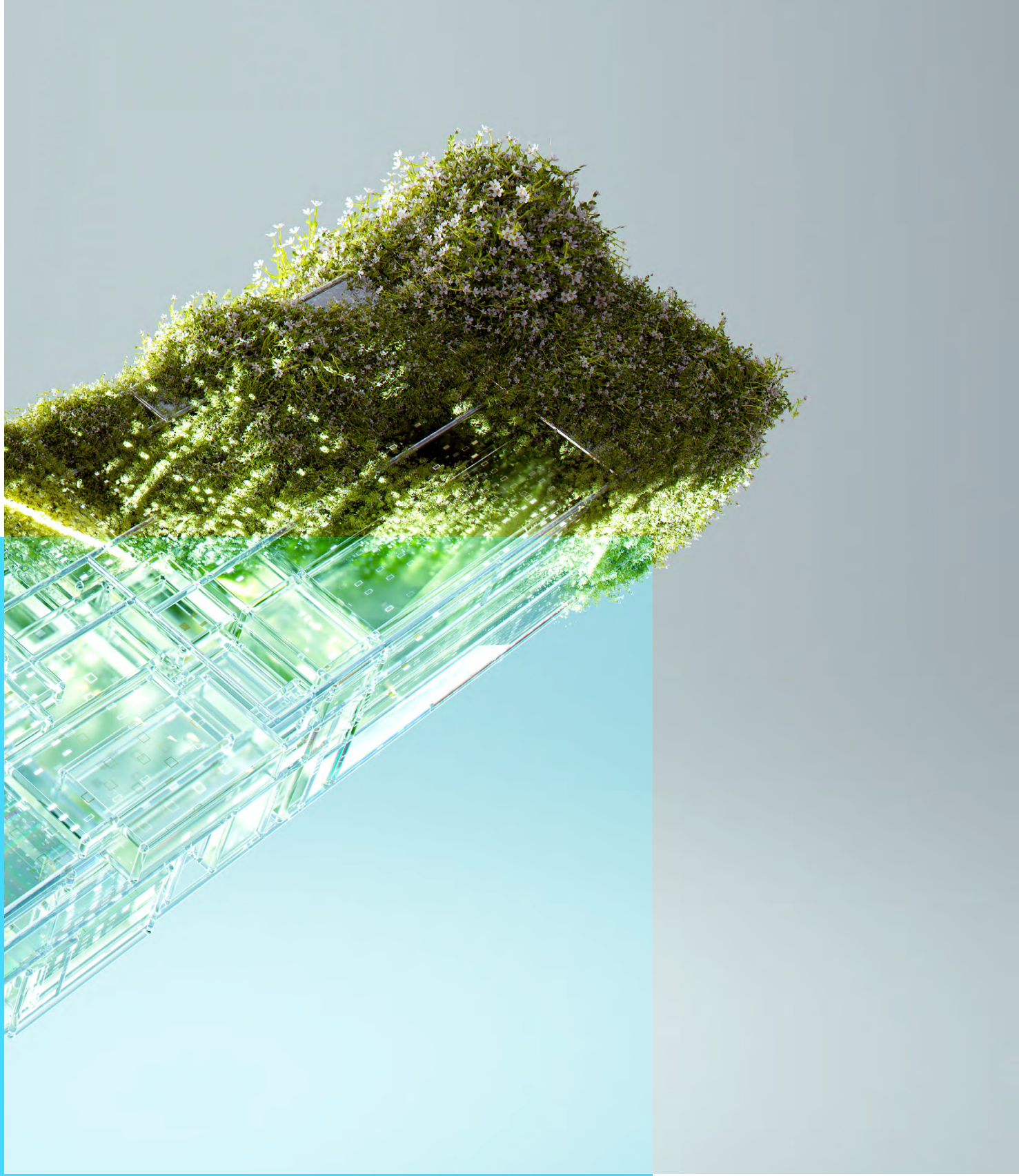
Tobias Hofer, Project Communications Green Data Hub and
Nina Popanton, Team Lead Data Intelligence Initiative (DIO)

The Green Data Hub focuses on the sharing and secure use of data in a sustainable European data ecosystem, compliant with Gaia-X directives and guidelines.

Every day, billions of data are generated and collected, analysed, and managed by a wide variety of organisations: Environmental data, health data, population data, and data from social media and the web, to name just a few examples. More and more areas of modern life are being digitised, not only changing our actions but also impacting the way we live. At the same time, the growing threat of environmental disasters and the consequences of climate change are increasing the imperative need to shift to more sustainable approaches in all areas of life and work. Political initiatives, such as the Climate Targets, the European Green Deal and the Sustainable Development Goals of the United Nations define ambitious targets and require rapid action. This is exactly where the Green Data Hub comes in: by sharing and securely using data in a sustainable European data ecosystem according to Gaia-X standards, practical solutions can be developed to address current climate and environmental challenges.

Data and Climate are Twins – the need for action

The climate crisis is not an intra-organisational, national, or continental problem, but a global one. Only if local data resources, know-how and innovations are made usable across organisational and national boundaries, according to the



decentralised approach by Gaia-X, such challenges can be tackled. Therefore, a collaborative approach to tackle the climate crisis at the European level is necessary. The economy, digitisation and climate protection can no longer be viewed separately – we talk about a twin transition of digital and climate. The primary premise of the Green Data Hub is to provide data-driven support for the implementation of concepts for a socio-ecologically sustainable development of the business community with new technologies such as artificial intelligence and machine learning – keeping in mind that these technologies need to be safe and sovereign to stay in line with European values.

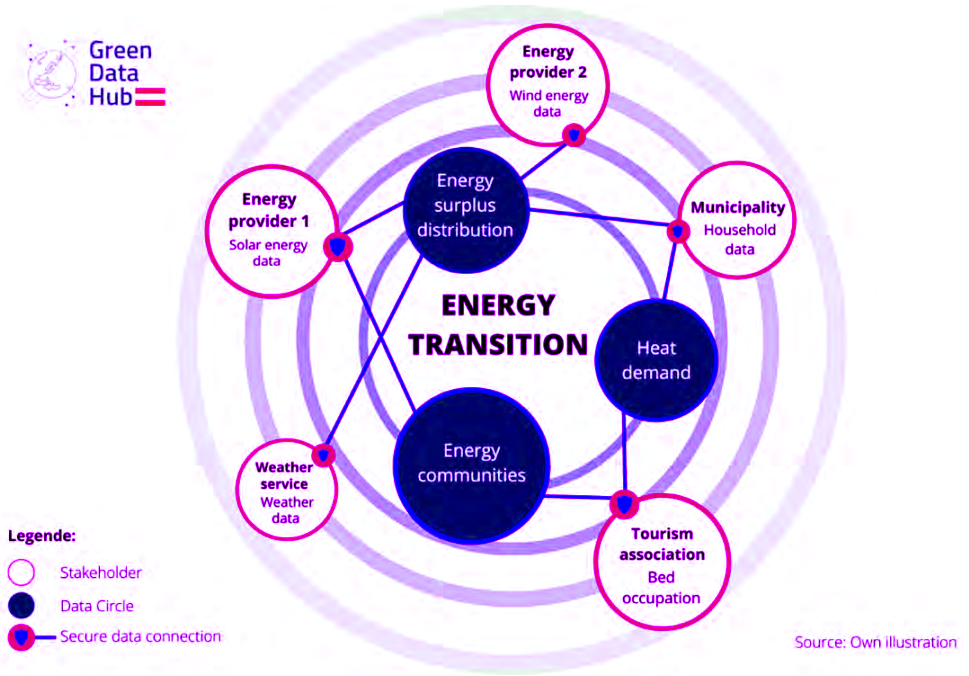
Collaborative data use – exemplified by energy communities

An example of sustainable collaboration between public administrations, businesses and citizens is an energy community. Photovoltaic systems are used to produce electricity on the roofs of public buildings, sports facilities, or private households, which can be made available to other stakeholders when there is a need or surplus. To enable the efficient operation of an energy community, a wide variety of data from different actors must be combined. These range from data on the efficiency level of a photovoltaic system to enable planning reliability for producers, to weather data to predict at what time additional electricity will have to be supplied from outside due to insufficient light incidence. This requires close cooperation with grid operators and energy providers.

Collaboration in the Green Data Hub

With a decentralised approach according to Gaia-X, the Green Data Hub demonstrates a simple and strictly controlled alternative for sharing data according to international standards. A major obstacle to data sharing is that organisations are unwilling or unable to share their data due to legal and economic uncertainties. The Green Data Hub addresses this with a Gaia-X compliant ecosystem approach. Data-producing, data-processing and data-using actors along the value chain are connected to form a network. This allows innovative new products and services to emerge together with the individually available data, enabling both economically and socio-ecologically sustainable added value. To overcome various barriers, the following are key in the collaborative use of data: trustworthiness of the individual actors, ensuring data sovereignty, and

Figure 12: Exemplary representation of the cooperation in the Data Space Energy Transition.



a solid set of rules defining the processing and use of data. Interoperability and standardisation are paramount. This is ensured with the establishment and collaboration in Data Spaces and Data Circles. The Green Data Hub is based on the architecture and standards developed by European initiatives, such as the Gaia-X Association and the International Data Space Association (IDSA). Their goal is a common European data infrastructure based on the values of openness, transparency, and trust.

Data Spaces and Data Circles

The term Data Space generally refers to a data relationship between trusted partners who apply the same standards and rules for storing and sharing their data. Of central importance here is decentralisation. Data is not stored centrally but remains at the source with the respective data owner and is only made available when needed. They can decide for themselves what happens to their data, where it is stored and always retain data sovereignty.

Data Spaces are formed with as many actors as possible and a large variety of data around superordinate domains (such as economic sectors or industrial sectors). The Green Data Hub focuses on the four domains Energy Transition, Mobility Transition, Circular Economy, and Climate Change & Risk Mitigation.

Within the Data Spaces, concrete use cases are identified by matchmaking the metadata of the individual actors, which are then developed in smaller circles within the framework of so-called Data Circles. This is where the concrete joint use of data takes place.

Figure 12 shows an example of how collaboration in the Data Space Energy Transition works. Different actors, such as energy providers, municipalities, weather services or tourism associations, are networked in the Data Space and possess different data (such as solar energy data, household data or data on current bed occupancy). Individual use cases, such as energy communities or energy surplus distribution, are processed in the form of Data Circles. This is where secure and trusted data sharing takes place. Individual stakeholders can also collaborate in multiple Data Circles with different stakeholders and different data sets.

Collaboration opportunity

A data ecosystem thrives on the greatest possible diversity of different stakeholders and data sets. Only through cross-organisational and cross-national collaboration does a value-added benefit to the community emerge. Cooperation is the guiding maxim for breaking down data silos. Let›s join forces and create a sustainable, green European data ecosystem!

The Data Intelligence Offensive

The Green Data Hub is a key flagship project of the Data Intelligence Offensive (DIO), a non-profit association for the promotion of the data economy and the optimisation of data technologies. As a cooperation platform with over 150 network partners, the association aims to push and promote business models to exchange and monetise data according to strict ethical and legal standards. DIO promotes the exchange of experience on state-of-the-art technologies and their best practices, with a special focus on artificial intelligence.

About the author
TOBIAS HOFER

Tobias studied corporate communications and international business administration and has worked in the fields of marketing and communication in an international corporation, the national broadcasting corporation and in start-ups. At the Data Intelligence Initiative (DIO), he is responsible for the communication activities and stakeholder relations of DIO's core project, the Green Data Hub.

Nina studied transcultural communication and is currently active in development research. She is Team Lead at the Data Intelligence Initiative (DIO) and focuses on scientific communications. Before joining DIO she supported listed industrial companies in national and international communications and in the field of investor relations.

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4.4

AGDATAHUB:

providing a shared and sovereign technological infrastructure to guarantee the development of AgriTech in Europe.

Sébastien Picardat, Chief Executive officer of Agdatahub

Agdatahub's ambition is to create the conditions for value creation from collection to use of agricultural data. Its solutions, aimed at 10,000,000 European farms and their 500,000 partners will enable farmers to regain control of their data.

Agdatahub operates consent and data exchange platforms to provide European agricultural players with sovereign and secure tools. Moreover, the platforms also ensure that the entire ecosystem has access to the reliable data needed to develop new services for better production and working conditions, improved traceability and animal welfare, and more sustainable and resource-friendly farms[1].

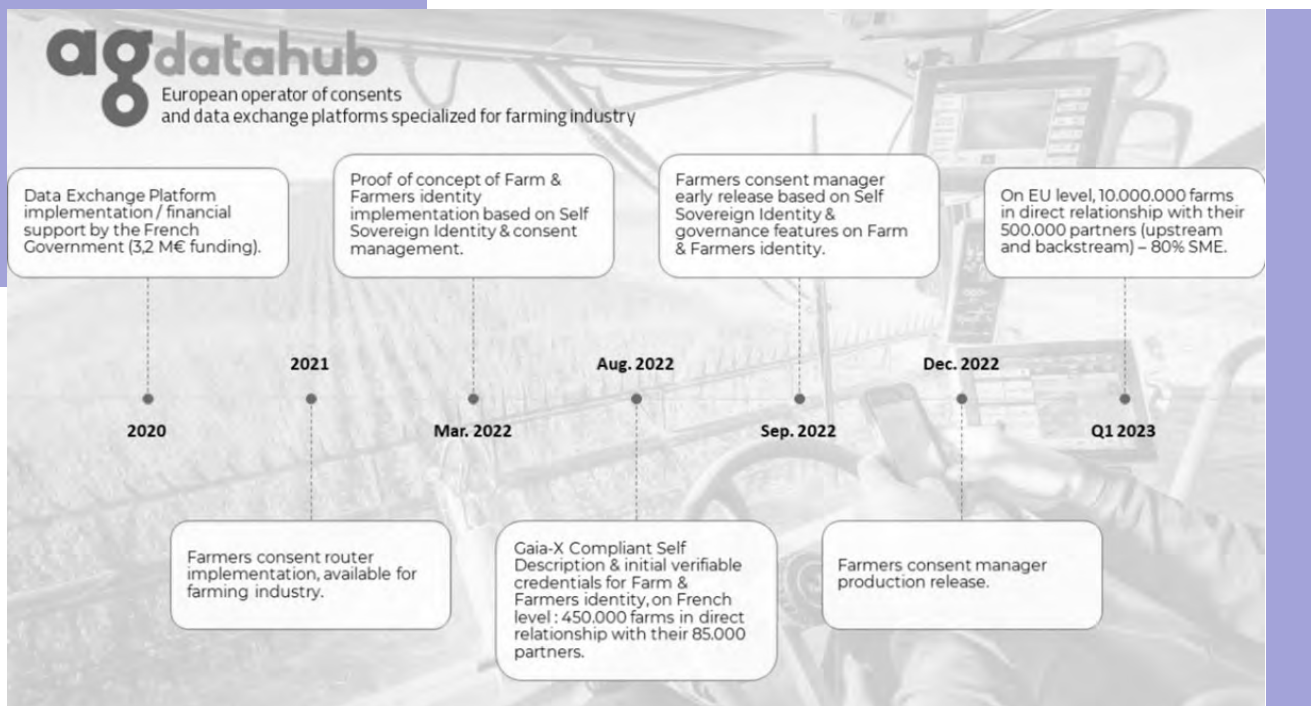
> **Agricultural data must be able to circulate within a secure framework and in compliance with the consent of farmers,**

points out Sébastien Picardat, CEO of Agdatahub.

The project milestone delivery may be seen below in figure 13.

1 OECD: New technologies and digitalisation are transforming agriculture and offering new opportunities to improve policy.

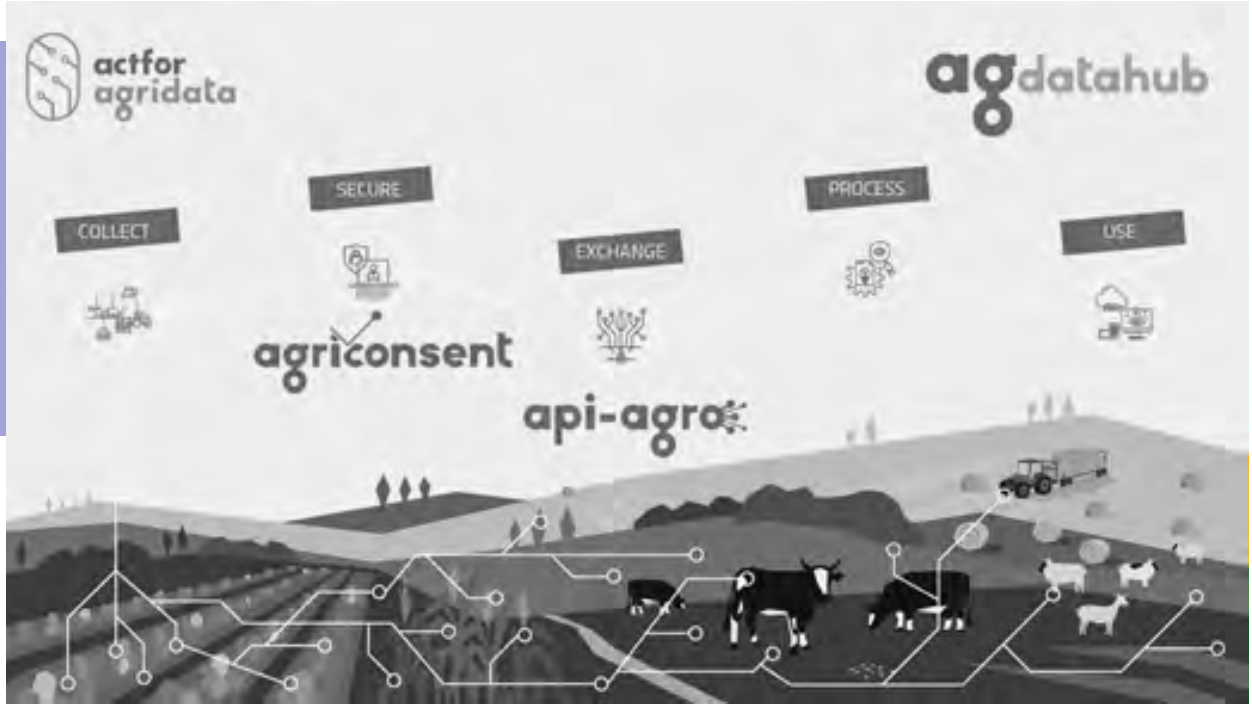
Figure 13: Project Milestones



How to streamline data exchanges

The API-Agro agricultural data exchange platform, which is based on the technology of the French company Dawex, provides this secure framework. Operated by Agdatahub, API-Agro is an essential technological building block for AgriTech innovation. Accessible in SaaS mode for data issuers and acquirers, it is based on a public catalogue of data offers where users

Figure 14: The agricultural data path by Agdatahub



expose their data on their terms. API-Agro is hosted on Orange Cloud for Business Services infrastructure.

How to secure data exchanges

Agdatahub has developed Agriconsent, in co-innovation with Orange Business Services and IN Groupe . This first-ever agricultural digital identity solution links the farmer's identity to the identity of his farm. This certifies that the farmer is the rightful owner and can give his consent to the sharing and use of his farm data.

The Agriconsent identity is based on a decentralised blockchain and works with a wallet on a smartphone. Certificates and various business attributes are stored there. With Agriconsent, the farmer also has access to a consent administration portal where he finds all the agreements he may have given for the use of his data.

Strong values

Agdatahub's ambition is to provide European agriculture with a shared and sovereign technological infrastructure to guarantee the development of digital agriculture. "In this respect, we are completely in line with the values of the Gaia-X Association, of which we are a Day-1 member, explains Sébastien Picardat.

> **Gaia-X is at the forefront of digital transformation in Europe, thanks to its lighthouse projects. It is great satisfaction and a great opportunity for us to be part of it.**

With its technological building blocks for consent and data exchange, Agdatahub wants to offer all players in the agricultural sector tools that echo European ambitions.

As an expert in strategy and organisation in agriculture, Sébastien has solid experience in information technology and institutional relations in the agricultural sector. With a global vision of the agricultural ecosystem, he carries Agdatahub's ambitions to decision-makers in the institutional and agricultural world in France and Europe.

About the author
SÉBASTIEN PICARDAT

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4.5

ENERGY DATA SPACE:

The year 2022 will see the launch of projects and interoperability standards in the ecosystem

Martine Gouriet, Director of Digital Uses at EDF Group and
Laurence Houdeville, Renault group

On 16 March 2022, the Energy Data Space organised its first Steering Committee meeting, chaired by Martine Gouriet, Head of the Data Space working group "Energy" of Gaia-X, member of the board directors of Gaia-X and Director of the digital uses at the French Electrical Company EDF. More than 40 members of 10 European countries attended the meeting. The participants had an overview of the Energy Data Space: its ambition, its governance, and its roadmap, with two major axes: **interoperability** and **use cases**. The meeting ended with a presentation of three funded projects linked to Gaia-X: OMEGA-X, Data Cellar and Enershare.

A path to a European approach for energy

The Energy Data Space is one of the working groups of the Gaia-X Association. It is a European ecosystem open to all energy organisations working together.

> **The monumental goal is the following:**

Reaching Carbon Neutrality before 2050 and therefore fostering all the digital solutions for energy efficiency and low carbon energy while maintaining European Strategic Autonomy in Energy. This means providing an ecosystem to develop use cases on a European scale to foster the energy transition and reach carbon neutrality. Thus, sharing data in a trusted, secure, and sovereign way, reaching a significant size, and becoming a reference for the industry.

Interoperability, the key to the success of the Energy Data Space

Interoperability was the subject on everyone's lips during this first Steering Committee meeting. Presented as the Holy Grail that will eventually connect projects, interoperability is defined in terms of its technical architecture standards. Ideally, the data models should cover the various use cases described by the players in the energy value chain, as well as those of other domains where relevant.

The roadmap includes key phases as diverse as the mapping of available connectors, and the facilitation of ideation sessions. All this will contribute to building a shared data model.

But what are the key levels on which this strategy of ongoing co-construction is based? Why is the objective not clearly defined? Let's consider the challenges in turn.

A common ground where 'The result is more than the sum of its parts'

The first challenge is to define a common contractual model that meets the interests of the different stakeholders, whether they are data providers or users. The legal framework underpins the discussion on the choice of technological building blocks (exchange platform, digital

identity manager or recording of consent). It is within this perimeter that models of cooperation must be sought.

Hybridisation - the keyword for the future of data spaces

This hybridisation takes many forms. On the one hand, there will be components and/or data models chosen from open-source communities, and, on the other, more specific contributions resulting from ad hoc developments, which will come from industry players, among others. Open-source approaches will be encouraged and generalised as far as possible, as they reduce dependence on a single supplier and allow greater availability and auditability of source code. The quality of these developments is said to be better because of the large number of corrections made.

Necessary alignment with Gaia-X proposals

Gaia-X lays down a set of rules, called federated services (GXFS) - a framework which provides access management or the choice of data exchange components. Gaia-X proposes also a 'labelling framework' to label the services offered by the cloud providers. These are the guidelines that the pilots of the various use cases must respect.

Solving architectural problems: a challenge that can be met in several ways

The first step is to think very early about the most common architectural problems that arise when designing an interoperable data space. Governance is necessary to integrate all future needs and to understand how they are intertwined. This will allow for effective escalation of issues anticipated by the pilot use cases to the level of the data space.

To improve cooperation at all levels, two areas of work are currently being studied. These concern the sharing of a common language and the choice of a sustainable interoperability model.

To describe the architecture, solutions and scenarios, Gaia-X suggests drawing on the expertise of Open DEI. This network of experts, funded by the European Union, aims to

> **align reference architectures, open platforms and large-scale pilot projects in the digitalisation of European industry.**

Open DEI identifies a target functional architecture. The technical bricks that constitute this architecture include both the infrastructure and the software solutions. All these bricks are interconnected. The Steering Committee reviewed the scope and impact of each block proposed by Open DEI on the use cases within .or in relation to various data spaces

It is this complexity that the Energy Data Space must manage to solve in time. Therefore, the strategy of taking small steps was preferred.

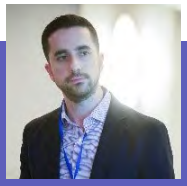
Four European projects
as examples of the interoperability challenges

OMEGA-X

Objective: OMEGA-X aims to implement a Data Space (based on European common standards), including federated infrastructure, data marketplace and service marketplace, involving data sharing between different stakeholders and

demonstrating its value for real and concrete Energy use cases and needs, while guaranteeing scalability and interoperability with other Data Space initiatives, cross-sector.

There will be no Green Energy Transition without full digitalisation. There will be no EU data strategy without data sharing. Data Spaces can answer to both challenges at once, being Energy one of the flagship use cases.



JAVIER VALIÑO

Coordinator of Omega-X, Atos Research & Innovation

Consortium: 29 partners from 12 European countries
Budget: 12M€

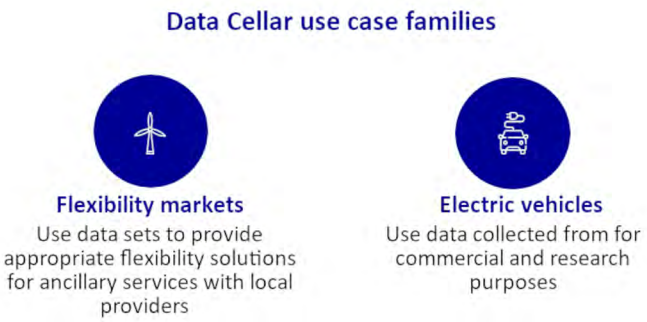
*According to the European Commission understanding, Local Energy Communities

organise collective and citizen-driven energy actions that will help pave the way for a clean energy transition, while moving citizens to the fore.

ENRICO DI MARTINO

Coordinator of Data Cellar, Rina

Consortium: 31 partners from 15 European countries
Budget: 12M€



DATA CELLAR

Objective: Creation, development and management of local energy communities (LECs) in the European Union by providing services and tools to local energy community stakeholders.

> **Within Gaia X, the Data cellar will be dynamic, interoperable and energy-oriented. It is a blockchain-based tokenization scheme for the remuneration of data provision and provides results based on pre-trained AI models.**

MASSIMO BERTONCINI

Coordinator of Enershare
Engineering Ingegneria Informatica

Consortium: 31 partners from 15 European countries
Budget: 12M€

Enershare use case families

Electricity & Heat

E-mobility & Water

Green Production

Operating and planning optimizations, thanks to synergies between Electricity & Heat, E-mobility & Water and Green Production

Local Energy Community
Smart buildings, smart mobility, and smart grid synergies

Power-to-Gas
Digital twins for optimal planning

Green financing
Thanks to data driven services

About the author
MARTINE GOURIET

Martine Gouriet is Director of Digital Uses at EDF Group, a role which she assumed in 2019. Most recently, she was Director of IT and Telecom shared Services at the company. Previously, she was leading EDF subsidiary Edelia which is specialised in energy efficiency and smart grids. She has worked during 17 years within Orange and she has launched in France the IP and vod TV.

Martine Gouriet is also member of the board of directors of Gaia-X European Association for Data and Cloud , leading the work related to labels and to energy in the association.

Martine Gouriet has developed strong skills in innovation, technical development, launch of new services.

She graduated from “Ecole Polytechnique” and from “Telecom Paris Tech”.

About the author
LAURENCE HOUDEVILLE

After 15 years in Digital agencies (Dentsu Aegis / Publicis Sapient) and successful entrepreneurial experiences (Semji, Atypics), Laurence HOUDEVILLE joined the Renault group to formalise and implement data strategy & data governance. At the same time, she acted as DPO for the Renault Digital subsidiary. She then took up consulting roles in a generalist firm where she led the data team and the data community in France and the Benelux.

Throughout her career, Laurence has developed digital solutions for process optimisation. Attached to defending the economic interests of companies at European level, she has been involved in projects to define concrete solutions. In particular, she co-wrote a white paper on the Sovereign Cloud for the French Tech Corporate Community. She is now in charge of Inetum' data strategy at the international level.

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4.6

THE EUPROGIGANT VOICE: BRINGING SMART AND SOVEREIGN USE OF DATA IN THE EUROPEAN MANUFACTURING INDUSTRY

Dr Claudia Schickling, Project Coordinator EuProGigant AT | and 4.0 Head of TU Wien Pilot Factory – Industry

Markus Weber, Project Coordinator EuProGigant DE | PTW TU Darmstadt

The simple and secure exchange of machine data between production companies along the supply chain enables responding quickly to changing conditions and needs. The Austrian-German Gaia-X lighthouse project EuProGigant demonstrates how secure and sovereign data exchange can be implemented across companies using Gaia-X, and how new, data-driven business models can be created.

Gaia-X for the production industry

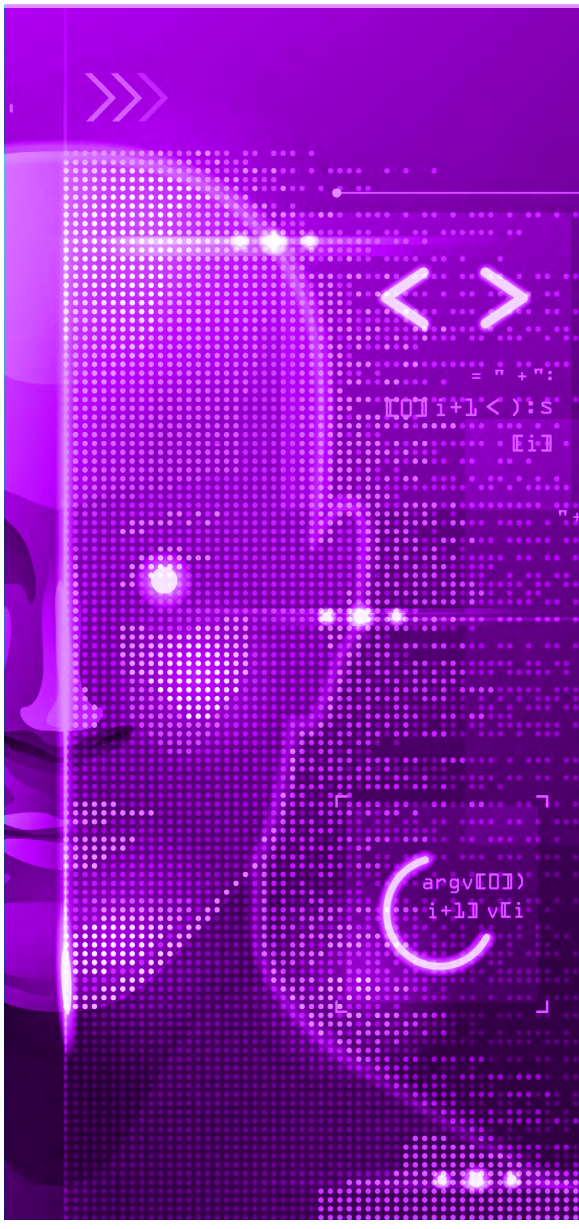
Gaia-X plays an important role in' 'Europe's production industry - especially when it comes to implementing Industrie 4.0 along a vertical plane. The next logical step is to connect companies across the horizontal value chain of products. However, production plants often have different systems with non-standardised processes. This framework makes secure data exchange harder to achieve. In addition, the increasing importance of transparency along the supply chain in terms of compliance with sustainability requirements or safety principles creates new challenges for companies. With its networked infrastructure. Gaia-X provides suitable solutions: Due to the uniform framework, companies can link

data more efficiently and share it securely across companies in the sense of data-driven business models.

But how can companies get access to the Gaia-X data infrastructure? This is where the Austrian-German research project EuProGigant comes in, as the project works on the implementation of Gaia-X for production companies. The European Production Giganet stands for the vision of a smart, resilient and sustainable European manufacturing industry. By March 2025, the project team will set up a multilocation, digitally networked production ecosystem. In interaction with Gaia-X, EuProGigant not only enables sovereign data management but also offers a new dimension in the analysis of the companies' own production processes by making cross-company data value chains in a multi-platform ecosystem describable.

Use cases

facing industry challenges



EuProGigant has been created for the industry and its needs. It showcases how data can support the industrial value creation process and at the same time, the project describes the utility of data-driven business models. So, EuProGigant supports the relocation of production companies back to Europe. In four thematic working groups, the project team explores seven use cases that address important problems in the manufacturing industry:

CO2 footprint in production engineering and manufacturing

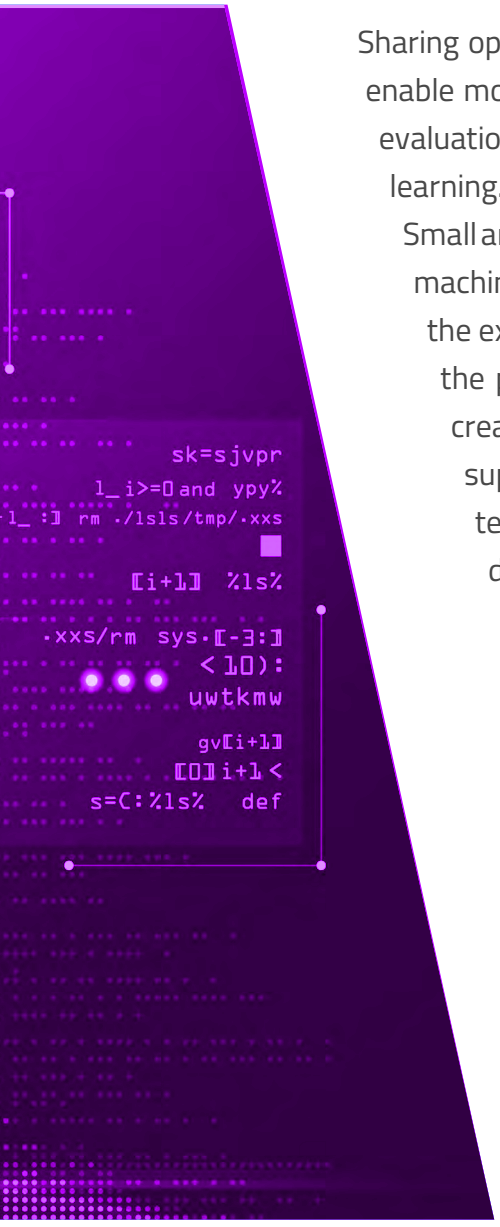
The European Green Deal focuses on complete climate neutrality by 2050. As a result, the CO2-equivalent footprint of products has become more important and may even be a competitive advantage. The working group focuses on how companies can already influence the carbon footprint of their products in the design phase. In doing so, the team develops ways

on how relevant CO2 and energy data around material selection and manufacturing processes can be recorded, made available, and used. Gaia-X as a federated data infrastructure ensures a secured and transparent data exchange.

Mobile processing machines

This working group is dedicated to the challenge when the component does not come to the machine, but vice versa. The associated use case focuses on how large amounts of data can be processed during the maintenance of railway tracks and further used for autonomous planning. It is representative of the mobile use of machines, where unreliable networks and poor transmission options currently make data exchange difficult. Using a measurement vehicle, the working group demonstrates how the data collected on the machine can be made available to external partners. Gaia-X enables targeted rights and access management.

Validation platform



Sharing operating data across the entire value network and company boundaries enable more reliable and longer use of production facilities. The aggregation and evaluation of this data are often carried out using artificial intelligence and machine learning. However, large amounts of data are needed to make valid statements. Small and medium-sized companies often lack the necessary number of identical machines to generate sufficient operating data, or they are unable to evaluate the existing data volumes. The working group is investigating ways of solving the problem of how players can cooperate across company boundaries to create such a database. The validation platform developed in the process supplements the data with standardised measured values from certified test systems. The benefit is that not only the data infrastructure and data are used in a federated way involving a data-driven business model but also the hardware infrastructure of test systems or test benches are used jointly. As a result, end-of-line testing and incoming goods inspection can be combined and resources saved. To ensure that data is exchanged securely, anonymously and sovereignly, the validation platform is based on the principles of Gaia-X.

Component matching

When mounting assembly groups in mechanical engineering, the assembly components have to be manually matched for accuracy of fit due to different manufacturing environments and methods. Manufacturers often compensate for the deviations in focus by using specially manufactured components. This is

where the working group comes in and plans an automated adjustment of the individual parts, taking tolerance deviations into account. In the process, information from different data sources is brought together, which enables an optimised assembly of the components. This results in added value, which is reflected in the reduction of the time required for manual assembly and in a reduction of rejects.

EuProGigant in numbers

With the seven industry-related use cases of the four thematic working groups, EuProGigant primarily addresses small and medium-sized companies, which receive valuable insights into the independent connection to Gaia-X through the project. The list of interested parties is long – 16 project partners and more than 25 companies in the industrial committee participate in the project or are otherwise involved. Overall, the research project will help companies achieve the following economic goals:

- **5% increase in sales by 2025**
- **10% increase in productivity**
- **10% reduction of CO2 equivalents in production and logistics**
- **20% reduction in production costs**
- **20% increase in energy efficiency**

The total cost of the lighthouse project is 8.6 million euros – this includes a subsidy of around five million euros from the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the German Federal Ministry for Economic Affairs and Climate Action (BMWK). [/Separate Box]

Involving all generations

Finally, EuProGigant believes strongly that in order to contribute to the future of manufacturing, the voices of those involved need to be taken into account. The project's intergenerational advisory board,

which consists of participants of all career stages, addresses the "the future-oriented view of the work environment". The aim of the board is to involve society in the technological developments of the project in order to promote their acceptance. The 19 members from Austria and Germany are focusing on topics such as the use of machines and equipment, skills shortages, flexibility in technical education, retraining and lifelong learning and the user-centric automation design. They stimulate social discussions to make the technology tangible and ensure that ethical questions do not remain unresolved.

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Dr Claudia Schickling is the project coordinator of EuProGigant on the Austrian side and head of the TU Wien Pilotfabrik Industrie 4.0. As a learning, innovation and demonstration factory for smart production and cyber-physical production systems, the TU Wien Pilotfactory Industry 4.0 focuses on new concepts and solutions for a multi-variant serial production in the field of discrete manufacturing industry, which are typical for many Austrian companies.

About the author

MARKUS WEBER

Project Coordinator EuProGigant DE | PTW TU Darmstadt

Markus Weber coordinates the EuProGigant project on the German side and was responsible for the domain of manufacturing technology at PTW as Head of Research from 2021 to April 2022. The Institute for Production Management, Technology and Machine Tools (PTW) at TU Darmstadt focuses on the machining of metallic materials, the construction and design of machine tools and components as well as process optimisation, production organisation and energy efficiency in manufacturing.

4.7

ACCELERATING THE MOBILITY DATA SPACE: THE DATA-SHARING COMMUNITY FOR THE MOBILITY SECTOR

Michael Schäfer, Managing Director of the Mobility Data

Access to data is prerequisite for the creation of innovative digital products and services that make mobility **safer, more sustainable, and more user-friendly.**

But we know that much of the data generated in the mobility sector remains unused resulting in **innovation potential being lost.** The reasons for that are manifold: Some organizations have access to data, but do not recognize its potential for new products and services, some are uncertain about its legal use, especially when it comes to personal data, some are suspicious of cloud services, or simply lack the resources and knowledge to get these processes started.

To put it in a nutshell: Those who have data available often don't use them, and those who need them for new business models lack access to this valuable raw material.

Against this background we must ask ourselves: How can we create an environment **where ideas emerge, that make a difference in the mobility sector?** How can we get as many stakeholders as possible involved to share their data? And how do we **boost collaboration?**

The mission of the Mobility Data Space is to answer these questions. I would like to present **five considerations** which aim to enable a sovereign data exchange in the mobility sector guiding us in our daily work.

Data are a special kind of raw material

Data accumulate almost everywhere. Some of that data might not be relevant for the organizations that produce it, but in turn might be very relevant for those with a great idea to bring mobility solutions to another level.

Therefore, the message that we spread among the participants is: Data can be used in different ways. Different kinds of usage do not necessarily have to be in competition with each other. If suitable partners match, it results in a **win-win-situation** with added value for both parties. Companies that have internalized this, are more inclined to share their data with partners.

To help stakeholders in the process of becoming aware of the potential of their data, we offer **exchange formats and work closely with service partners** who coach participants in that matter.

Making the partners

ambassadors of the common goal

Data abundance is good, but we need to define rules for dealing with it. We strongly believe that the values of openness, transparency, and trust that Gaia-x and the Mobility Data Space hold, provide many organizations with reasons to reconsider their entry into the data-driven business.

Creating a trustful digital infrastructure has been crucial since the conception phase of the Mobility Data Space. More than **200 key stakeholders** from the mobility sector worked together to lay out the foundation for a new digital ecosystem **based on European values:** mobility and data experts of corporations, science, start-ups, administration and public companies.

By involving them in the process of creation, the stakeholders have witnessed first hand how European values have shaped the new digital ecosystem.

This is what has made them **ambassadors of the common goal** of a sovereign and self-determined data infrastructure.

Trust and sovereignty
are key

One of the core elements to ensure a trustful environment is that the Mobility Data Space creates **a level playing field among all participants.**

All buyers and sellers of data are free to determine the specific terms and conditions of their transaction agreement. **Data is transmitted directly between the contractual parties** (peer-to-peer). There is no central data storage.

Data providers can decide who can use their data. They are also free to deny certain entities the usage of their data. Pricing is subject to negotiations between sellers and buyers.

Innovation arises where
people interact with each other

The data sharing community is not only about exchanging data, but also about exchanging ideas and concepts.

This is why we have been **promoting dialogue between the participants** from the very beginning. This has led to projects we are very proud of: Our partners have implemented impressive use cases that contribute to a sustainable, safe and user-friendly mobility - turning the Mobility Data Space's mission into reality.

Networking and the exchange of information between the participants will continue to be promoted. Therefore, we have **launched various online and offline exchange formats** open to everyone who wants to shape the future of mobility.

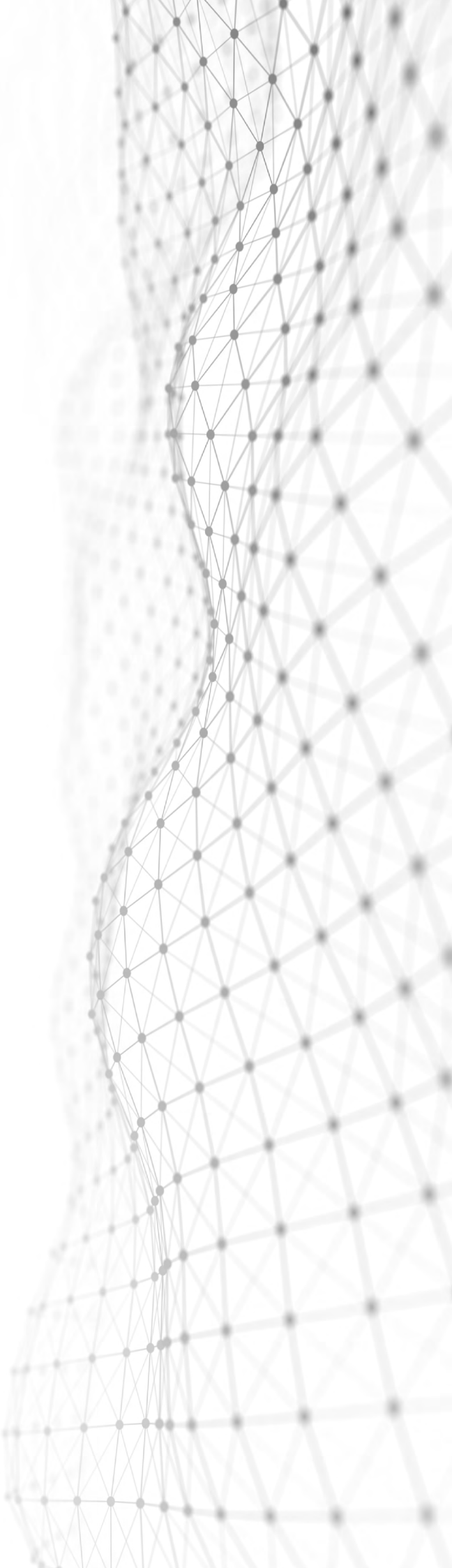
Standards pave the way

Again and again studies show, that the **lack of standards are a huge hindrances** for organizations to make their way into the data economy. Be it because it prevents them from taking the first decisive step or because it makes it difficult for them to **collaborate with partners.**

As Gaia-X, the Mobility Data Space stands for **portability, interoperability, and interconnection** of the infrastructure **within and across sectors**.

Not only does the Mobility Data Space cover all kinds of mobility-related data, including e.g. maps, weather, and infrastructure data. Its technical architecture – the International Data Space (IDS) – will also be interoperable and compatible with other GAIA-X domain data spaces.

This facilitates the interlinking of different stakeholders and sectors. As we are strong believers of our way of trustful and sovereign exchange of data we particularly appreciate further initiatives like ours across Europe and strive to collaborate with them. And standards are key for this.



About the author

MICHAEL SCHÄFER

Managing Director of the Mobility Data Space

Since January 2022, Michael Schäfer is one of the two managing directors for the Mobility Data Space (MDS). Manfred Rauhmeier, Managing Director of acatech – National Academy of Science and Engineering, acts as MDS´ founding managing director.

After the Mobility Data Space was successful as a research project last year, it has entered a decisive phase of growth in 2022. Michael Schäfer is in charge of the operational business and the development of the innovative data marketplace.

The qualified electrical engineer looks back on more than 30 years in the IT industry and brings experience in the areas of industrial automation, image processing, Internet of Things and Industry 4.0. He has managed numerous major international projects in the course of his career and most recently headed the areas "IIoT Application Factory" and "Business & IT Transformation" of the Global Competency Center at Software AG in Darmstadt. He is member of the German ORACLE User Group (DOAG).

Michael Schäfer on his start as Managing Director: "The Mobility Data Space holds enormous opportunities for society and companies to develop the mobility of the future. I look forward to the challenge of laying the foundations for this together with our partners and great colleagues."

Mr Schäfer is married and has three grown-up children. In his free time, he does mountain biking and skiing. His dream is to learn Arabic to get to know this culture better.

4.8

TELECOMMUNICATIONS: THE CURRENT AND BIGGEST CHALLENGES– PERSPECTIVES FROM PROXIMUS

Antoinietta Mastroianni, Chief Digital & IT Officer, Proximus

It might seem crazy to suggest that the world's telecom companies are facing a battle for survival, but we can observe that over the past decade, the telecommunications industry has been under continuous pressure as their traditional value pools, such as connectivity services have gradually been commoditised.

Little differentiation for a customer between one telco's connectivity service and another, a very competitive market (between traditional competitors, hyperscalers, cloud-native start-ups…), exponential tech advances, and price compression… are all drivers that push the telecoms industry to fundamentally reimagine their business and strategy.

> **Standing still is not an option anymore.**

We believe that **partnerships are crucial to growth and innovation.** They are also **a means to generate more value.** We work with industry leaders via our national and international brands to provide an ever-growing range of services and solutions for our customers. Each of our national and international brands is aimed at a different target audience, ensuring our services reach the widest possible range of consumers.

To support our ambitions, we want to modernise, by 2025, the architecture within Proximus in order to become a 'super integrator' which offers all its services across the entire digital spectrum. To realise this, we have drawn up a very detailed five-year plan.

What exactly is this five-year plan?

It is built on 7 essential pillars: in the first three, we are laying the foundation for success by upgrading our current monolithic architecture to a multi-purpose system, enabling space for clean data, and developing a service delivery model sustainable, focused on quality and responsiveness. This solid foundation will then allow us to focus on the four innovative pillars.

First, we continue to work on optimising our digital channels to ensure a natively digital user experience. For example, we will continue to improve our app, online store, and customer-oriented service.

Next, we want to enrich and develop our entertainment channels with new content. Entertainment will play an important role in the future. To compete with other big names in the industry, we must therefore take the lead and bring content to the customer in an innovative way.

For the third innovative pillar, we want to improve our customer experience by making the most of the potential of data and AI to develop new ways that will ensure to help our customers faster and better.

Finally, thanks to a renewed application ecosystem, we will be able to effectively offer our customers new products and services that largely succeed in the framework of the traditional telecom operator.

What role does Gaia-X play in Proximus' five-year plan?

Today, we see that we are evolving from a model where many organisations inhibit access to data, preserve data silos and discourage data sharing to a system, where sharing data between companies is a key enabler for digitisation. There is no doubt that the development of the world economy and its industries - especially those in Europe, depends highly on the availability and accessibility of data. But we are not there yet. The pandemic has shown how Europe still lacks efficiency today: all countries approached the pandemic crisis differently, while data sharing was impossible.

With Gaia-X, we can create a proposal for the next generation of data infrastructure: an open, transparent, and secure digital ecosystem, where data and services can be made available, collated, and shared in an environment of trust.

Our ambitions have been in line with Gaia-X's vision for a long time. In the years to come, Gaia-X will play a key role in the evolution of data management in Belgium and Europe. As technology operators, it is impossible for us to carry out our projects alone. Gaia-X brings all the key players together to work together towards a common vision: build a European data & cloud infrastructure, facilitate European Data Spaces, and ensure Europe's digital sovereignty.

This synergy allows us to set much more ambitious goals. Therefore, between 2022 and 2025, we want to develop several use cases to highlight the value of Gaia-X. The project is still in its infancy. Today, many companies have still produced themselves as adversaries in the data landscape. With our use cases, we want to make them aware of the possibilities offered by Gaia-X and motivate them to join us.

Do you already have a concrete use case that you are working on?

Yes, we are currently looking, with the Agoria Belgian Geoinformation working group, into a solution to improve the way we handle flooding in Belgium so that we can better estimate risks and reduce negative impact in general.

As we all know, Belgium – among others - suffers from frequent flooding and this situation will worsen in the future, due to climate change. Therefore, an efficient data ecosystem – which is not the case today - needs to be engineered to enable an efficient and effective data flow prior to (flooding simulation, design of mitigation measures, risk analysis), during (crisis intervention) and after (claim assessment) a flooding event. A lot of possible solutions to better estimate flood risks and reduce negative impact have been discussed but it was decided to focus first on how we could reduce a resulting impact during a flood, as it could nicely reflect on a specific Gaia-X use case.

What do you have in mind exactly?

We want to provide detailed monitoring and build rapid flood inundation mapping using remotely sensed and crowdsourced data to identify the area affected and to evaluate the damage. Such a solution, intended mostly for insurance companies and governments, will allow them, through a platform, to better estimate flood risks and reduce a negative impact by getting access to near real-time flood information on flood extent and most impacted areas. But it will also enable an improved customer management and damage claims handling; better efficiency in resource allocation, a better uniform and consistent cross-border information and an enhanced flood risk identification, prevention and control.

> **The solution includes and could serve a broad spectrum of partners such as geodata providers, IoT integrators, crowdsource data providers, and technology providers.**

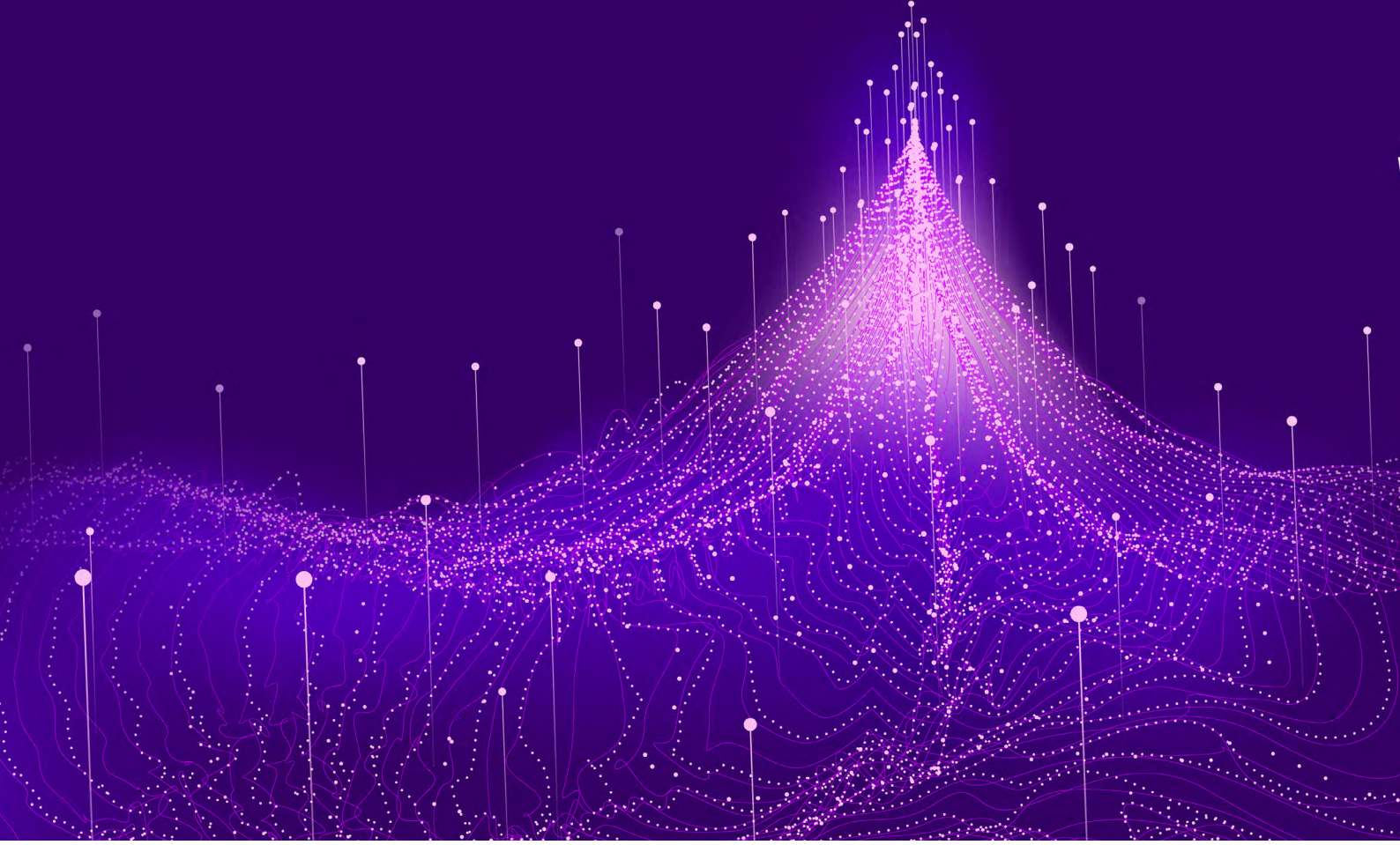
Still, we are only at the beginning of the adventure and a lot of challenges have still to be addressed (minimum viable product, technical requirements, funding, governance…). Stay tuned!

What is the future for Gaia-X? Are there any significant obstacles or challenges to be expected?

We must first ensure that our ambitions materialise in practice. Also, Gaia-X certainly should not get overwhelmed by other big players dictating what to do or what not to. A third challenge lies in finding profiles with the right knowledge and skills. Coordination is key in this regard.

And finally, fourth, let's not forget that it is all about the customer: create new products and services for the benefit of the European citizens. That's why it's important to retain citizen-centric practices no matter the scale of the initiative.

Gaia-X is ready for the future. Together with Belgium, Agoria and Proximus, we want to support, achieve good results and make the most of all opportunities for a better future.



About the author

ANTONIETTA MASTROIANNI

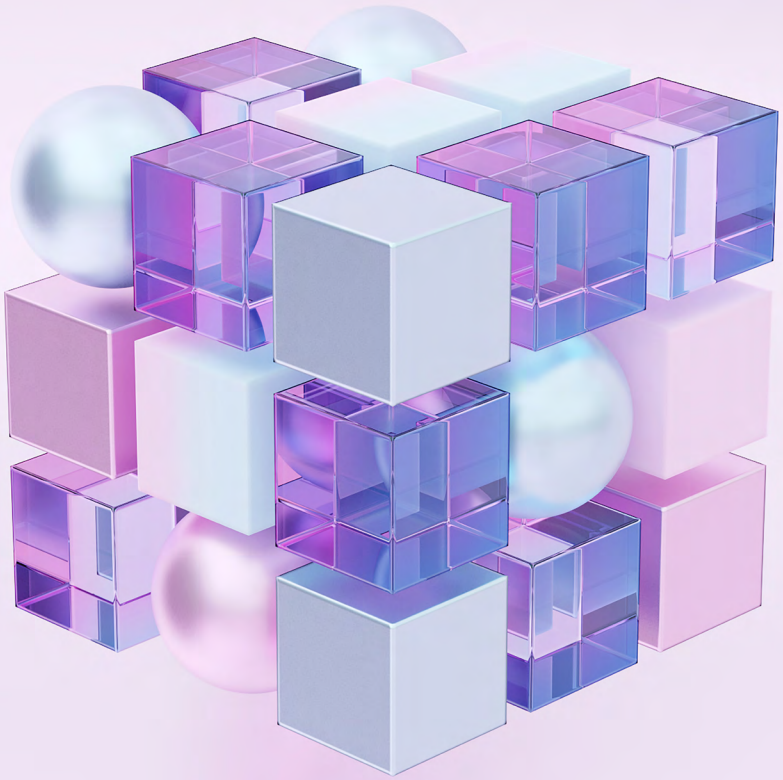
Antonietta Mastroianni has been a member of Proximus Exco since April 2021 where she acts as Chief Digital & IT Officer. Before joining Proximus, she was Group CIO and CDIO at the Danish TDC, Head of IT and Business Partner at Swiss Sunrise, and she had several roles in Swisscom and H3G Italy.

She is an influential IT leader with 20 years of international Telecom experience in leveraging technology to drive organizational growth, performance and profitability. She focuses on digital and agile transformation, the impact of leading-edge technology on business, technology and product innovation as well as IT and Telco transformation. She has worked in different European countries (Italy, Switzerland, Denmark and Belgium) and is a council member of Etis and a member of the Italian Order of Engineers. Currently, she also holds the VC Finance seat on the Board of Directors of Gaia-X.

Antonietta Mastroianni studied Computer and Automation Engineering at the university of Siena and she is a member of the Order of Engineers of the province of Caserta.

05

Gaia-X National Hubs



05

5.1

HOW TO CREATE VALUE FROM DATA?

Denisa Mäki, Project Coordinator, Gaia-X Finland project, The Finnish Innovation Fund Sitra

Having available data does not mean that a value from data will be created. In order to explore the potential of data, we need to understand how and where data can be used and what value we want to create. A functional data economy also needs rules and standardised procedures built on trust and fairness.

Gaia-X aims to create a common European data ecosystem and strengthen Europe's digital independence and competitiveness.

The big question is how?

Gaia-X's achievements will be apparent over time. The achievements depend on how effectively Gaia-X will be involved in the European digital market, how successfully it will support European digital sovereignty, what benefits it will create for Europeans and how long it will take.

Gaia-X aims to design an infrastructure that enables the sovereign exchange of data.

Europe needs more digital innovation. Such innovation can help to improve the production, increase competitiveness, reduce waste and emissions, introduce new products and services and boost prosperity in Europe.

To succeed, Europe needs to keep developing data-driven innovations that bring real benefits not only to businesses and the public sector but to individuals alike. A well-functioning data economy needs rules and standardised procedures built on trust and fairness.

Finland could be strong in transnational projects

The Finnish Gaia-X Hub was officially launched in June 2021 and is now part of the Gaia-X journey. Walking the path is an opportunity to explore and support innovative and sustainable data economy in Finland and elsewhere in Europe. But how?

For one thing, through new innovative use cases. The most active Gaia-X community includes Germany, France, Italy and the Netherlands, where cross-sectoral projects are being built, and the so-called vertical ecosystems have been recognised within Gaia-X.

A collaborative environment based on transparent rules fuels innovation, it also offers an opportunity to tackle challenges, work towards a more responsible future and participate in the data economy development in Europe. Furthermore, cross-national cooperation can improve efficiency and increase competitiveness and business processes through standardisation and access to data.

A better understanding of data helps to develop its use and get better control of our data. To do that, data needs to be shared in securely, and the rights and interests of individuals and businesses have to be protected.

Cross-border projects offer opportunities to create new solutions and business models with others based on data sharing. The Gaia-X data spaces were created to advance the ecosystem approach for data sharing in cross-border and cross-sector collaboration to boost innovation in Europe - not only in Finland, but equally in other European countries. A door opens to access new networks and perspectives of cross-national project cooperation.

Use cases show how Gaia-X might work in practice

One of the key elements within Gaia-X is the use cases. Different use cases have been already submitted from industries in various Gaia-X Hubs.

In terms of the maturity of use cases varies: some are more developed and can be implemented; some are less developed and need support for additional development. Having said that, the national Gaia-X Hubs play an important role in the process by identifying and helping to implement new use cases.

Use cases open new opportunities to develop cross-sectoral and sector-specific needs and enable the creation of new value from data. It is important to make the data-enabled business simpler because it will help to understand better how data flow within a sector, value networks and value chains.

Those interested in exploring the benefits of Gaia-X and the potential of use cases in Finland can join national level domain working group(s), which are connected to corresponding European level working groups.

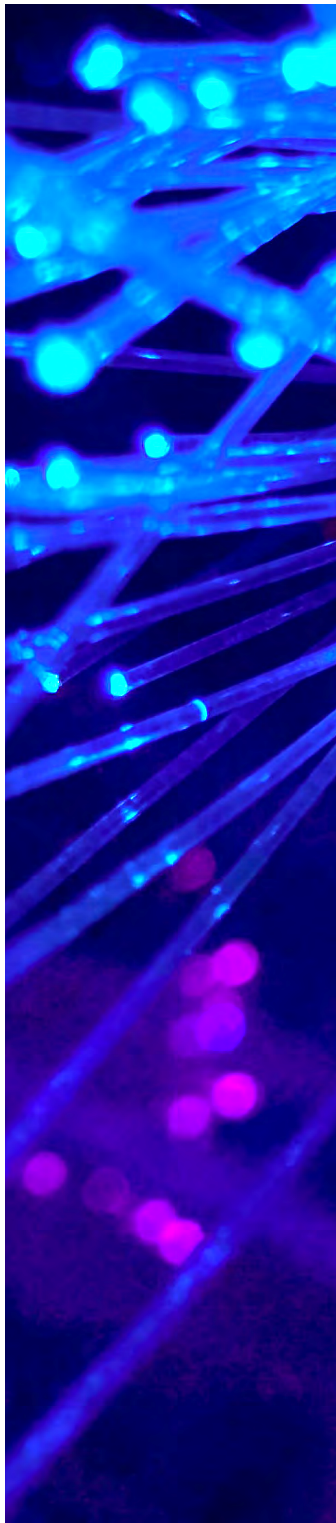
The advantage of the Gaia-X network lies in the scope for finding partners with whom data-driven business can be created through cooperation, between companies, sectors and countries.

Gaia-X also plays an important role in creating frameworks, handbooks and guidelines on how companies can address data-driven businesses.

The challenge of creating a new business based on sharing data fairly

The concept of data sharing is not new in Finland. Many Finnish companies have been active in data sharing for a number of years. It is also worth mentioning the work of the Finnish Innovation Fund Sitra with respect to a fair data economy and data sharing ecosystems.

Even though the data sharing concept is not new, creating a new business based on data-sharing in a fair way could still be challenging. It might take time to create confidence and trust between partners; to find a mutual and clear vision; to understand how to achieve goals collectively and work together. But it is possible.



Within Gaia-X, there are already good examples and experiences to share on what tools are needed when creating data-sharing ecosystems. These examples include use cases that were positioned within the European Gaia-X network.

The Gaia-X network is expanding. There are already 15 national hubs established throughout Europe. They raise awareness and formulate value propositions to show the benefits for companies and other stakeholders.

> **Focus on strong areas, such as manufacturing or circular economy**

So what are the opportunities for Finland?

Compared to other countries, such as early Gaia-X pioneer Germany, Finland does not have such supportive national funding programmes that would help businesses be more active on Gaia-X, which should change.

In the meantime, existing opportunities should be explored, including the scope to use tools, such as Gaia-X and connect them to EU Funding Programmes and other initiatives.

In Finland, the foundation for use cases was built and there are many opportunities in strong use cases. Therefore, it is good to focus on areas where Finland has a strong sectoral starting point, be it agriculture, circular economy, manufacturing, logistics or built the environment sector.

About the author
DENISA MÄKI

Currently at Sitra as Project Coordinator, she is a lawyer by education, a generalist by profession and a part-time business and finance student in the evenings. At Sitram she is responsible for supporting their domain working groups within Gaia-X Finland Hub on their engagement in building a data-sharing ecosystems. She is also building and maintaining relationships with relevant stakeholders at national and international level. In the past, she has gained experience from the European Union, UN and the private sector as a consultant, researcher, and a project specialist. She is adamant to making an impact in her work and in improving the Gaia-X project coordination, visibility and overall impact and sustainability. Always keen to thinking outside the box and learn new, be it new technology or ways to improve.

References:

Gaia-X Finland project, The Finnish Innovation Fund Sitra: https://www.sitra.fi/en/topics/gaia-x-finland

Domain working groups in Finland: https://www.sitra.fi/en/events/gaia-x-finland-domain-working-groups

Free data economy online tools are included in our Rulebook for a fair data economy, with tools and agreement templates to make it easier and faster to build and join fair data economy networks, https://www.sitra.fi/en/publications/rulebook-for-a-fair-data-economy/

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5.2

SMART CONNECTED SUPPLIER NETWORK - UP TO TWENTY PER CENT INCREASE IN PRODUCTIVITY FOR THE AVERAGE MANUFACTURING COMPANY – THE GAIA-X DUTCH HUB PERSPECTIVE

Smart Connected Supplier Network - up to twenty per cent increase in productivity for the average manufacturing company

Peter Verkoulen, Programme Manager Gaia-X NL Hub and TNO

Case summary

The success of supply chains in the manufacturing industry relies on sharing large amounts of data. Previously, there was no existing standard available for sharing data within the manufacturing supply chain.
Smart Connected Supplier Network (SCSN - https://smart-connected.nl/en) is the result of the cooperation of 300+ companies, from SMEs to larger OEMs in the manufacturing industry and their IT-partners. Together they developed and implemented a data standard that makes exchanging information in the supply chain more efficient, allowing companies to share data more easily, quickly and reliably. This results in higher productivity within the supply chain through fast, secure and interoperable exchange of information between companies.

The Smart Connected Supplier Network illustrates the success of cooperation and connection within the digital infrastructure, resembling the vision of Gaia-X. In order to realise interoperability, standard connections are available, enabling all parties within the network to connect with other parties and dismissing the dependency of one single service provider; a 'four-corner model'. Additionally, it is no longer needed to set-up a new EDI-link for every new supplier, saving time and money.

Instead, a one-time registration in the SCSN address book suffices to be connected with all other parties. Although data-exchange is vital to the manufacturing industry, data is also a valuable asset to companies. The International Data Spaces (IDS) technology, integrated within the Gaia-X reference architecture, ensures sovereign data-exchange

enabling the companies within the network to control their data and decide when and with whom their data is shared. To ensure unambiguous communication within the network, a message standard based on the Universal Business Language of Oasis (UBL) was adjusted to the needs of the manufacturing industry.

Industry:

Manufacturing

Affiliated companies:

Two kinds of companies are playing a role in the SCSN ecosystem: manufacturing companies and their IT service providers.

Companies within the manufacturing industry:

300+ companies ranging from larger OEM's and first-tier suppliers to SME second- and third-tier suppliers, as well as (steel) wholesalers and steel manufacturers.

Service providers:

The IT-partners facilitate the connection to the SCSN network for companies in the manufacturing industry. The partners set up various standard connections with a diverse range of IT systems, enabling an easy connection to the SCSN network for new companies. This results in a 'four-corner model': a network of networks in which all service providers/brokers are connected to each other. Instead of every company being linked to one service provider, the various service providers are connected to each other, making their services interoperable. This enables every manufacturing company to communicate with all other manufacturing companies in the SCSN network, regardless of the service providers to which the manufacturing companies are affiliated.

Data infrastructure:

International Data Spaces (IDS) is the technology under the 'four-corner model' within SCSN, also known as the international DIN-SPEC 27070 'Requirements and reference architecture of a security gateway for the exchange of industry data and services' standard. Referring to Gaia-X, IDS components are integrated in the top of the X enabling sovereign data spaces. In a next step, steps will be taken towards the current de facto underlying federated cloud infrastructure.

Message standard:

The message standard used in SCSN is based on the Universal Business Language of OASIS (UBL), a widely internationally accepted domain language, also known as standard ISO/IEC 19845:2015.

[VIDEO: SCSN testimonial Smart Connected Supplier Network Testimonial Compilation - YouTube]

(Description: Testimonials from the manufacturing industry – why SCSN helps to fulfill the ambition to become a connected digital factory)

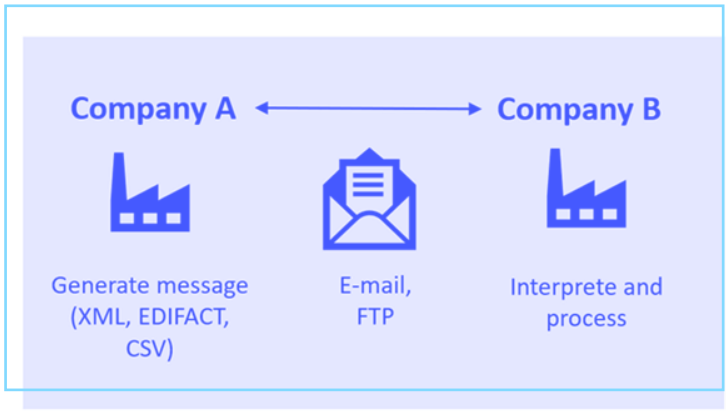
Data exchange in the chain:

The success of supply chains within the manufacturing industry relies on the sharing of large amounts of data. In respect to SMEs in particular, which play a central role in this chain, the receipt and transfer of data is not automated. Thus, the data they receive from their customers must be read, interpreted and usually manually entered into their own ERP systems. This is often a time consuming and error-prone process.

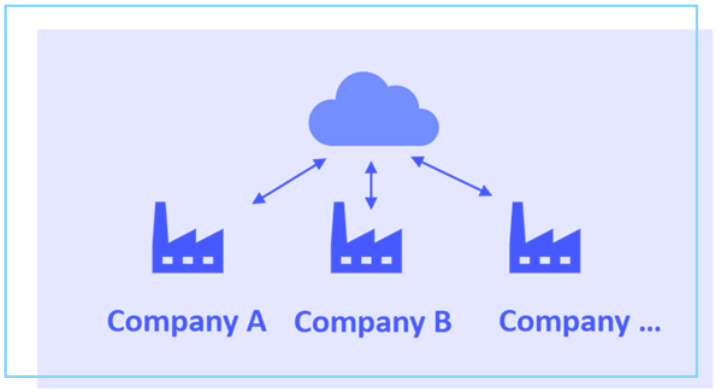
SCSN simplifies data sharing within the chain because SCSN messages can be automatically processed in the ERP system of a connected company. There are also strict agreements in place on the semantics of the messages, so they can only be interpreted in one way. The message standard used in SCSN is based on UBL, a widely internationally accepted domain language. UBL is an extremely extensive, complex language and is therefore not directly applicable within a domain. Agreements have been made within SCSN concerning how UBL can be applied within the manufacturing industry. In addition, SCSN connects seamlessly with the European Commission's e-invoicing agreements.

Registration is needed only once:

Traditionally, a lot of the data is exchanged via an EDI link between two companies. If you want to exchange data with a new company in that approach, you need to set up a new EDI link. With SCSN, however, this is not necessary. SCSN has been set up in such a way that a company only needs to be registered once with an SCSN service provider, after



Each connection is custom-made and thus costly. Therefore, not scalable.



Dependency on a single Service Provider who can have access to all data transactions.

which it can exchange data with all other connected companies. It is therefore no longer necessary to make a connection with each individual company.

The enabling technical infrastructure is set up according to the 'four corner model'. In order to understand this model, it is important first to explain its' predecessors (the 'two and three corner models').

Traditionally EDI connections are set up according to the 'two corner model'. This means that a tailor-made connection is set up between two parties who wish to do digital business with each other. For each new party that is connected, a new connection must be set up, which is often unique and therefore different from the previous connection. Each new connection needs the same investment (costs) to set up and manage. This model is very expensive and not scalable. An improvement on this model is the cloud platform or broker model, which is

set up in accordance with the 'three corner model'. This involves an intermediary IT party (i.e., a service provider) to which all manufacturing companies can connect. Once a manufacturing company has connected to this service provider, it ensures that a connection can be set up with all connected parties. In this model, only one connection is needed, which significantly reduces maintenance and costs.

However, this model only works in a scenario where there is only one service provider in the market. The reality is quite different, as there are always dozens of service providers involved. This means that manufacturing companies still would have to set up multiple connections (thus increasing costs and complexity).

Even in a scenario where there would be only one service provider, this model has its limitations. In this scenario, the service provider gains insights into business-sensitive data such as the order transactions of an entire industry, which can be a major business risk.

Furthermore, an entire industry is dependent on one IT party, and thus a monopoly on data exchange is created. This problem has already become clearly visible in the B2C sector (for example: taxis, large web (retailers) and meal delivery companies) and has had major consequences for that sector. The lesson is that data sovereignty (i.e., the ability to control one's own data) is essential. SCSN is structured according to the 'four-corner model'; see also the image below.

The SCSN network is a network of networks in which all service providers/brokers are connected to each other. This enables every manufacturing company to communicate with all other manufacturing companies in the SCSN network, irrespective of the service providers to which the manufacturing companies are affiliated. This is made possible by strict technical and commercial agreements between the service providers, which are managed by the independent SCSN Foundation.

This network is comparable to the telecom sector. Everyone is free to choose a telecom provider (i.e. a service provider in this example) that suits them best. The customers of these telecom providers can call all other connected people (i.e., manufacturing companies in this example), regardless of which telecom provider they are connected to or which type of mobile phone they have (i.e., IT system in this example).

Service Providers:

- Digital platforms, interconnected seamless agreements
- Independent 'address book' for routing communication
- Several providers. Choose the most suitable for your business

Manufacturing companies:

- One-time integration with own ERP system
- Registration in the SCSN address book

Data sovereignty:

Exchanging data through a cloud connection usually means that a company's data is stored externally and is accessible and visible to the cloud service provider. Since data is becoming an increasingly important asset for companies, it is essential to share data in a controlled way. With SCSN, a company retains control over its own data; it decides itself which data is shared with whom. International Data Spaces (IDS) makes it possible to share data in a secure way, without losing control over it. SCSN has established its own data space and governance, which is compatible with the other IDS-based initiatives. As a result, SCSN fits in seamlessly with dozens of other initiatives, eventually with the possibility of connecting the data spaces resulting in a federated European cloud according to the Gaia-X principles.

Next steps:

Gaia-X knows the concept of labels. If an organisation uses services with a certain Gaia-X label, they have to trust that those services indeed meet the requirements of the respective label. Within the Dutch Gaia-X ecosystem, there are two relevant organisations in this respect. The first one is the Online Trust Coalition (Online Trust Coalitie | Home, in Dutch). The objective of the OTC is to create a

consistent and efficient method for cloud service providers to prove their services are reliable and safe. The other one is NOREA (https://www.norea.nl/english), the professional association for IT-auditors in the Netherlands. The Dutch Gaia-X hub has initiated a project with SCSN, OTC, NOREA in collaboration with TNO (Information & Communication Technology | TNO) to test the usage of Gaia-X labels in practice, within the SDSN environment. This will provide insights that are valuable to elaborate on the label concept and learn how to deploy it in other application areas.

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More info:

www.gaia-x.nl

www.gaia-x.eu

www.DutchBlockchainCoalition.org

https://www.linkedin.com/in/peter-verkoulen-b4632a/

About the author
PETER VERKOULEN

Peter Verkoulen has been working in science, business and government after having obtained an M.Sc. and Ph.D. in Computer Science. He is now working as an independent advisor on building innovation ecosystems & business development and as a speaker and facilitator. Currently, he is serving as the Coalition Manager of the Dutch Blockchain Coalition (DBC). He is also the manager of the Dutch Gaia-X hub on behalf of TNO.

5.3

ORCHESTRATING INNOVATION ECOSYSTEMS – A CASE STUDY ON THE FINANCIAL BIG DATA CLUSTER

The role of hub firms within Gaia-X

Luisa Kruse, Senior Innovation Manager at Fintech Community Frankfurt GmbH(TechQuartier)

Jonas Geisen,PhD at the FINDER project and Centre for Organization Restructuring at Radboud University

Dr. Sebastian Schäfer, Managing Director of Fintech Community Frankfurt GmbH (TechQuartier)

When Gaia-X was initiated, many were uncertain what it would bring: a European cloud service provider, a new platform, open innovation? The project's mission is

> **to create a proposal for the next generation of data infrastructure: an open, transparent and secure digital ecosystem, where data and services can be made available, collated and shared in an environment of trust.**

Its mission is to develop common requirements for a European data infrastructure as a response to the increasing pressure on European business models on a global scale. At this point in time, as we will show, Gaia-X is already delivering on it through various lighthouse projects, such as the 'Financial Big Data Cluster' (FBDC).

Therefore, we deep-dive into the case of the safeFBDC explaining the progress made by highlighting how the project has evolved so far. Stating with the paradigm shift towards ecosystems for open innovation we follow up by shining light on the emergence of the role of an ecosystem orchestrator and the dynamic capabilities that an organization taking up such a role should exhibit. We conclude this with our assessment of innovation hubs being prime targets as ecosystem orchestrators as they promote the competitive advantage of the entire business ecosystem, instead of only their own organizational aims, through its orchestration initiatives. With this necessary fundamental understanding on ecosystems, we unfold the FBDC through our case study of the safe FBDC to showcase how this lighthouse project already successfully implemented an ecosystem to be opened and grown in future endeavours of Gaia-X.

Towards a new paradigm:

ecosystems for open innovation

Digitisation accelerates global structural change in previously unknown dimensions in successive innovative waves (Schwab; 2017). This ever-increasing technological progress has significantly driven down the cost of information processing, storage, and communication costs, a former barrier that keeps

firms from making their optimal decisions when striving for excellent innovative performance (Altman, Nagle, & Tushman, 2015; Hilbert & Lopez, 2011; Koh & Magee, 2006). Instead, the newfound wealth of information and the extractable knowledge imposes new challenges for organisations: the formerly abundance of optimal (or near-optimal) decisions has exploded so that organisations face the dilemma to decide out of a plethora of thousands of (near-) optimal decisions (Altman et al., 2022). To enable themselves to make the best of their options, to reduce the risk of reoccurring failure when innovating, in face of today's rapid technological change firms would need to adapt their process of bringing innovative value propositions to the market. To do so they are bringing down the barriers of competition by moving towards collaboration outside their organisations to a formerly unknown scale. This allows making the innovative process less risky through (1) an increased pool of resources as these can be harnessed from outside of organizational boundaries allowing organisations to efficiently search large solution spaces; and thereby (2) diversification of risk as with a joint resource commitment the sunk costs in case of a failed innovation are decreased. This shift toward the direction of cooperation gives birth to the new paradigm of ecosystems. As a new form of organizing themselves and their environment ecosystems allow organizations, willing to shift paradigm in search of innovativeness, to address today's complex challenges in science and business (Eisenhardt et al., 2016; Davidson et a., 2015).

But what exactly are ecosystems? Back in school ecology taught us that ecosystems are systems of living and non-living interacting components within the same environment. Applying this idea an innovative reader[1] may think about something in the line of the following:

> **Business ecosystems are a network of firms with differing interests bound together as a collective whole such that the fate of its [actors] is bound to the structure of that network and the roles played by its [actors].** *- Tan, Tan & Oh, 2007: 2*

In its most basic form ecosystems are a form to govern a collaborative venture. In other words, ecosystems are a way to organize undertakings with a multilateral set of partners. Historically, we understand collaborative efforts as restricted to a joint value chain as alliances and networks are directly interlinked with a focal firm. In this light competitive instead of collaborative behaviour was the norm

1 Based on Schumpeter (1950 ,1939 ,1934) and more recent Martín et al. (2011) who understand one form of innovation as the application of an established idea to a new context.

when it came to innovative endeavours conducted by organizations of the same kind.[2] While this idea has prevailed for a long time the predominance of strict competition has been slowly losing ground to the idea of partial cooperation (Jacobides et al., 2018; McKinsey and Company, 2015). The strategical behaviour which combines both competitions with cooperation, labelled coopetition, occurs when firms of the same market cooperate in the exploration of knowledge and research while competing in its resulting exploitation (Brandenburger and Nalebuff, 1996). Nowadays, with the backdrop of the risks of the technological transformation, this concept has culminated in ecosystems as they not only bring together competitors but a vast array of different firms - public institutions, corporations, as well as small and medium enterprises or start-ups.

However, there are more factors necessary for such an ecosystem to be of success. First, the participating organisations must work jointly on the same offer of a user value proposition (Kapoor, 2018). Such a common mission makes it attractive for participants to mutually grant access to assets and resources with the aim to create more value for their customers, reduce costs or improve business processes. Second, the ecosystem should be organized in a modular fashion (Shipilov and Gawer, 2020). Modularity is key for ecosystems as it prevents an overdependence on single participants (Jacobides et al., 2018; Baldwin, 2014).

Achieving the missioned value proposition consequentially should not depend on a single participant, instead, the contribution of each actor within an ecosystem should be substitutable by a different actor. This ensures the fulfilment of the value proposition by preventing failure through e.g., the withdrawal of a participant from the ecosystem or an overconfident assessment of a participant's usable capabilities. A good example of modularity is, fittingly, a cloud server that can easily be adapted to customers' needs. Third, directly intertwined is the complementarity of ecosystem participants. Participants should not only be modular but provide complementary capabilities, in form of e.g., innovations, products, or services, with significant interdependencies (Shipilov and Gawer, 2020). Therefore, it is important that the ecosystem not only consists of coopetitors but diverse organizations from e.g., different industries or of different nature e.g., public, or private, established or newcomer. Keeping the example of the cloud server, imagine we use it to host an Operating System (OS) platform with a complementary app. Without the OS platform the app does not work; with the app the OS platform can increase its value (and with increased usage also the value of the app itself). Should an increased usage deem it necessary the cloud server can be adapted in its specifications.

2 This is based on Schumpeters (1950 ,1939 ,1934) work who expected that innovative behaviour is based on the profit expectations during the growth of an industry as the major determinants of a firms growth.

Managing Ecosystems

The emergence and role of ecosystem orchestrators

Ecosystems build in a modular and complementary fashion allow their members, to some degree, autonomy in their activity. Consequentially, the locus of control of ecosystem activities resides outside of the organizational boundaries of single members. An alignment, or more explicitly, a mutual agreement among the members regarding the value proposition but also the positions of and flows between participants, therefore, is necessary.

> **If we are to make strategic sense of innovation communities, ecosystems, networks, and their implications for competitive advantage, we propose that a new approach to strategy [called] 'open strategy' is needed.** *- Chesbrough and Appleyard, 2007: 5*

Accordingly, the underlying strategy determining 'how' to achieve the ecosystem's value proposition, while securing the participant's roles in it, (Adner, 2017) has to be a shared one (Gooyert et al, 2019). To achieve consensus in that matter ecosystems follow an open approach. Such an open strategy can be defined as "an openness in terms of inclusiveness, in other words, the range of people involved in making strategy; and an openness in terms of transparency, both in the strategy formulation stage and, more commonly, in the communication of strategies once they are formulated" (Whittington et al., 2011: 532).

When it comes to monitoring and managing the implementation of the open strategy and thereby the activities between multiple, diverse stakeholders of an ecosystem one has to zoom in on the coordinative interactions of inter-organisational coopetition (Teixeira, 2014; Tsai, 2002). Only when we understand what an ecosystem orchestrator does, we can tackle the question who such an orchestrator should be. Naturally, the tasks for an orchestrator depend on the specific ecosystem, its members, and the value proposition that is pursued. However, to make it tangible for our readers we offer an exemplary set of activities, derived from a study of an ecosystem orchestrator (Reypens et al., 2019), that is likely to be encountered:

- Formulating the ecosystems mission
- Developing the proposal of the value proposition
- Stimulating initial encounters between members
- Bridging stakeholders to build the ecosystem
- Creating small teams for an agile way of working
- Stimulating bottom-up collaboration
- Discussing differences & raising awareness to showcase and utilize complementary
- Facilitating relationships within and outside of the ecosystem
- Assigning roles and a flow
- Providing flexibility to ensure modularity
- Motivating key contributors
- Monitoring progress
- Showcasing the ecosystem and sub-projects
- Showcasing results

These orchestration activities are exemplary as they depict dynamic capabilities such an orchestrator should have. Dynamic capabilities for orchestration are an organisation's ability to purposefully adapt its resources and competencies to handle change in a flexible manner (Eisenhardt and Martin, 2000; Teece et al., 1997). In the case of ecosystem orchestration such dynamic capabilities can be synthesized as (Adner, 2017; Dhanarai and Parkhe, 2006):

1. Connecting; this encompasses tasks revolving around the consolidation of disperse resources & capabilities e.g., knowledge, of members
2. Facilitating; by engineering processes to initiate and grow the ecosystem
3. Governing; in form of overseeing the creation and extraction of value for members.

Having these dynamic capabilities for ecosystem orchestration, or at least exhibiting the ability to build them quickly, is of relevance as orchestration necessitates a leadership role without the benefit of hierarchical authority. Accordingly, the question of how to orchestrate and who should orchestrate an ecosystem is an intertwined question. Recent research has shown these questions should be answered with a decisive 'it depends' (Reypens et al., 2019). Naturally, the orchestration mode can be understood as a spectrum.

On the one end of the spectrum, a core actor (or a small group of core actors) sets the collaborative agenda, recruits partners, and typically relies on formal contracts to steer relationships (e.g., Kazadi et al., 2016) - accordingly, we call this dominating orchestration. On the other end, multiple members collectively negotiate the agenda, membership is often voluntary, and trust predominantly governs relations (e.g., Roloff, 2008) - therefore we call this consensus-based orchestration. Table 1 contrasts the two ends of the spectrum showcasing the strengths and respective weaknesses of both approaches.

Table 2: Dominating versus consensus-based orchestration modes (Reypens et al., 2019)

Orchestration mode	**Dominating**	**Consensus-based**
Vision creating connections	Formulated Set up arranged marriages and blind dates	Negotiated Build emergent teams around key contributors and key challenges
Coordination	Top-down division of work Centralised pooling of innovation efforts	Bottom-up, self-selection into work Decentralised aligning of innovation efforts
Handle plurality	Select complementary partners Create convergence around common goal	Create platform for collaboration Create harmony and awareness of different objectives
Control over outcomes	Set goals and outcomes	Provide flexibility to deviate from goals
Member engagement	Enforced through contracts	Enforced through relationships

As is often the case neither of the ends of the spectrum is optimal. Instead, an ambidextrous approach, mixing both modes, is the most beneficial option. The so-called hybrid orchestration, lending to both sides of the spectrum over the lifetime of an ecosystem allows an orchestration that makes the most use of (1) connecting, (2) facilitating, and (3) governing capabilities. Bringing together the exemplary tasks and orchestration modes allows to showcase that for some practices a certain orchestration mode is deemed more suitable than for others.

As a result, switching between these and using a hybrid approach is optimal. Table 2 depicts this by mapping the aforementioned orchestration tasks to the respective orchestration mode considering the number and diversity of stakeholders in the ecosystem. The activities depicted can be understood as a toolbox of orchestration practices to address distinct challenges an ecosystem faces. The takeaway from table 2 is that different kinds of tasks are more efficiently fulfilled when either conducted by a dominant orchestrator or by a consensus-based group. Conclusively, switching between both modes - hybrid orchestration - ensures the most successful innovation trajectory over time (Reypens et al., 2019).

Table 3: How dominating and consensus-based orchestration help orchestrators address distinct ecosystem challenges brought by the number and diversity of stakeholders (Reypens et al., 2019)

Orchestration mode	**Dominating**	**Consensus-based**
Dominating orchestration	Practices to overcome ecosystem opacity Developing project proposal Assigning roles Stimulating initial encounters Bridging stakeholders	Practices to create a shared representation of the project Formulating project vision Showcasing projects Showcasing results
Consensus-based orchestration	Practices to address collective action problems Motivating key contributors Creating smaller teams Monitoring progress	Practices to increase legitimacy Discussing differences and raising awareness Providing flexibility Stimulating bottom-up collaboration Facilitating relationships

The showcased exemplary tasks provide an understanding of tangible activities the orchestrator, either in form of a focal organisation or multiple members, could utilise to govern the ecosystem. These activities can be understood as

a toolbox of orchestration practices to address distinct challenges through hybrid orchestration to ensure a success of the ecosystem (Reypens et al., 2019).

As some of the exemplary tasks already reflect ecosystem orchestration also necessitates the governance of members on a more intangible level. Bringing together diverse, modular, and complementary organisations under one focal value proposition makes an ecosystem a potpourri of organisational culture.

At the interplay of cooperation and competition, digital business ecosystem orchestration often requires a dual perspective on other seemingly contradictory situations. Wareham, Fox, and Cano Giner (2014), for instance, describe how orchestrators of digital business ecosystems need to balance tensions like openness versus closedness, standard versus variety, or individualism versus collectivism. Accordingly, an orchestrator should be able to set a culture that embraces the value of togetherness ('contributing to a focal value proposition'), working with tensions and contradictions ('embracing dualities') and active acceptance of uncertainty ('working with proto-visions') to set the right tone for successful collaboration. This is, however, not only the task of a single orchestrating entity. Instead, representatives of organisations active in ecosystems, need to achieve a mindset shift from competitive opposites ("them versus us") to a complementarity-oriented attitude ("collaborative but distinct"). As a result, managers in such settings often must build multi-faceted identities and distinguish between their internal corporate role and the role they play with other digital business ecosystem participants (Neudert and Kreutzer, 2021).

Conclusively, the question of how and by whom ecosystems should be orchestrated can be best described as a "translucent hand" (Altman et al., 2022). Situated between the infamous invisible hand of the market (Smith, 1776) and the visible hand of organisational hierarchy (Chandler, 1977) ecosystems are a hybrid form found right between both. While organisations engaging within an ecosystem retain their own agency an orchestrator that shepherds all participants without exploiting them is necessary for guidance. Such a

shepherd has the task to uphold the openness of an ecosystem (Tan et al., 2020; Adner, 2017) by enabling and implementing an orchestration which is both dominating at some and consensus-based in other times.

Innovation Hubs as ecosystem orchestrators

Technological innovation and the rapid development of ecosystems have often been credited with having significant strategic implications for organizations by shifting the competitive landscape and changing the industry's market dynamics. Against this background, so-called hub firms (or innovation hubs) play an increasingly important role for stimulating indigenous innovation to reduce dependence on foreign technology and enhance the innovative capabilities of German and European firms. Considering our foregoing explanations we conclude, in line with literature (Rusell and Smorodinskaya, 2018; Williamson and De Meyer, 2012), that an innovation hub provides the dynamic capabilities required for an ecosystem orchestrator to shapes the ecosystem indirectly rather than through direct command and control. Dynamic capabilities are regarded as key for hub firms orchestrating business ecosystems (Gomes et al, 2018; Helfat and Raubitschek, 2018). Still, most of the existing research focuses on how the hub company achieves its own competitive advantage by leveraging the ecosystem's resources. Only a few studies examine how the hub company promotes the competitive advantage of the entire business ecosystem through its orchestration initiatives.

Looking at the business landscape, in many contexts a hub firm coordinates services for the ecosystem (e.g., Gaia-X, Mobility Data Space). In these settings, the hub firm must coordinate, influence, and manage various players in the ecosystem to create value (Jacobides et al, 2018). Hub firms must balance various tensions, such as tensions between efficiency and inclusion, self-interested motivations, and collective benefits, as well as complexity and high costs. Following this, they need to make decisions while considering what every other active firm in the ecosystem is doing. Hub firms may have control over the technological infrastructure, they may control the brand that determines the value of the ecosystem or regulate access to a given shared platform or community. In this way, hub

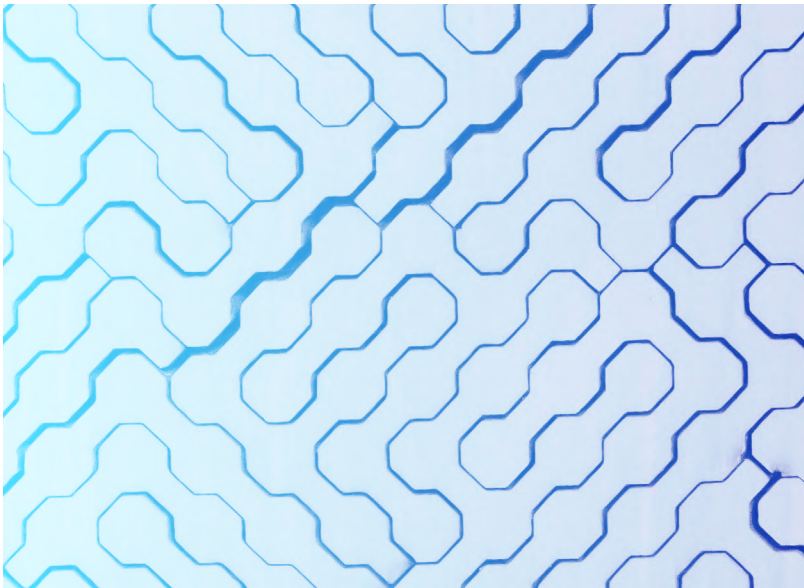
firms are known as ecosystem orchestrators, purposefully building, and managing inter-firm ecosystems by using their prominence and power to perform a leadership role in pulling together the dispersed resources and capabilities of the different ecosystem actors (Scaringella and Radziwon, 2018; Su et al, 2018).

Value creation and capture from the ecosystem are the main goals of the ecosystem orchestrator (Dhanaraj and Parkhe, 2006), which depend on two orchestration processes that a hub firm must perform, namely managing knowledge mobility and innovation applicability. Knowledge mobility is defined as the ease with which knowledge is shared, acquired, and deployed within the ecosystem, and the hub company bears the responsibility for improving knowledge mobility and use of competencies in the ecosystem (Thomas et al, 2014). At the same time, a hub company must also address another key issue, that of appropriateness, to ensure equitable distribution of value among ecosystem actors and to prevent potential free-riding and opportunism (Jabobides et al, 2018).

Case Study: Financial Big Data Cluster

Managed Ecosystems for the Financial Service Industry

The rapid development of technology is presenting financial services providers with major challenges. This particularly applies to the current and future positioning of the financial services industry, as users increasingly ask for digitised services. Accordingly, financial service providers have an increasing interest in platformisation for the exchange of data but face, however, regulative, and cultural challenges that have kept them from exchanging freely (Westermeier, 2020; Hendrikse et al., 2018; Khanagha et al., 2014). For many, the question arises as to whether they want to digitize their business models and if they have the necessary capabilities to do so. Even for organizations that have such capabilities readily available in-house the positioning in newly emerging ecosystems to create new product and service offerings can be attractive. Especially ecosystems that are enabled through an IT infrastructure (Tan et al., 2020) allow innovation at the forefront as they intertwine business and digital processes (Dini and Nachira, 2007). Such ecosystems



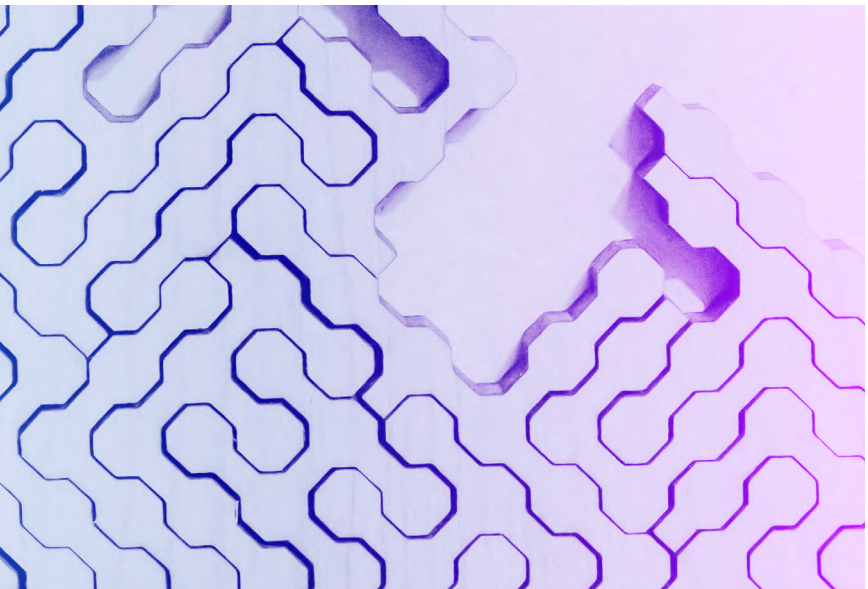
offer benefits as new forms of revenue generation, integration with specialised partners, greater customer retention, or sharing of costs. However, risks must also be taken into consideration ranging from the loss of customer interfaces to data security concerns, reduced margins, or the loss of established business models and brand identity.

According to a recent study, the business interests for participating in ecosystems is particularly related to a rising interest in monetising data (Deloitte, 2021). This comes as data ecosystems have made a significant impact on multiple fronts across organisations in the past, e.g., improving customer satisfaction, increasing operational productivity/efficiency and reduction of costs.

On the other hand, the increasing amalgamation of firms in data ecosystems could also result from perceived weaknesses in European data availability and access, especially among small and medium-sized companies, as well as regulatory barriers. The quest for ecosystems that offer innovative solutions is therefore also a logical conclusion, i.e., a diverse network of value-creating business partners is an essential part of a company's future assets.

Approach and project context

In this article, we present a case study to investigate the orchestration activities of an innovation hub as ecosystem orchestrator and the role of ecosystem-based dynamic capabilities. Case study methodology is preferred when the units of study are not fully understood, complex and hard to isolate from real-life context. It enables detailed tracking of processes that cannot be controlled in the lab and are difficult to find in archival data (Yin, 2013). Building on prior research, we've selected the case of a multi-stakeholder innovation project - the Financial Big Data Cluster (FBDC).



The aim of FBDC, which started already back in 2019, is to build and establish an ecosystem for the sovereign exchange of data between multiple parties in the

financial services industry, focusing on the handling of highly sensitive financial data. The architecture should be aligned with Gaia-X requirements to ensure long-term interoperability.

The main challenge of the FBDC architecture is to integrate and analyse data of multiple private institutions of the financial sector (e.g., Bank A, Bank B, Bank n) but also public institutions. Against this background it is also the declared goal of the consortium (see table 3) to tackle regulatory challenges and derive strategic recommendations for regulators, supervisors, and the public sector, when it comes to societal challenges such as e.g., money laundering. This ecosystem is bound by its set of goals and the project's mission. Within the framework of FBDC, it is to be shown how the European path of data sovereignty can become competitive with the commercialisation of data in the USA and the surveillance approach of China.

During the last 1.5 years, the FBDC ecosystem has grown significantly in the number of partners and use cases, being initialised by the lighthouse project safeFBDC. This research and development project is run by a consortium of selected firms, supported by numerous associated partners covering a large part of the German financial services industry. In order to provide a business foundation for the projects - and thus for the emerging ecosystem - it is necessary to determine incentives and requirements of financial market participants to partake in data sharing and the ecosystem in general. The analysis of these research aspects takes place implicitly within different use cases that have been selected by the ecosystem orchestrator i.e., the potentials, challenges, and incentives that cross-organisational data sharing entails are identified in relation to these use cases. The elaboration of these results will be carried out across organisations by analysing the incentives and requirements for data sharing in a business context from both a technical and an economical perspective.

safeFBDC: From creating competitive advantage to contributing to a focal value proposition

The project duration of safeFBDC amounts to three years (2021-2023). During this time, safeFBDC receives funding by the German federal ministry of economics and climate protection (BMWK). FinTech Community Frankfurt GmbH (short "TechQuartier") was selected as the leading orchestrator (hub firm) due to its neutral shareholder structure and expertise in building ecosystems.

The consortium, which has come together under the leadership of TechQuartier, consists of private sector companies, startups and public institutions. Table 3 summarises the involved ecosystem participants.

Figure 15: Information structure (adapted from Chen et al, 2019)

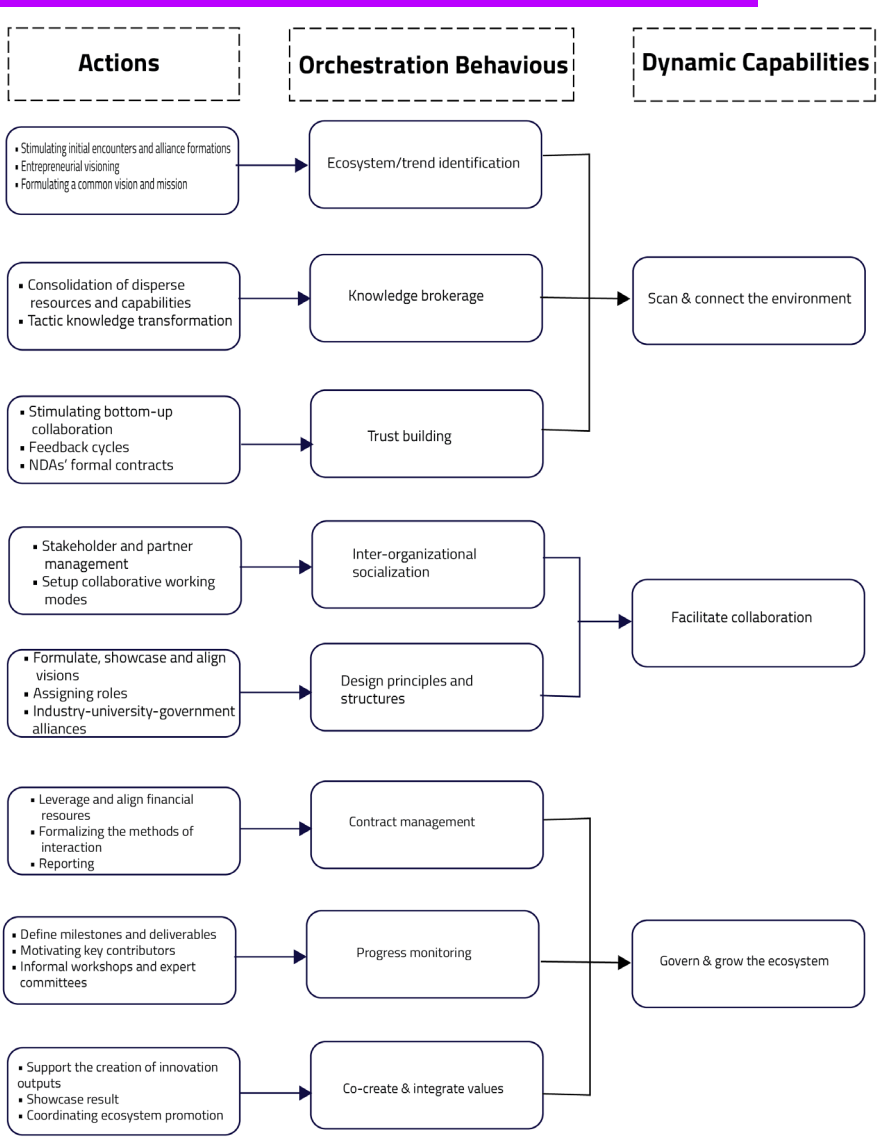


Table 3: List of involved companies, legally bound by a cooperation agreement; *: companies subcontracted by one of the ecosystem participants

Research Institutions (5)	Private Companies (6)	Startups (2)	Public Institutions (3)
Frankfurt School of Finance & Management Technische Universität Darmstadt Fraunhofer-Institut für Materialfluss und Logistik (IML) Fraunhofer-Institut für Software und Systemtechnik (ISST)* Deutsches Forschungszentrum für Künstliche Intelligenz*	Deutsche Börse SAP Fioneer Helaba Landesbank Hessen Thüringen ING-DiBa* Deutsche Bank neosfer TechQuartier	Hawk:AI spotixx	Hessisches Ministerium für Wirtschaft, Energie, Verkehr und Wohnen Deutsche Bundesbank Green & Sustainable Finance Cluster Germany*

The diversity of the project becomes clear when looking at the involved parties: While young companies are often “agile natives”, incumbents have to embark on an organisational transformation journey to be an integrative part of the ecosystem. Balancing clear processes along corporate hierarchies with re-designed agile units and fully experimental setups requires a differentiated understanding of which organisational design optimally contributes to value co-creation (on an ecosystem level) and value capture (on an organisational level). Formally, the cooperation is regulated by a jointly concluded cooperation agreement.

Orchestration activities (Case study findings) / Ecosystem-based dynamic capabilities of the hub firm

As innovation hub TechQuartier plays the important role of the translucent hand in the FBDC ecosystem orchestrating members who seek to create value and extract value from the ecosystem. Following the approach of Chen et al. (2019) in figure 15 we summarise the

key actions of the hub firm with an initial list of first-order concepts, related to the firms' actions. We retrieve this data from TechQuartier employees, which are amongst the authors of this article. We sorted this information and compared it across informants (employees) in order to identify key concepts and relationships among them for identifying second-order dimensions, linking them under orchestration behaviours. These second-order categories enable us to capture a higher level of abstraction and aggregate this into several key factors, namely ecosystem-based dynamic capabilities. Based on existing literature on ecosystem orchestration (Adner, 2017; Dhanarai and Parkhe, 2006) we map the orchestration behaviours to existing dynamic capabilities of orchestration. Furthermore, we adjust these based on our observations of capabilities exhibited by the hub firm.

Scanning and connecting the environment is a major orchestration capability of hub firms such as TechQuartier. It is key to combine the knowledge of their own and related complementary asset providers (e.g., start-ups) to identify trends and capture opportunities in response to the external environment and for the enhancement of the ecosystem. This capability implies that the hub firm can assess and select appropriate partners for the ecosystem formation. In the context of safeFBDC, TechQuartier was for example responsible for stimulating initial encounters and formulate a common mission, which also requires a certain level of entrepreneurial visioning. This mission defines the projects value proposition, binding together the ecosystem. Being driven by this value proposition allowed TechQuartier to build and understand the ecosystem in a structuristic approach, meaning that the vision defines further activities (Adner, 2017). Furthermore, we find that the capability of scanning and connecting the environment is comprised of knowledge brokerage and trust building. The former is another key factor for hub firms to sense external opportunities, to evaluate trends and to derive strategic recommendations. TechQuartier adopted several tactics for knowledge brokerage, including but not limited to brownbag meetings, expert lectures, roundtables, and research forums. The latter, trust building, includes for example measures for stimulating bottom-up collaboration. For innovation ecosystem, trust is crucial for the strengthening of ecosystem identities among related partners, underpinning them to cope with the uncertainty of external environment. In the case of FBDC, the neutral shareholder structure of the orchestrator, i.e., the hub firm, is a central advantage and simplifies the paths for trust building, which include feedback cycles and formal contracts.

The capability of facilitating collaboration allows hub firms to organize the ecosystem actors in appropriate ways to leverage and gain essential resources for developing products and services, i.e., the innovation outcome (Jacobides

et al., 2018). According to our case analysis, we find that this capability contains inter-organizational socialisation and the design of principles and structures. To broaden inter-organizational socialisation it is an important task for the hub firm to strengthen communication and collaboration across regions, countries, and competitors. In the previous sections we have already outlined that this is a critical challenge for the ecosystem and its inherent coopetition. In our case, the inter-organisational socialization was even more challenging, since, until April 2022, due to the Covid-19 pandemic, no or very few physical meetings have been possible.

Against this background it was necessary to identify other ways of communication and collaborative working tools (e.g., virtual workshops and alignment meetings or secure communication platforms and messenger services). To fully leverage the ecosystem members and strengthen the innovation appropriability, the hub firm should also employ several design principles and structures. Consistency in alignment and decision-making processes can have a strong positive impact on voluntary cooperation and discourage hoarding of ideas (Dhanaraj, Parkhe, 2006). In the case of safeFBDC, work-breakdown structures, i.e., the formation of smaller teams, individual milestones and deliverables have been enforced, as depicted in figure 16. This was also necessary due to the diversity of thematic focal points.

Each organisation holds specific roles and individual tasks. The regular meetings and open discussions of designated organisational representatives result in a dense, highly decentralised, and inclusive

Figure 16: Work-breakdown structure of safeFBDC (simplified)

form. From the experience of TechQuartier, it is also apparent that more robust relationships can be built by a hub firm enforcing multiplexity, meaning that more than one relationship occurs at the same time within an ecosystem (Dhanaraj and Parkhe, 2006). Increasing multiplexity can help to expand the scope of relationships so that firms interact more broadly and deeply with each other. In our case, TechQuartier keeps establishing alliances between industry partners (start-ups and corporates), universities, research institution and the local government and thus generates coopetition between partners by coordinating ecosystem activities.

Another important capability of the hub firm is to govern and grow the ecosystem and oversee the creation and extraction of value for actors of the joint value creation. According to our case analysis we find that contract management, progress monitoring, co-creation and integration of values are associated with this capability. In ecosystems, joint asset ownership, e.g., intellectual property right sharing with ecosystem partners, is particularly effective at joint problem-solving arrangements and innovation appropriability enhancement (Dhanaraj and Parkhe, 2006), so that self-interested motives can be aligned with common interest. In our case, formal contractual arrangements have been adopted in the interest of the ecosystem participants which sets rules for the distribution of joint value outcomes.

This, however, limits to some extent the openness of the ecosystem, representing a bureaucratic barrier to the inclusion of additional ecosystem participants. TechQuartier oversees the contract management as the orchestrating hub and formally manages the ecosystem participants. The case of FBDC shows that progress monitoring is another important task of the hub firm, yet not an easy one. There exist several tensions, including the need for efficient operation vs. member involvement, the conflict between individual and whole interest or the equilibrium between complexity and high coordinating costs (Tiwana, Konsynski, and Bush, 2010). Thus, actions need to be selected carefully to motivate the key contributors and stimulate collaboration. It is fundamental to the hub firm to support the creation and integration of innovation outcomes to further grow the ecosystem. According to our case analysis, these actions can be manifold, ranging from promotional activities (e.g., fairs and exhibitions, social media presence) to acceleration formats (e.g., hackathons) or coordinating the relationships with local governments or related public initiatives.

Conclusion

The prominence of digital business ecosystems in today's economy raises questions about how to support collaboration between multiple, diverse stakeholders and, in the narrower sense, emphasises the importance of ecosystem orchestration to make the digital business ecosystem flourish. Not every company is in a position or has the capabilities to be an orchestrator. You cannot unilaterally choose to be the orchestrator, but rather you need to be accepted by the other players in the ecosystem. The orchestrator should occupy a central position in the ecosystem network and have the ability to coordinate effectively. As stated earlier in this article, the orchestrator should be perceived as a fair choice by the other members, not as a competitive threat. Ecosystem orchestrators, such as TechQuartier, build ecosystems, encourage others to join, define standards and rules, and act as a mediator in cases of conflict. Nonetheless, one has to face the limitations both inhibited by the chosen orchestrator as well as the ones imposed by the environment of the ecosystem. In case of the FBDC this means (1) legal restrictions that bound the scope of the ecosystem; (2) a lack of resources e.g., manpower and capabilities e.g., technological expertise of the hub firm and the ecosystem partners; and (3) the restrictions imposed by the limited external funding scope led to part of the initial value proposition being externalized into a new sub-project. In front of the Gaia-X backdrop the safeFBDC project in its light-house-project function is already on a good way to accomplish the vision of a joint standard through its interdisciplinary structure and the joint approach from the ecosystem. Finally, it is important to mention that a successful ecosystem not only needs orchestrators, but also contributors to create something new and valuable. At best, these should be innovative and have the capability to lead the ecosystem to new perspectives and products.

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Dr. Sebastian Schäfer, is an experienced entrepreneur and ecosystem builder. As co-founder and Managing Director of TechQuartier and as the former head of the business incubator at Goethe University, he has spent the last 10+ years building up the startup scene in the Frankfurt Rhine-Main metropolitan region. He is also involved as an advisor, business angel and co-partner of Pitch Club GmbH.Sebastian's academic background includes degrees in economics and Japanese studies from the University of Tuebingen and a doctoral degree in behavioral economics from the University of Frankfurt. He is associated with the Center for Leadership and Behavior in Organizations and The Frankfurt Laboratory of Experimental Economics at Goethe University. Plus, Dr. Schäfer continues to lecture at Goethe Business School, Frankfurt School of Finance and Management and on event stages around the globe.

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Jonas Geisen is currently a second year PhD candidate in Strategy at Radboud University Nijmegen. As a researcher of the FINDER project he is a fellow of the Marie Curie Initial Training Networks (ITN) under the umbrella of Horizon 2020. Since, Jonas is a member of the Centre For Organization Restructuring his research focus has been on corporate development and ecosystems. He explores corporate development strategies encompassing mergers & acquisitions, alliances, and divestments and how their temporality as well as motive impacts firm performance. His interest in ecosystems, as new business model, lies in their structure and orchestration.

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5.4

AUSTRIAN COMMUNITY SETS SAIL FOR A PAN-EUROPEAN DATA ECOSYSTEM. WORK OF THE AUSTRIAN GAIA-X HUB COMMENCES WITH THE INAUGURATION IN MARCH 2022

After almost two years of preparation and intensive project work involving numerous key stakeholders, the Austrian Gaia-X Hub was launched in April 2022. The project aims to accelerate European data ecosystems for economic, ecological, and societal value creation.

Helmut Leopold, Chairman of Gaia-X Hub Austria, and AIT Austrian Institute of Technology

After almost two years of preparation and intensive project work involving numerous key stakeholders, the Austrian Gaia-X Hub was launched in April 2022. The project aims to accelerate European data ecosystems for economic, ecological, and societal value creation.

Preparation for the establishment of the Gaia-X Hub Austria took almost one-and-a-half years of careful work to ensure the involvement of a broad stakeholder community from industry, SMEs, public administration, science & research, infrastructure & service providers.

As a first step, a selected stakeholder group defined the potential content, goals, and organisational forms. The participants in this working group included several ministries, such as the Austrian Chamber of Commerce, the Federation of Austrian Industries, ICT Austria, Data Intelligence Offensive (DIO), Platform Industry 4.0 (PI40), Open-Source Business Innovation Group (OSSBIG), Kompetenzzentrum Sicheres Österreich (KSÖ), Internetoffensive Österreich (IOÖ), EuroCloud (ECA), ACOmarket, the Austrian Institute of Technology (AIT), and representatives of the Gaia-X flagship project EuProGigant as well as several other organisations. The broadest possible support for the further measures was thereby already ensured at this stage. During the preparatory phase, the initiative was known as Ö-Cloud, and it was already an element of the extensive digitisation initiatives of the Republic of Austria.

Initiated by two Austrian ministries, the Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the Ministry for Digital and Economic Affairs (BMDW), an ambitious group of organisations, initiatives, and companies formed a management board, including an advisory, domains, and working groups to jointly contribute to the Gaia-X goal of a pan-European data ecosystem.

Organisation of the Austrian Hub

The approach of directly involving many relevant stakeholders in the development and work of the Gaia-X Hub from the very start was also applied to the organisational structure of the Austrian Hub. The Hub is centrally led by a six-member Management Board appointed by the two involved ministries: Georg **HAHN**, Tobias **HÖLLWARTH**, Helmut **LEOPOLD**, Roland **SOMMER**, Christian **TAUBER** and Günther **TSCHABUSCHNIG**. Each member was able to appoint a deputy. The Management Board steers the operational working groups and reports to the funding ministries.

In this regard, Helmut Leopold of the AIT (Austrian Institute of Technology) was chosen as Chairman of the Management Board. The AIT is the largest non-university research institution in Austria (with 1600 employees) and is highly experienced in handling international research projects. Georg Hahn of OSSBIG (Open-Source Business Innovation Group) was elected Vice-Chairman.

Management Board including support staff. From left to right: Mario Drobics (AIT), Michael Fellner (PI4.0), Georg Hahn (OSSBIG), Helmut Leopold (AIT), Roland Sommer (PI4.0), Nina Popanton (DIO), Tobias Höllwarth (EuroCloud), Günther Tschabuschnig (DIO), Gerald Steiner (ICT Austria), Christian Tauber (ICT Austria).

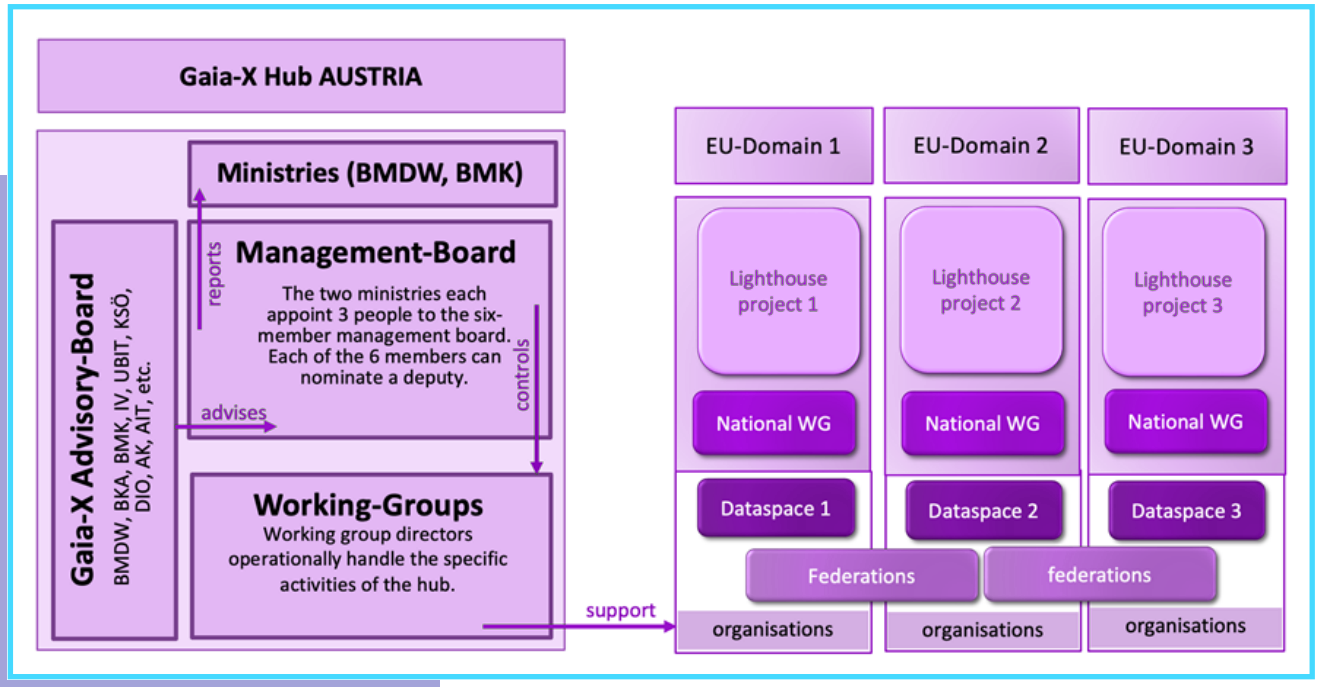

Figure 17: Organisational Structure

Besides the Management Board, an Advisory Board was established to support the Management Board in an advisory capacity. This board includes relevant representatives from the civil society, as well as from business, science, and public administration, thereby ensuring a strong multiplier for all of the Hub's activities. In addition, this is intended to ensure that all activities and initiatives already underway in the field of the data economy can be identified early on and thus supported by the Gaia-X Hub.

Austria's existing data initiatives

Austria has a strong history and background when it comes to data-driven innovations, data markets, and a functional data service ecosystem. Nearly ten years ago, the study Conquering Data in Austria elaborating the Austrian Intelligent Data Analytics Roadmap delineated the path to a sovereign, secure, and trustworthy data economy. The Data Market Austria lighthouse project achieved a significant milestone on this path. The first important principles concerning data sharing, data exchange, and (in monetised form) data trading were set out. In addition to its results, the Data Market Austria project generated two important lessons for the future path of the data economy in Austria: Namely, that the consensus in the data community had to be strengthened and that software solutions needed to be fully geared toward sovereignty, security, and trustworthiness.

Preparatory activity

for initiation of the Gaia-X Austria Hub

The Management Board is working intensively on important directives, such as the vision and mission of the Austrian Hub – and above all on its proposition for generating added value for the Austrian data community as soon as possible. With this full-speed approach, it will be possible for Gaia-X Hub Austria to begin its full operational activity in June 2022. For this purpose, the core team of the Hub draws on the broad support of the community in the form of the Advisory Board, but also on that of all other interested organisations and companies. With the existing networks of partners along with the strong base of the Ö-Cloud initiative, there are no major obstacles to this collaborative next step towards value creation.

Austrian Hub – the Gaia-X deep dive for Austria begins

In this context, the Austrian expertise is concentrated on targeting economic, ecological, and societal value creation.

Through the Austrian Gaia-X Hub, key innovations in terms of infrastructure and frameworks related to data sharing, data spaces, data markets and the ecosystem will be anchored in the national economic, political, and societal environments. An important example of the economic added value of Gaia-X is provided by the Gaia-X lead project EuProGigant.

This project is developing a data space for Manufacturing and Industry 4.0 with four use cases and a strong focus on SMEs. The four use cases are CO2 footprint in production engineering and manufacturing, component matching for optimal resource use and minimal waste, mobile processing machines, and a validation platform for monitoring machines without compiling a large database.

Stronger together – invitation to collaborate with Gaia-X Hub Austria

Figure 18: Graphical Representation of EuProGigant Use Cases

It is a well-known fact that data do not stop at national borders, and that data-driven services and products need to be feasible for the pan-European data community to create sustainable added value. It is, therefore, our goal to strengthen our outputs and outcomes through strong collaboration with other national Hubs. We warmly invite you to get in touch with us for further discussions.

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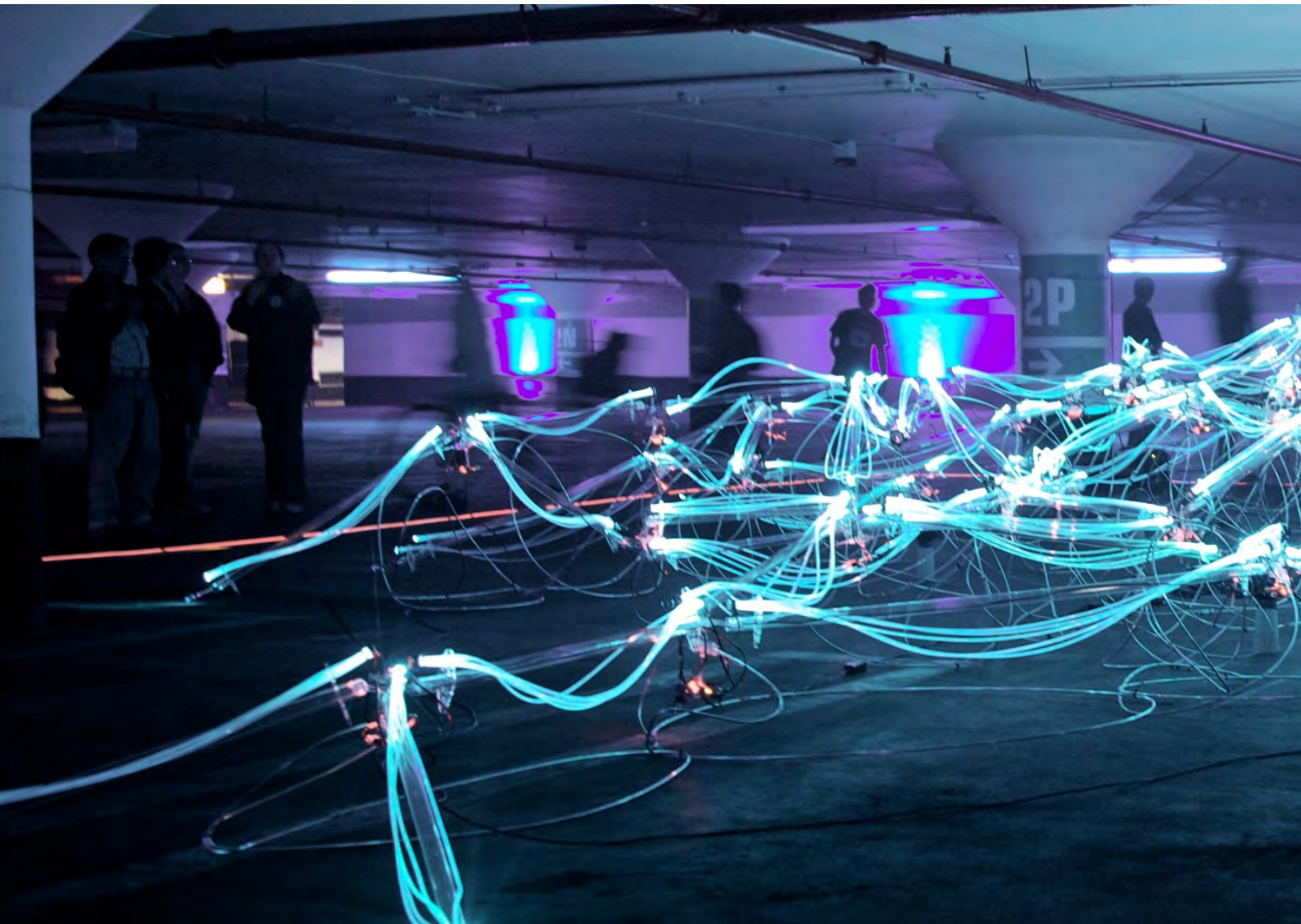
Helmut Leopold has more than 30 years of experience in the IT and communication technology market. Currently, he is with the AIT Austrian Institute of Technology where he heads the Digital Safety and Security Center. In this role, he is responsible for the digital research programme covering areas such as artificial intelligence and data science, cyber security, and IoT systems among others.



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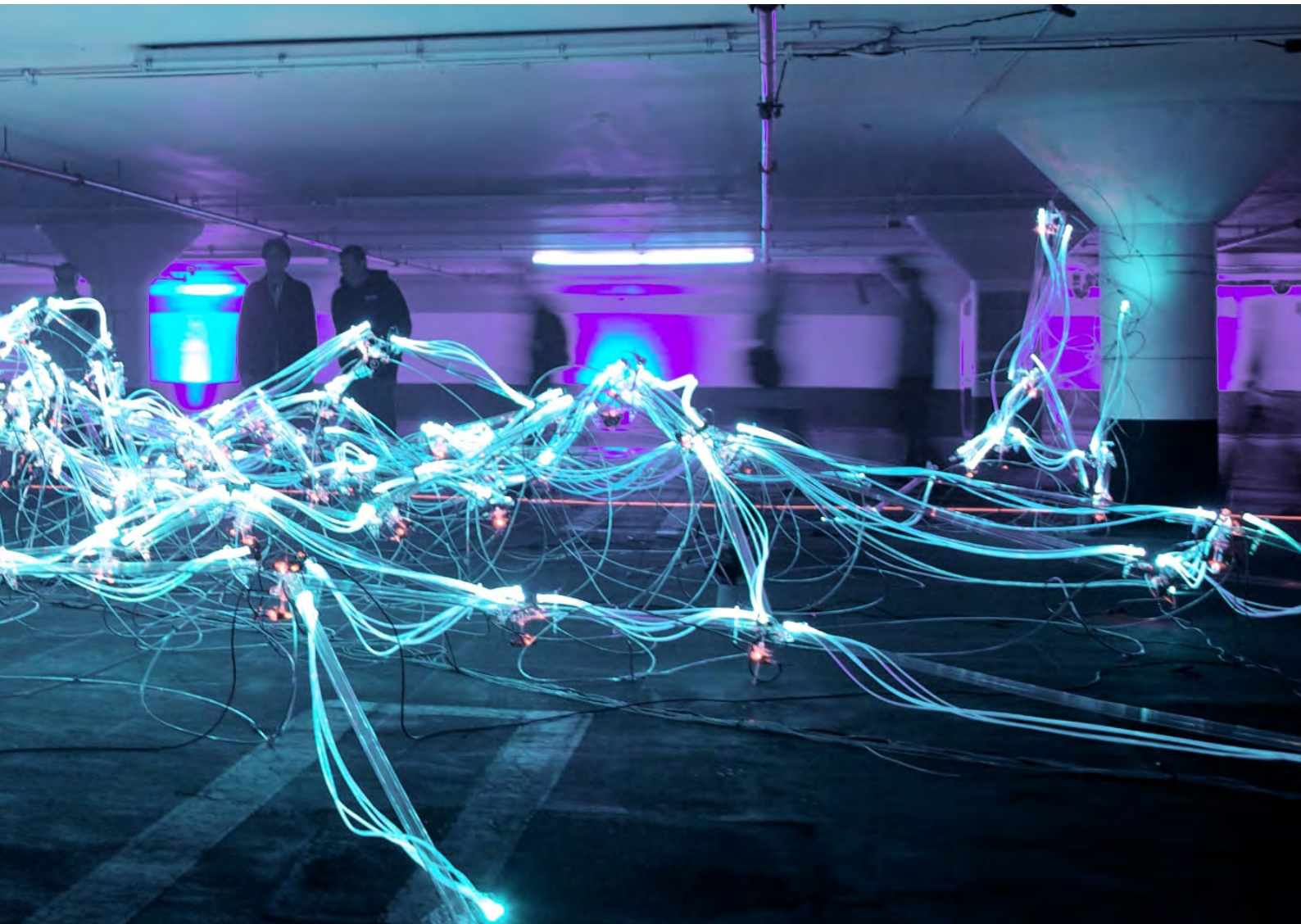
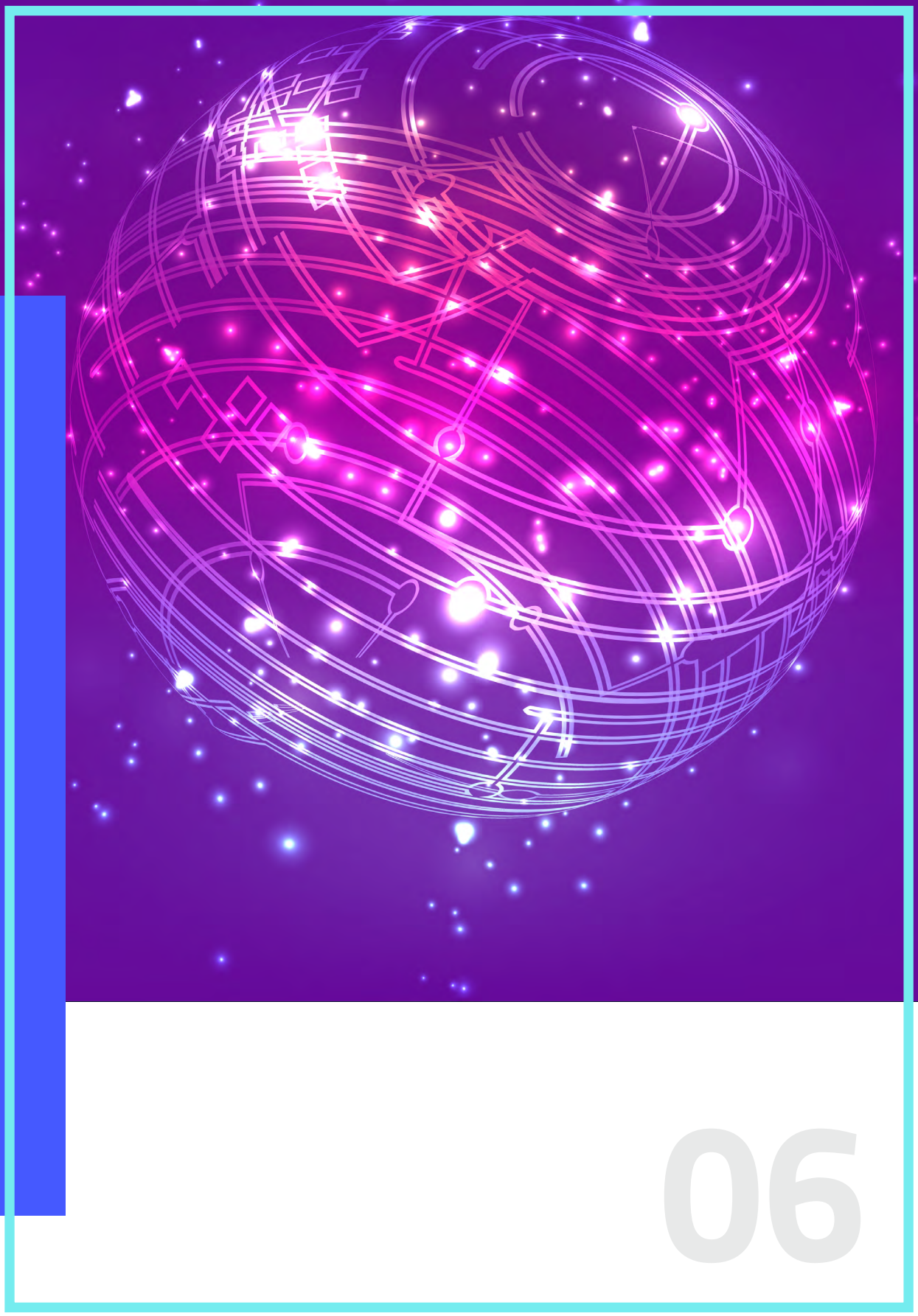


06

Gaia-X and the Private Sector



06

6.1

COMPANIES, USE YOUR DATA!

Companies can increase their success if they use their own data. The data use allows them to analyse and improve their processes. It can also be advantageous for companies if they use data jointly with other companies. This makes supply chains more transparent and efficient, allowing them to respond flexibly to market changes.

Barbara Engels, Senior Economist, German Economic Institute

> **But do companies actually see these benefits?**

To find out, a survey was conducted in the fall of 2021 among 1.002 German companies in the industrial and industry-related service provider sectors. Jan Büchel and Barbara Engels published the results in the study "Datenbewirtschaftung von Unternehmen in Deutschland" (available only in German;).

Only 29 per cent are ‘data economy ready’

To be able to pass on data to other companies or receive it from others in an efficient manner, companies must be able to manage their data efficiently themselves (‘data economy readiness’). According to the study, a company is data economy ready if it is advanced in the areas of data storage, data management and data use, i.e., if it covers as many as possible, but on average, at least half of the aspects relevant in these areas (cumulative model). ‘Data economy ready’ therefore means that the company stores many different types of data, fulfils many different elements of efficient data management, and pursues many different purposes with the use of data.

Most of the companies surveyed in Germany are not able to manage data efficiently. Only 29 per cent of companies have the prerequisites to do so. Medium-sized and large companies are ranking far better than small firms.

Only 27 per cent manage data jointly with other companies

Given the low prevalence of the ability to manage data efficiently, it is not surprising that joint data management with other companies does not play a role for 73 per cent of the companies surveyed. When companies do share data, it is primarily because they receive and use data from other companies, not because they share their data with other companies. 18 per cent of the companies surveyed say they are more likely to be data receivers, 2 per cent are more likely to be data providers and 7 per cent are equal parts data providers and data receivers.

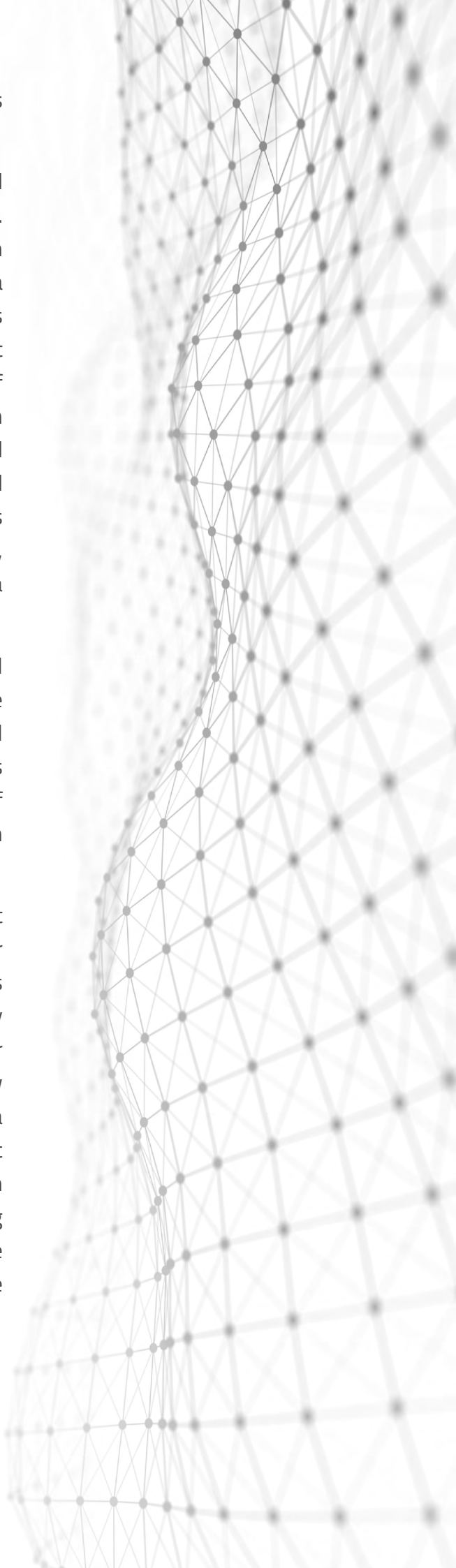
Data is most often shared with direct suppliers or customers: Nearly three-quarters of companies that share data say they receive data from direct suppliers or customers. Just over half say they provide data to them. In direct contact, data sharing is often what makes collaboration possible in the first place: customers communicate their requirements and suppliers communicate information about outstanding deliveries mostly in the form of digital data. The lower share of data providers compared to data receivers is explained by companies that are afraid of losses, due to the resulting transparency. They may be afraid of unauthorised

parties gaining access to information that the company does not want to share.

Legal barriers, in particular, prevent the companies surveyed from sharing data (68 per cent mention legal barriers). The most frequently cited legal obstacle is data protection concerns. Even a few years after the European General Data Protection Regulation (GDPR) came into force, which has unsettled many companies, data protection still tops the list of legal obstacles. It is unclear whether data protection itself is actually the obstacle or whether companies are uncertain about which data protection rules apply. It can be assumed that better information about data protection rules would imply that data protection would no longer be perceived as an obstacle. In fact, the GDPR only applies to personal data, which is presumably not the focus of companies' joint data management activities.

Much less relevant than legal barriers are organisational barriers, which are cited by 26 per cent of the companies. The greatest organisational obstacle is a lack of organisational knowledge. Above all, a lack of data governance often leads to poorly organised data. It can be assumed that a lack of organisational knowledge is not entirely separable from technical obstacles.

Economic and technical barriers are each cited by 22 per cent of companies. The biggest economic barrier is the unclear benefit of data sharing, followed by concerns about business success and the lack of a suitable business model. For many companies, there appears to be no economic need to consider what joint data use might look like. Correspondingly, few companies say they are continuously looking for new data use opportunities. However, especially in the area of joint data use, there is a lot of trial and error and experimentation to be done to leverage synergies. Possibly complicating matters is the inability of companies to determine the value of their data to other companies and derive an appropriate data price based on that.



The biggest technical barrier is the lack of standards for data sharing (67 per cent). Standards are central to (automated) communication and transactions in the digital space. Agreeing on standards is often a lengthy process. This problem is to be solved as part of the Gaia-X initiative. Overall, technical barriers play a surprisingly minor role. The technical foundations for shared data management seem to already exist, or companies at least know how to acquire them. This makes it seem all the more urgent to mitigate the barriers in the other areas.

Companies must have room for experimentation

As a result of the low level of data sharing, a great deal of value creation potential remains untapped in Germany. One problem is how companies handle their data. It is neither sensible nor possible for all companies to be exclusively data-based. But it is crucial for the future viability of companies that they know what data they are collecting and that they store and process it digitally securely and in tested quality. Only then can they recognise and use the data treasures in their company, for example, to improve processes and products, or to be able to offer them to other companies if necessary.

Companies must have the leeway to experiment and examine where they can proceed in a data-based and digital manner and where it makes sense to remain analogue and where the analogue can be combined with the digital. This is the only way companies can survive in international competition in the long term. If companies recognise the potential of using data, likely, they will also be more open to joint data use: both as data receivers and as data providers. It is not

equally useful or meaningful for all companies to share data with other companies. But every company needs to explore this option. The Gaia-X infrastructure will provide companies with opportunities to explore their data potential.

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6.2

TELLUS: A FEDERATED NETWORK INFRASTRUCTURE FOR CRITICAL APPLICATIONS

Alina Rubina, Researcher in Product Research and Development at DE-CIX

The rapid digital transformation enabled by cloud computing and the wide adoption of software as a service application is putting a strain on the underlying network infrastructure. In particular, data processing for critical business use cases has very stringent requirements in terms of latency, bandwidth, resilience, security, availability and trust that cannot be fulfilled over the public Internet that runs on the best-effort principle.

A consortium of 10 companies led by DE-CIX, the world's leading operator of Internet Exchanges, has the objective to provide innovative solutions to these network challenges with the project under the name "Tellus". The project has received official funding from the German Federal Ministry

of Economic Affairs and Climate Action for approximately 8.75 million Euros, provided through the funding competition on

Innovative and Practical Applications and Data Spaces in the Gaia-X Digital Ecosystem

The goal of TELLUS is to provide Gaia-X network infrastructure for critical applications through a Gaia-X compliant interconnection platform.

The vision of Gaia-X is the creation of a secure and federated data infrastructure to establish sovereignty in data ecosystems. The goal of the Tellus project is to extend and enhance the data infrastructure of the various cloud ecosystems with a powerful interconnection and integration of heterogeneous networks. TELLUS, embedded in the larger Gaia-X ecosystem, further strengthens competition and uses an innovative approach to reduce, among other things, the monopolistic tendencies of hyperscalers.

Taking into consideration the uses cases of the partners (Mimetik, Trumpf and IONOS) involved in the consortium, DE-CIX plans to develop a network instance to satisfy the critical identified requirements for seamless end-to-end networking for hybrid cloud services, which today have a poor performance and are cost and time-intensive to set up as they require the data transport over the Internet through a chain of different providers (CSP, data centre, cloud exchange, carriers, enterprises). Many companies and users can therefore benefit from better network infrastructure and use the evolving digital

transformation as an opportunity to enable new use cases and new business avenues while maintaining data sovereignty.

The implementation will be realised with the TELLUS overlay, which is set up and managed by the users as a virtual, cross-cascade routing via various network and cloud service providers (see Fig. 1). Scenarios involving a cross-infrastructure and overlay services with distributed workloads spanning from the end customer with their own edge cloud via various network and IXP providers to one or more cloud providers

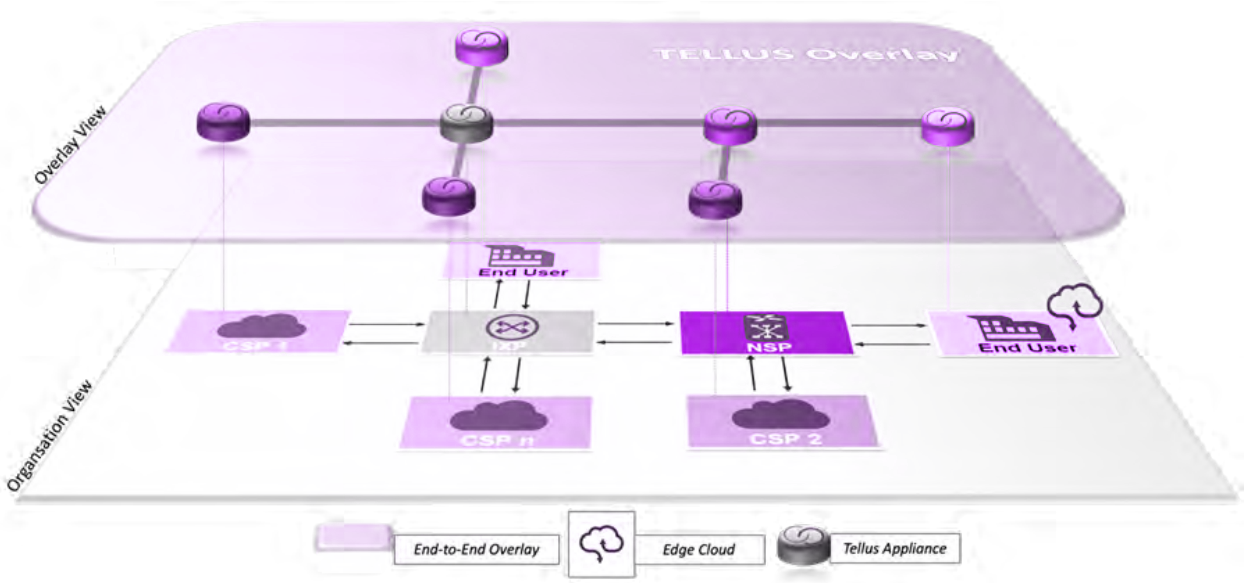


Figure 19: Tellus overlay for an end-to-end connection with guarantees.

can be implemented and orchestrated according to the desired requirements thanks to the guaranteed level provided by the project.

The consistent removal of the interoperability hurdles enables data exchange across providers and applications and will be developed within the framework of the domains identified with the innovative Tellus use cases. Security will occupy a central role and will be considered at all stages from the design to the final operational phase.

To achieve its desired technological goals envisages the composition of services from the network and the cloud layers. This includes a smooth instantiation of cascaded services, as well as constant monitoring and log analysis to comply with the level guarantees and integrate options for rapid fault clearance.

Its appliance (fabric and connector) enables an overlay that can be set up between customers, various networks and cloud providers. All the

relative components will be initially designed as a software that is as portable/containerisable as possible, which can be supplemented with standardised network components as required.

However, any ambitious endeavour comes with significant scientific and technical challenges. In particular, the most important identified so far are the following:

1. Standardisation and unification of interfaces and data exchange formats over the network

2. Cross-network optimisation of setups based on distributed monitoring data

3. Automation instead of manual processes

4. Illustrations of sophisticated industrial use cases

5. Design of solutions in accordance with the Gaia-X architecture

The first challenge is also addressed by the subWG Infrastructure Service Characteristics that is working on the unified attribute vocabulary with the help of which different infrastructure services, including network, interconnection, compute, and storage can be described.

About the author
ALINA RUBINA

Alina Rubina holds a Master Degree in Communications and Signal Processing from Technische Universität Ilmenau (TUI). Before DE-CIX she worked as a research assistant, supervising students and participating in the teaching process. Her research was focused on creating efficient trajectories for drones, such that smartphones can be localized more efficiently. After her studies, she joined DE-CIX, the operator of the largest Internet Exchange Point (IXP) in the world in Frankfurt. She is a member of the DE-CIX research team and works on product development and current research projects, analyzing network data, attending conferences and supervising students. Currently, she is managing Gaia-X related project activities in DE-CIX, participating in Technical Committee, Architecture Group and is leading the Infrastructure Service Characteristics Group.

6.3

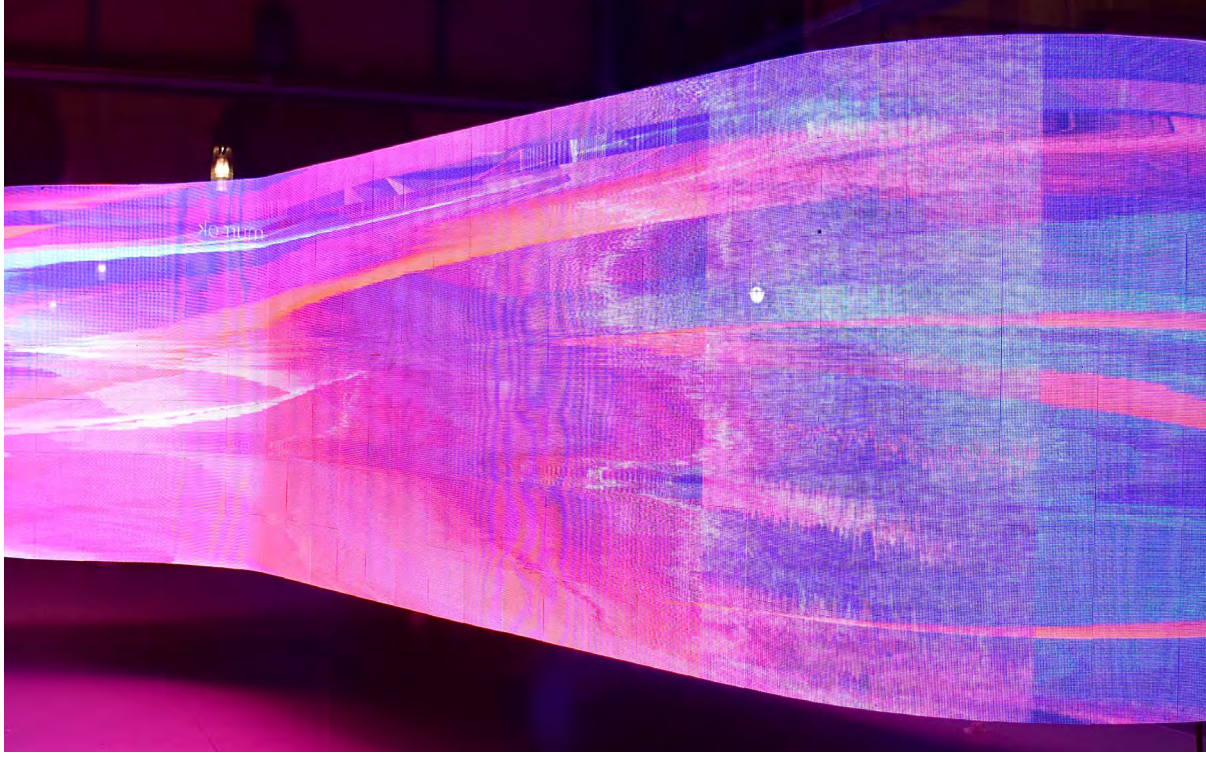
FOUR MYTHS ABOUT Gaia-X

Andreas Weiss, Head of Digital Business Models at eco and Director of EuroCloud Deutschland_eco

Thomas Sprenger, copywriter and consultant

That Europe is lagging behind in digital technologies already seems like its natural state to many. The announcement of state-funded projects earns little more than routine ridicule – especially when the name of the project borrows from mythical figures.

From the very beginning, Gaia-X has been given unflattering labels –"cargo cult", "castle in the clouds", "innovation-less state cloud" and, of course, "paper tiger". But the project's advocates are not giving up -on the contrary: there are more and more of them in the many EU Member States, dozens of pilot projects and numerous industries. This year, the first components of the Gaia-X code are being created. Time to clear up a few myths and misunderstandings.



A new Euro-hyperscaler

doesn't even stand a chance against the US clouds!

Yes, that's right. Nevertheless, this paragraph is not over yet. In fact, some of the initiators may have initially flirted with the idea of building a European Airbus for the cloud. The political context may also have caused misunderstandings. Months prior to the announcement of the project, the German minister responsible, Peter Altmaier, had presented his Industrial Strategy 2030, which recommended building national and European champions.

However, Gaia-X will not become a commercial competitor to the established public cloud hyperscalers. Because Gaia-X is an ecosystem, not a platform. But what is the difference?

The term "cloud platform" means the technical infrastructure of a single provider. It consists of a network of data centres, various software tools and front-ends. A platform business model aims to attract as many customers as possible, who ideally also satisfy their entire IT needs with one provider. The disadvantage: Such a vendor lock-in makes switching to the competition, let alone orchestrating different platforms, challenging and expensive for customers.

As a "cloud ecosystem", Gaia-X pursues the opposite strategy: through common rules, standards and open-source technology, Gaia-X makes the platforms of different providers cooperative and interoperable. This makes it easier for customers to combine offers and share data securely and transparently with partners across platform boundaries – this is the key to the data economy. The right strategy for Europe's digital transformation is, therefore, not another hyperscaler only under the EU flag, but an ecosystem: by committing all providers – especially also from outside Europe – to common frameworks according to European specifications.

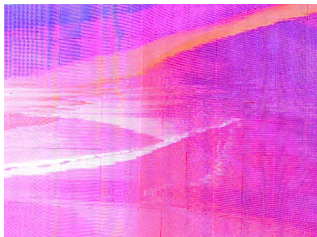
The large public clouds already offer all of the functions. A copycat project cannot win over the market

The problem with this point of criticism is the perspective on a single cloud: Gaia-X was not launched because one or the other US cloud offered too few functions. As an ecosystem, Gaia-X looks at the entire market for cloud services in Europe. The goal is new functions and rules for the interaction of all providers and customers. In short: it is about framework conditions for the market, not about a few features.

Above all, the project wants to improve the freedom of choice for customers in the selection and combination of cloud services, all while promoting innovation. This is where the hyperscalers have a blind spot: their platforms are designed as general-purpose clouds. Their business model focuses on mass-market and scalable applications.

However, Europe's economic strength is not based on streaming services, e-commerce platforms and social networks, but on the complex value chains of its highly specialised service and industrial companies. In order to digitise this network of cooperation between specialists and hidden champions, innovation is needed in a thousand niches. Here, services do not "scale" as they do in mass markets, which makes them economically uninteresting for Silicon Valley.

Accordingly, market researchers see a strong trend towards specialised industry clouds in Europe. Gaia-X is creating the necessary framework conditions for this demand, most recently through the tendering of corresponding Gaia-X Federation Services. With these, industries can technically implement their own requirements for an industrial cloud.



Gaia-X is a state-planned economy and, therefore, has no chance of success

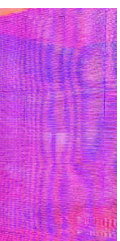
This reproach is an expression of false expectations of state-funded research and industry programmes. The development and marketing of products are, of course, best left to companies. This also applies to cloud platforms. The state, on the other hand, can improve the conditions for innovation by providing financial support for basic and applied research. For example, fifteen years ago, the Theseus IT research project created numerous patents, business models and services around semantic search technologies – but not a new Google.

The claim that Gaia-X is just a planned economy implies that state bureaucracy dictates everything without dealing with the reality of the market. This is precisely not the case with Gaia-X. The project is not just a small consortium of a few large companies that use up the millions in funding among themselves.

In addition to the Gaia-X Association for Data and Cloud (AISBL) in Brussels as the association and institutional core, over 340 user companies and organisations from business and science make up the second pillar of the project. They organise themselves into national Hubs at the level of the EU Member States in order to adequately reflect the specifics of the different economies. For their industries and subject areas, the members work out their particular requirements for a European cloud and data infrastructure. This is done not only in the national Hubs and working groups but also in over 70 pilot projects from ten sectors in 17 EU member states.

The focus is always on concrete benefits through the use of Gaia-X: i.e. economic added value for companies, but also progress for research, administrative processes, in healthcare or the everyday lives of citizens. The perspective of a single cloud provider, however large, is not enough to achieve this.

> **That is why Gaia-X is not a solitary cloud platform, but an ecosystem that strives for digital progress for many areas of society in Europe.**



Gaia-X has too many stakeholders involved. This makes the project cumbersome and slow

The range of stakeholders and interests is indeed a challenge. But it is necessary. Because it also gives the project its legitimacy. Let's remember: **Gaia-X is not about new features for a cloud platform, but about framework conditions for the entire cloud market in the EU.**

In this respect, **Gaia-X is also a political project. And that is precisely what the cloud market has lacked so far: fair rules for all.** These should not be decided solely by the Boards of Directors of a few commercial providers, especially those from outside Europe. After all, the future technologies of the 21st century, such as artificial intelligence, networked industrial production, telemedicine, autonomous mobility, smart cities and digital administration, are all based on the availability of suitable cloud infrastructures.

At Gaia-X, we Europeans can bring one of our greatest strengths to bear: The ability to compromise and to shape contradictory interests into a common entity – even if no one knows what to call it afterwards. Confederation, supranational federation, cloud ecosystem, dataspaces, federated, decentralised...

The polyphony of Gaia-X is, therefore not a bug but a feature!

About the author
ANDREAS WEISS

Andreas Weiss is the head of this series of articles. As Head of Digital Business Models at eco and Director of EuroCloud Deutschland_eco, Andreas Weiss is very well connected and familiar with the Internet and cloud industry in Europe. He brings his experience to the Gaia-X Federation Services (GXFS), whose project teams are responsible for the development of the Gaia-X core technologies. Led by eco, the GXFS-DE project is also funded by the German Federal Ministry of Economics and Climate Action (BMWK) and is in close exchange with the Gaia-X Association for Data and Cloud (AISBL).

About the author
THOMAS SPRENGER

Thomas Sprenger supports Weiss in this article who has been writing and communicating about digital transformation as a copywriter and consultant for twenty years.

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Conclusion:

Gaia-X Editorial team

Gaia-X represents a diversified nature: it is built from the people to the people. We were founded to lead a European movement and continue to represent a diverse set of beliefs that represent all of us equally. Ranging from the private sector companies, Gaia-X National Hubs, and sector-specific initiatives, this edition outlines our mission. In this regard, Gaia-X is more than a standard-setting association. For sure, it is not a platform, a hyperscaler, a mythical creature or an unrealised dream or even a nightmare. By this point, we have heard it all and we are here to stay.

Gaia-X is the next generation of the data space ecosystem. It will relaunch the data economy of Europe to levels of competitiveness, which are yet incomprehensible. Given that Gaia-X operates based on principles, common values, and standards, the most important of these are Transparency, Inclusiveness, Openness, Democracy, Empowerment and Continuous Improvement. When all of these add up to a citizen-centric reality, then we feel that something really great will come out of this.

The same belief is shared with over 350 members that have entrusted us with the serious, but equally, important burden to bring to fruition. To conclude the first edition of the Gaia-X Magazine, we would like to showcase a number of achievements across different sectors; present our vision, and congratulate our National Hubs for the relentless resilience shown within this ambitious project. This cannot happen without a team spirit and delivery. Relaunching Europe in the global market after 2020 is not an easy task, but with our ever-tireless community formed around the Gaia-X ideals and values, we are certain that digital sovereignty in a federated European data-sharing ecosystem is indeed feasible.

Moreover, the economy of data encompasses not just the volume of cash generated by the technology industry, but also the far larger and hidden value generated by digital add-ons, or brand-new data-driven products and services. Hence why, as Francesco Bonfiglio discussed, without governance and control, data as a topic in the public sphere will continuously be subjected to constraints deduced by fear of the unknown. The Gaia-X standard proposes a simple, methodical scenario. It takes into account Data Spaces, whereby a great quantity of data is collected for post-processing purposes when the importance should lie on real-time virtual collaboration spaces, where each participant's data is augmented and enriched by the data of all others.

As a result, Jeroen Tas emphasises the necessity for a digital economy ecosystem upgrade and cites Gaia-X as a project that offers data economy solutions. It is a European cloud project whose purpose is to assist cloud providers in offering their platforms by the common Gaia-X standard, thereby reducing firms' dominance in the data economy from the far West, particularly in areas that impact Europeans. This is further confirmed by prominent scholars, such as Dr Christian Rusche, that states that

> **Gaia-X aims at limiting the market power of dominant digital platforms, while, at the same time, offering a safe infrastructure to all enterprises to use their data and develop customised solutions for their business.**

Digital Responsibility Goals (DRGs), in this regard, play a central part in our project, and as Andreas Weiss, Jutta Juliane Meier, Kai Michael Hermsen, Harald Wagener, and Prof. Dr Björn Eskofier discuss, the DRGs give diverse stakeholders, decision-makers, and civil society organisations the opportunity to develop a plan and agenda for dealing with human-centric digital transformation. Digital Literacy, which strives to employ knowledge, education, and comprehensive information for every decision-making and self-determination objective, is at the forefront of these DRGs.

From an Operations standpoint, as presented by Dominik Rohrmus, all deliverables are linked to the Association's groups, which generate and maintain them throughout their lifecycle. This facilitates a smooth

introduction of Gaia-X to the market, resulting in its effective adoption, just as stated within the various sector-specific dataspaces. One of the most significant aspects of the Gaia-X programme is the close collaboration with all parties involved to build common solutions based on the identified needs and requests. Not only does this help to comprehend and define requirements, but it also helps to collaborate on solutions that match market demands and contribute to the Gaia-X framework. Gaia-X Association is a bastion of what we stand for working symbiotically with our growing branches that are spreading across Europe and already reaching other parts of the globe. Gaia-X National Hubs as separate entities in the data ecosystem are grassroots proponents of the Gaia-X project and serve as the primary point of contact for interested parties in each country.

Nonetheless, as showcased in the Lighthouse projects - the ability to adapt promptly to changing conditions and needs is enabled by the simple and safe interchange of machine data between production organisations along the supply chain. For instance, as a network of collaborating providers, it is described by Dr Sebastian Schäfer, Luisa Kruse, and Jonas Geisen that the Sovereign Cloud Stack also allows the European cloud infrastructure to be federated, allowing compatible technologies and federative identity and access management to emerge without the need for a central authority to oversee. In addition, the federation encourages a wide range of services and geo-redundancy, while also ensuring that growing services and moving applications between clouds are made simple.

This is especially relevant when we are referring to efficient solutions to the current global crises. In this instance, Tobias Hofer and Nina Popanton's Green Data Hub aims to leverage artificial intelligence and machine learning data to combat climate change, as they advocate for bringing together local data resources, ideas, and technical know-how from organisations and countries in a decentralised manner to address climate challenges. The Green Data Hub also tackles corporations' reluctance to share data, and it has identified three critical factors to overcome this: actor trustworthiness, data sovereignty, and implementing clear rules that specify data sharing, processing, and use.

With regards to the energy sector, by Martine Gouriet and Laurence Houdeville address the gigantic objective of achieving carbon neutrality by 2050 and developinh digital solutions that will result in low carbon energy and energy efficiency.

From an agricultural standpoint, Agdatahub better facilitates the agri-food chain and the data sharing from farm tech advancements and other useful information for the entire agriculture ecosystem, making it more secure to proceed with data exchanges; support AgriTech partnerships and link farmers' identities to their farms, certifying who the rightful owner of a farm is and who can give consent to sharing and using farm data.

When it comes to machine connection and machine-related data processing, Dr Claudia Schickling and Markus Weber state that EuProGigant provides shared benefit fulfilment, multi-cloud connectivity for collaborative and predictive maintenance, and energy efficiency. Most importantly, EuProGigant demonstrates how small and medium-sized businesses can use the Gaia-X Federation Services to connect to the European data infrastructure independently, hence integrating them fully and much better in the supply chain.

With regards to the Telecommunication sector, Antonietta Mastroianni discusses the challenges of the telecommunications sector and its five year plan to construct multiple use cases that will demonstrate the value of Gaia-X in the data environment, hoping to raise awareness of its capabilities and encourage other enterprises to join.

To summarise, the entirety of the Gaia-X community stands united behind the values of Transparency, Inclusiveness, Openness, Democracy, Empowerment and Continuous Improvement insofar as the future of Europe and the efficient response to climate and industry needs is concerned. In this regard, this edition strongly emphasised the revolution that the Gaia-X standard brings to the world of tomorrow - a world of climate crises, conflicts, and industry needs in which response requires reliable and ethical processing of data in a trustable ecosystem.

From this point of view, the Gaia-X Hubs views are particularly relevant. Denisa Mäki from the Gaia-X Finnish Hub outlines the Gaia-X cross-sectional projects that are being developed across Europe, from Germany to Italy, France, and the Netherlands, in collaborative environments with transparent rules to fuel innovation and offer opportunities

to combat challenges and work toward a more responsible future while participating in the development of Europe's data economy. To this, Peter Verkoulen from the Gaia-X Netherlands' Hub highlights that solution to the unprecedented challenges faced by the supply and demand side of the manufactory sector, is transparency. To reiterate, this is the only method to determine the impact on other portions of the supply chain so that everyone in the ecosystem can plan and respond appropriately. Helmut Leopold, the Chairman of Gaia-X Austria states that an open and secure data infrastructure with defined data rooms, bundles, and networks Austrian operations at the national and European levels. This will boost Austria's position as a digital data location, while also contributing to national and European data sovereignty.

In this direction, Gaia-X has begun delivering on its promises and goals through its lighthouse projects. The most recent case of the 'Financial Big Data Cluster,' alongside other lighthouses can indeed usher Europe into a new era of open innovation that will bring about technological advancements, and a digital breakthrough in Europe's industries.

Barbara Engels from the German Economic Institute reveals that such a breakthroughs would be a result of data sharing and management on a wider scale. According to Engels, "Companies can boost their success if they use their data". This is because they can analyse and enhance their operations thanks to data collection.

Organisations can indeed benefit from sharing data with other companies because it makes supply chains more open and efficient, allowing them to respond more quickly to market developments". Such can be the case if we draw a reference to Project Tellus. As described by Alina Rubina, a researcher at DE-CIX, project Tellus aspires to create a bridge between cloud providers, connection providers, and cloud customers. Individual providers should be linked together using integrated software instances and uniform interfaces. All elements of a provider cascade (corporate network, connection provider, network operator, Internet node, cloud provider) must be technically integrated for interactions between providers (cloud) and users (industrial companies) for critical Tellus applications, and the requirements in all end-to-end dimensions on the network side must be met.

As an endnote, this edition busts most myths surrounding Gaia-X, with Andreas Weiss and Thomas Sprenger, discussing these in a rather open way, fully engaging the community to continue working in the mission statement envisioned by Gaia-X that tirelessly works to get it

implemented.

But Gaia-X is also an all-inclusive environment, whereby each voice counts equally and can take us somewhere, in a single direction. This is what we have tried to do this with this issue and we can potentially do more with the second one.

For now, the Gaia-X team wishes to graciously extend a sincere thank you to all of our authors and contributors making this issue possible and commits to bring an even more promising second issue, openly encouraging everyone to join our current members, hubs, and teams to support our growth and expand our message, in Europe and beyond.

We sincerely hope that you have enjoyed this issue and we were able to plant yet another seed of inspiration.

Stay tuned.

Gaia-X is here to stay.

Acknowledgments

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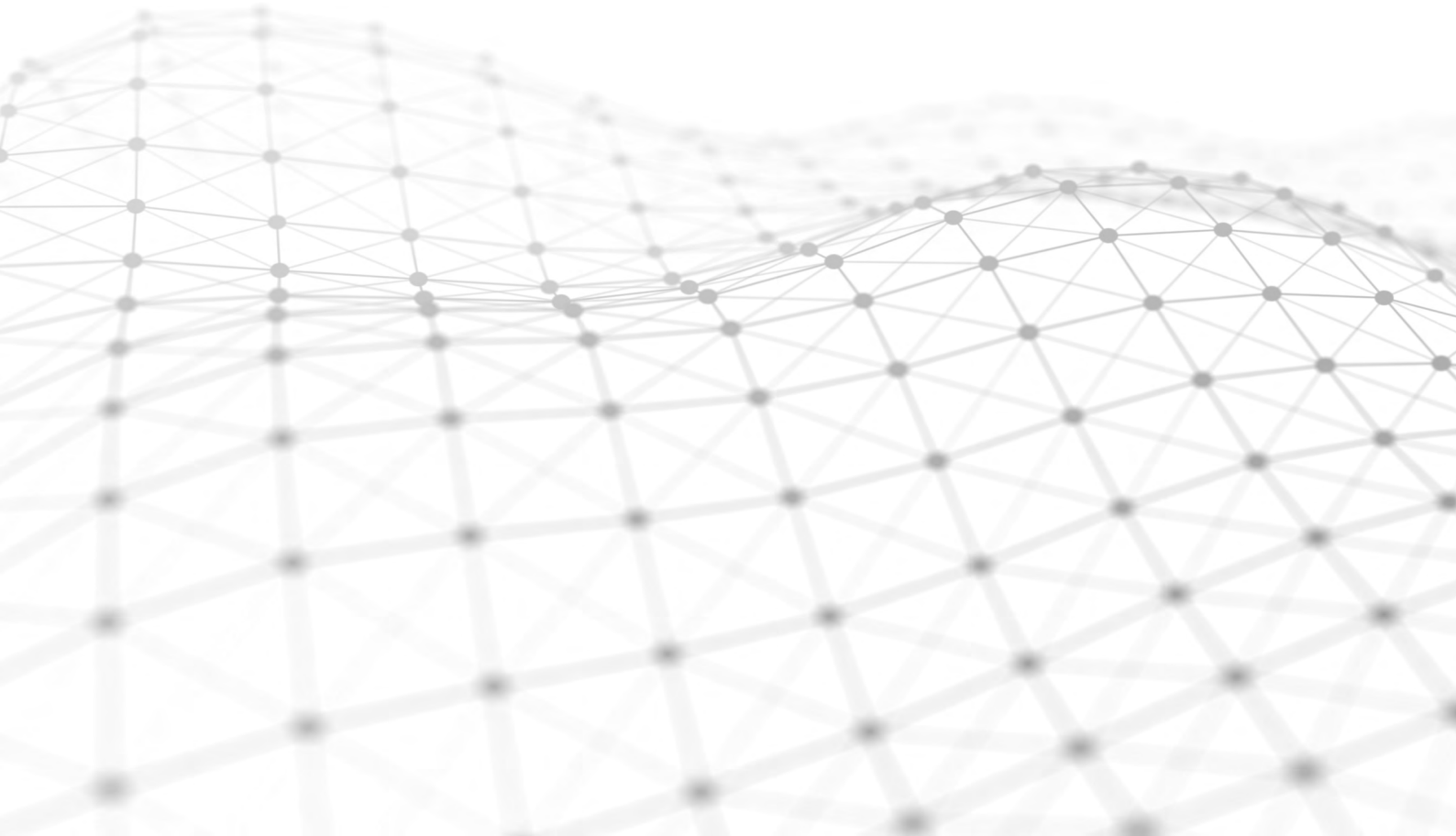

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