

The Mindset Shift – From Centralized Platforms to Federation

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Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

Funded by the European Union
NextGenerationEU

Version 1.1 (September 18, 2026)
ISBN: 978-3-9828074-3-0

Published by
eco – Association of the Internet Industry (eco – Verband der Internetwirtschaft e.V.)
Lichtstrasse 43 h, 50825 Cologne, Germany

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funded by the German Federal Ministry for Economic Affairs and Energy (IPCEI-CIS)
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Executive Summary

Unlocking Europe's digital potential: The case for federation

Data has become the key resource for economic growth, enabling smarter production, new services, and innovative customer experiences. By 2030, the additional economic potential of leveraging data is estimated in the range of $5.5 to $12.6 trillion globally. Realizing this potential requires data to be accessible in real time and reliably across borders. For example, an autonomous vehicle traveling from Warsaw to Madrid across Europe must receive data in a consistent format, regardless of location or legal boundaries.

Europe's digital economy needs to move from centralized platforms to decentralized, federated ecosystems. Currently, Europe's digital economy is dominated by large, centralized platform providers. The platform model creates barriers to cooperation: vendor lock-in, lack of transparency, and risks to data protection. Dominant actors can impose rules, restrict portability, and aggregate economic power. This makes platform operators the winners in digital value creation, while the actual data providers and users are discouraged from investing in digital collaboration. **Thus, to realize the full potential of digital transformation, a fundamental mindset shift is required.**

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The game changer: Federation

At the heart of this shift is the concept of collaboration through federation. Federation describes a decentralized approach to data handling and exchange. Multiple partners collaborate under a joint governance model, enabling seamless data usage and sharing without centralizing data or control. Each organization decides where and how to store its data.

- At its technical core, federation relies on **open-source software** to build trust and maintain transparency. The federated model enables rapid scaling by integrating new participants, services, and domains. This openness fuels growth.
- **Trust, fairness, and innovation** are the key enablers in federations. Neutral organizations can coordinate stakeholders, ensure transparent decision-making, and maintain a clear separation between governance and data storage to protect digital sovereignty.
- **Digital sovereignty** ensures that organizations and individuals control their data and decide how it is used. Digital sovereignty extends beyond data ownership to include the freedom to choose partners, technologies, and infrastructure. This approach prevents dominance by any single actor.

8ra/FACIS enable scalable federated data ecosystems

The European 8ra Initiative connects more than 120 partners working toward federation. With its project FACIS (Federation Architecture for Composed Infrastructure Services), 8ra helps to make Europe's Multi-Provider Cloud-Edge Continuum based upon federation a reality. FACIS enables digital collaboration across industries and borders, working toward multi-provider "cloud roaming." FACIS provides the necessary practical tools, templates, and guides for quickly setting up federations. It offers ready-to-use and open-source technological blueprints, digital identity wallets, and a framework for automated digital contracts. With its toolbox, FACIS minimizes the cost of joining a federation and helps already established federations scale quickly and efficiently.

Moreover, FACIS develops use cases that show how federation can operate in real-world scenarios. For example, together with the aviation industry, FACIS demonstrates that even within a highly regulated sector, federation immediately adds great value. By turning aircraft into "Flying Edge Devices," repairs can be completed faster, and downtime can be reduced because the right data securely reaches the right people at the right time.

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The way ahead: Growth, innovation, and sovereignty

Federated data ecosystems offer significant benefits for business, society, and innovation:

- **Business:** Companies gain access to high-quality data. This enables new digital business models and cost-sharing solutions. Small and medium-sized enterprises (SMEs) can compete on equal terms with larger firms, democratizing data monetization and fostering fair competition.
- **Society:** Public administrations and civil society benefit from greater transparency, participation, and sustainable growth. Federation supports smarter services and decision-making.
- **Innovation:** Federations create a strong research base by integrating diverse data sources, fostering cross-sector exchange, and driving scientific and technological advances. Businesses can securely access cross-industry data, enabling new products and better processes.

Federation is no longer just an idea – the concept has proven itself. Federations are demonstrating their added value in productive use. By embracing federation, digital sovereignty, and the practical solutions offered by FACIS, Europe can unlock the economic potential of data exchange and usage. It can foster innovation and build a digital future that is open, resilient, and inclusive. **Everyone can participate.**

> “ Federation is no longer just an idea – the concept has proven itself.

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1.

Why the Current Model Falls Short

Digital transformation changes the way we live and see each other, how we work, and how we create value. Data has become the key resource for a smoothly functioning economy and the basis of successful business models. Data gives companies insights into their supplier ecosystem and allows for more efficient, resilient, and real-time supply chains. Data unlocks smarter and networked production and enables entirely new services, products, and customer journeys[1].

Beyond production, data is the foundation of a more efficient and reliable healthcare sector, including pharmaceutics, logistics, networked medical practices, hospitals, and digital patient files.[2] It is a driver for new cultural experiences and allows media providers to improve and innovate their content.[3] Data enables innovative and sustainable mobility solutions like pay-as-you-drive or travelers' journeys across different means of travel.[4]

Digitalizing and automating production, networked value chains and linking physical products with digital services promise massive economic potential. However, as of 2025, Europe's digital infrastructure and thus the backbone of Europe's digital economy face a double challenge: cooperation is fragmented in supply chain-specific silos while market power concentrates on large platforms.

Taking on this double challenge requires a fundamental mindset shift. A shift away from historically grown practices of securing one's competitive advantage in isolation. A shift away from cooperating based on personal networks. A shift away from storing data in proprietary clouds without any intention to use it for innovation. Organizations should embrace the vast (business) opportunities that lie in broadening the perspective: collaboration beyond their own bubble, tapping into digital business models, and engaging with data as a resource that is worth securing, sharing, and monetizing.

1 Plattform Industrie 4.0. (2019). 2030 Vision for Industrie 4.0 – Shaping Digital Ecosystems Globally

2 Sphin-X. (2025). One Dataspace for Health

3 ard.de. (2025). Stärkung der digitalen Souveränität: Deutsche Medienhäuser erproben Grundlagen einer gemeinsamen Dateninfrastruktur; acatech. (2025). Der Datenraum Kultur

4 Mobility Data Space. (2025). Mobility Data Space

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For Europe's digital economy to thrive, **a mindset shift from centralized, platform-based models to decentralized federation** is needed: companies should move beyond established routines that prevent innovation, cause transaction costs, and centralize the returns. Federation means decentralized but connected ecosystems that allow data to flow freely and securely. This will enable businesses and society to collaborate on their own terms. Collaboration will be based on trust supported through a shared set of rules and mechanisms that make sure that returns remain with those that invest.

By 2030, the additional economic potential of leveraging data and merging the digital and physical worlds is estimated to range from $5.5 trillion to $12.6 trillion in value globally.[5] To unlock this potential, data needs to be accessible in real time. Access needs to be reliable across borders. A networked product, an autonomous car, for example, needs to receive data in the same format independently of the border it has just crossed. Equally important, data owners need to be able to control what happens to their data, and those collecting, storing, and processing data must be held accountable. The prime example for this requirement is the establishment of the EU digital identity wallet (EUDI Wallet). In brief, for the data economy to run smoothly, a resilient, secure, and trustworthy digital infrastructure is required.

For this scenario to become a reality, for Europe to enhance its economic growth, its security, and its future position in global competition, a functioning, resilient, and effective digital infrastructure is necessary – an infrastructure that is based on federation. Business as usual is no longer an option: the very factors that fuel centralized platforms' success now create risks for data protection, infrastructure resilience, and fair competition.

> “ Business as usual is no longer an option.

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5 McKinsey & Co. (2025). The Internet of Things: Catching up to an accelerating opportunity

Shortcomings of the platform approach

Today, cloud and infrastructure providers rely on platform models that let developers, businesses, and users build, deploy, and use innovative services easily. Scale and network effects fuel platforms' success and lead to market concentration: the more users join, the more attractive the platform becomes – and the cheaper it becomes for the platform to provide the service per client.

The platform approach creates several barriers for companies and users. Once a platform reaches a critical mass, providers collect vast amounts of data and fees due to data aggregation. Platform providers can further expand their service portfolio, attracting more users. This leads to concentration of economic power. These network effects already make switching difficult. Additionally, providers actively lock users in through proprietary technologies that block data portability. As a result, customers cannot easily migrate their data and applications across platforms and, at the same time, are unable to avoid price increases.

From their central position, providers shape the rules – openly through terms and conditions or quietly through algorithms that favor their own offerings. This lack of transparency and accountability that comes with the operator's powerful position also poses risks related to end users' data protection rights. Platforms routinely transfer data across national borders. Users often lack insight into data governance and access policies.

Therefore, platforms require a high level of trust in their technical reliability as well as their economic and political stability. Yet their business models based on data aggregation often undermine companies' trust with their sensitive data or intellectual property. Companies fear violations of property rights, unauthorized data access, and the misuse of data to train AI models. Finally, from a security standpoint, the centralization of business processes on platforms and their pervasiveness pose considerable risks regarding the resilience of value chains. Potential outages, through technical issues, security-related or political incidents, would have massive effects on virtually every link in a company's value chain.

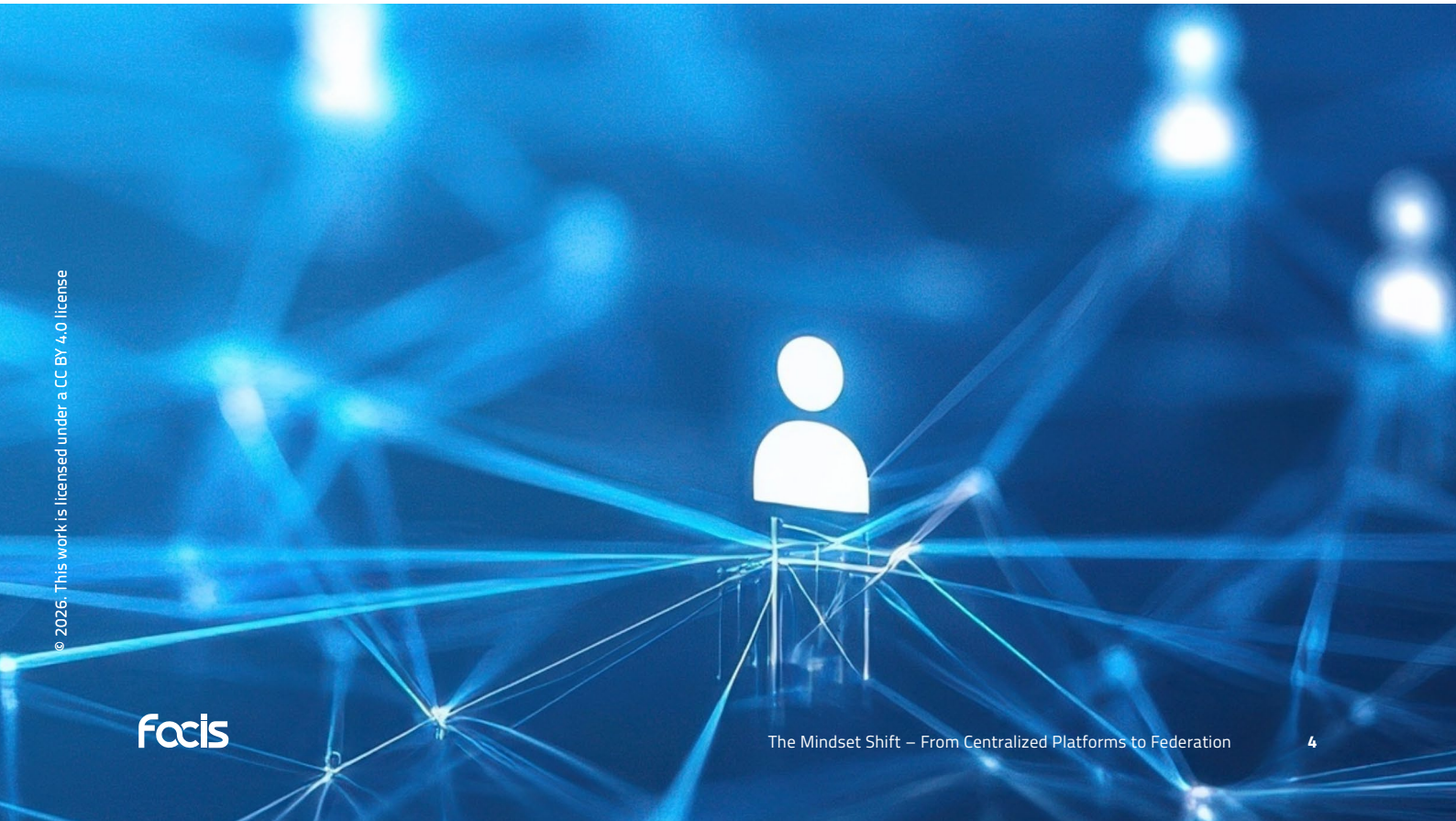
As large tech companies gain more power, Europe has responded by regulating their influence. The European Union aims to limit excessive market power and protect competition, customers, and civil rights to create sustainable, resilient, fair, and trustworthy solutions. This is especially relevant in the context of artificial intelligence. Two major initiatives, the Digital Markets Act (DMA) and the Digital Services Act (DSA), aim to strengthen customer rights and give European market participants a fairer chance.

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The DMA helps European consumers and businesses in two ways: it requires platforms to ensure that some of their services work together in a way that data can be used and shared seamlessly across providers (interoperability). It also prevents platforms from favoring their own products in search results or digital marketplaces. These steps level the playing field. However, efforts to break up large platforms have not succeeded, and major issues with interoperability and security remain.

The differing approaches to regulation of digital markets across global regions are becoming increasingly visible. In the European Union, regulatory frameworks are designed to safeguard fundamental values and create trusted digital environments. At the same time, these frameworks can be challenging to translate into day-to-day practice. A more harmonized and consistently applied regulatory approach helps ensure that the EU's competition, security, and innovation goals can be achieved effectively while remaining practical for organizations across all sectors.

Because of established patterns in the concentrated digital markets, regulation will remain a challenge, especially as the world economy becomes more protectionist and unstable. That is why Europe must not only regulate but also actively support political, economic, and societal actors who are building real alternatives to the platform model. Decentralized, federated structures offer a fairer, more secure, and more dynamic digital economy for Europe.



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2.

The Mindset Shift to Federation

Europe's digital future depends on how we protect, organize, share, and make use of data. For over two decades, centralized platforms have dominated the digital landscape. They offered convenience, scale, and innovative solutions. But they also created dependencies, as they themselves benefited most from the available data. As digital transformation accelerates, Europe faces a clear choice: stay dependent on a few powerful platforms or embrace federation and enable equal collaboration across economy, science, and society.

In a federation, companies, public institutions, or service providers work together by adhering to a common set of rules, standards, technologies, and trust mechanisms. Unlike centralized platforms, a single entity does not control the system or set the terms in a federation model. Instead, the federation model allows each participant to keep control of their own data while benefiting from collaboration and data exchange.

Federation goes far beyond technology. It creates the foundation for innovative, data-driven value creation in ecosystems that benefit not just individual companies, but the entire European economy and society. Since the start of the research project Industrial Data Space (later evolved to International Data Spaces) in 2015, and in the context of the Gaia-X initiative since 2019, policymakers, business, and science have discussed and worked toward federated data ecosystems. Since then, Europe has invested in the development of open standards and reference models.

Gaia-X and the International Data Spaces Association (IDSA) have paved the way toward the inception of a federated European data ecosystem. They offer support, facilitate cooperation, and promote principles, technologies, and standards, which are brought to life in various initiatives. The IDSA's Space Radar listed over 140 data space projects in 2024,[6] while in 2025, over 50 Common European data spaces are being initiated across 14 different domains ranging from agriculture to tourism[7]. Each of these projects works toward the creation of sector-specific federations and toward demonstrating the benefits of a federated approach.

6 International Data Spaces Association. (2024). The Data Spaces Radar: Data Spaces Support Centre Edition

7 European Commission. (2025). Common European data spaces

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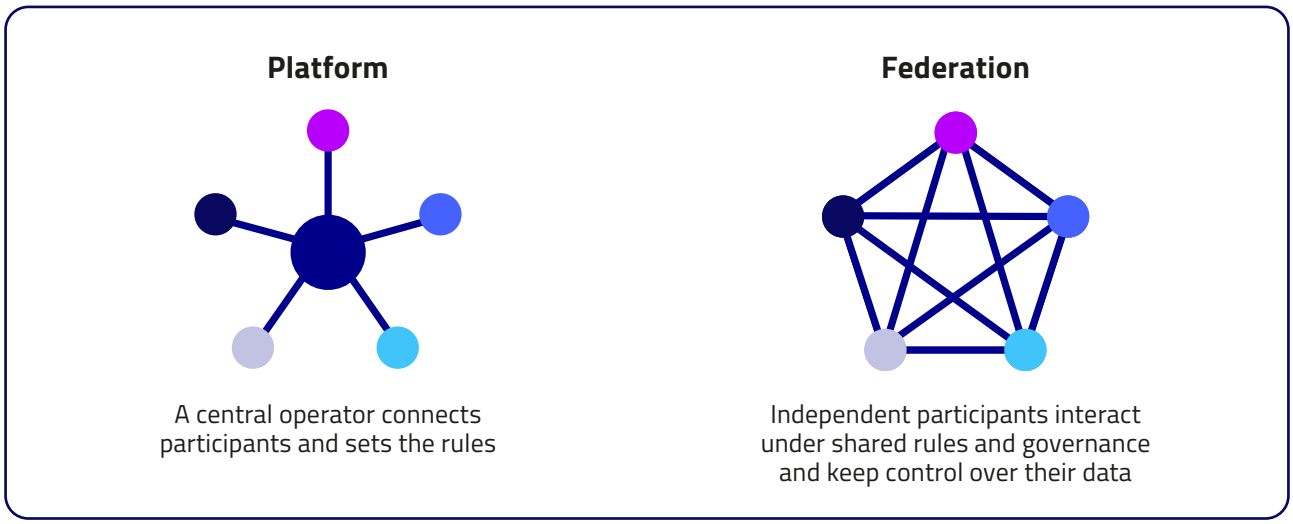


Figure 1. **Platform vs. federation**

The real challenge begins now: it is no longer enough to have isolated flagship projects. SMEs and large corporations alike must bring federated models into the mainstream – embedding them across industries and use cases at real scale. This transformation will only succeed if leaders are willing to question old habits and actively pursue new paths. Now is the moment to take responsibility. Those who dare to act today will lay the foundation for a Europe that strengthens its digital sovereignty, unleashes innovation, and creates sustainable growth for everyone. It is up to us to seize the opportunities of federation for organizations, society, and the future of Europe.

To support this essential transformation, the European Commission has launched the Important Project of Common European Interest on Next Generation Cloud Infrastructure and Services (IPCEI-CIS). Around 120 partners, including large enterprises, SMEs, start-ups, and research organizations, support the initiative's impact across Europe[8]. The 8ra Initiative serves as a community-driven implementation layer that ties together the loose ends in a somewhat fragmented landscape of various projects. 8ra's central goal is to develop a Europe-wide cloud system in which many different providers can work together seamlessly and securely.

Most importantly, Europe must change its mindset. This change means moving away from the comfort and convenience of centralized platform models, which may seem easy but ultimately create risks like dependency and distrust. Instead, organizations, policymakers, and stakeholders need to engage in the era of federations. They offer a bold vision for the future, one where people and organizations work together as equals, sharing knowledge and resources while retaining control and sovereignty. Federations empower us to break down barriers, spark innovation, and build digital ecosystems that are resilient, fair, and truly European. Now is the time to seize this opportunity and shape a digital landscape where everyone can thrive.

8 8ra. (2025). What is the IPCEI-CIS

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Federations as a counter-model to platforms

Federation brings partners together: companies, public institutions, and service providers work side by side, build trust, and follow shared rules. Instead of letting one organization take charge and set all the terms, federation lets everyone keep control over their own data and how they operate. Partners share ideas and data, spark innovation, and benefit from working together. At the same time, they decide for themselves what and how much to contribute. In a federation, everyone acts as an equal, shaping the collaboration on their own terms.

Federation moves beyond the old model of sending data in just one direction. Instead, **it creates data spaces** where trusted partners actively, securely, and efficiently share and access data with each other. Partners work together to set the rules and standards, making sure everyone benefits and the system runs smoothly. Rather than letting one company control everything, federation encourages everyone to take part, shape decisions together, and build services as a team.

At its core, **federation is about enabling digital sovereignty.** Digital sovereignty means that organizations and individuals have the agency and capacity to control their data, decide how it is used, and ensure compliance with local laws and values. Digitally sovereign actors decide freely who they trust with their digital infrastructure across the whole stack of their chosen solutions. In a federation, organizations typically only share a summary or description of their data with others, rather than the data itself. This way, each organization keeps full control over who can view or use the real data, and for what specific purposes the data is used.

A key strength of federation: **no single actor dominates**, and vendor lock-in is eliminated. In a federation, participants are bound only by rules or fees they agreed on together. Participants decide on additional services, changes to data standards, and agree on potential pricing for membership fees or the use of services. This flexibility prevents any single player from changing the rules alone or shutting others out. Federated systems give consumers real freedom to choose the providers that best fit their needs. Different providers can work together within the same federation, and the technical foundation is built from parts supplied by various sources. This means the system is flexible and open, encouraging innovation and competition. As a result, users are not forced to rely on just one provider or technology, and they can easily switch or combine services as needed.

Another major advantage of federations: **they are based on open standards and open-source software.** Open-source means the software's inner workings are available for anyone to see, use, and improve. This openness builds trust, because organizations are not dependent on a single vendor and can check for themselves how the software operates. It also encourages collaboration. Companies, public institutions, and even individuals can suggest improvements or adapt the software to their needs.

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In a federation, each organization decides where and how to store its data – without vendor lock-in. Each participant keeps full control over their digital assets. This flexibility strengthens independence, supports fair competition, and creates an environment where innovation can thrive.

Table 1. **Federated data ecosystems vs. platform model**

Property	Federation	Platform
Market structure	Fair competition based on cooperative infrastructure	Oligopolistic, infrastructure dominated by a few large actors
Coordination mode	Trust-based, multilateral, shared governance	Power-based, unilateral, top-down control
Risk of lock-in	Low – no forced dependency, open-source technology, standardization, and built-in interoperability	High – switching is complex and costly due to lacking interoperability, proprietary APIs, and code
Governance	Rules and standards jointly developed, consent-driven, transparent Collectively agreed governance structure (trustee, federator)	Rules set unilaterally by platform providers, who can change them at their own discretion Use of platform on provider's terms
Digital sovereignty	Strong – each participant controls their own data and access rights	Weak – data often controlled by platform, limited user agency
Innovation and value creation	Enabled by shared infrastructure, open collaboration, and competition	Constrained by central control, innovation at the provider's discretion and benefit

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Potential of a mindset shift

A shift toward federated data ecosystems offers huge economic potential. Federated models scale quickly by integrating new participants, services, and domains, so everyone benefits from network effects without lock-in. This openness fuels growth. Market analysts project double-digit expansion for federated data ecosystems in Europe.[9]

There are three ways federation can help organizations grow and succeed[10]:

1. Easier Connections: When joining and sharing data becomes simple, more businesses take part. When it is easy to connect, everyone benefits from new partnerships and opportunities.

2. Working Across Sectors: Federation is not just for one industry. It helps different sectors, like manufacturing, healthcare, or logistics, work together and share information, making collaboration smoother and more effective.

3. New Opportunities: Federation does not only help companies work more efficiently. It also opens the door to new products, services, and business ideas. By sharing data and working together, organizations can move beyond just saving costs and start creating real value and innovation.

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9 HTF Market Intelligence. (2025). Global Federated Data Platforms Market Roadmap to 2033

10 Plattform Industrie 4.0. (2019). 2030 Vision for Industrie 4.0 – Shaping Digital Ecosystems Globally

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Federation changes mindsets. It encourages partners to join forces, share resources, and stop letting one powerful player dictate technology choices. Open-source software plays a central role. Anyone can review, improve, and adapt the code, which builds trust and transparency. Common standards and reusable blueprints help organizations connect quickly, avoid repeating work, and focus on new ideas. Examples are those developed by the IPCEI-CIS/8ra project Federation Architecture for Composed Infrastructure Services (FACIS).

Moreover, connectivity between federations and data spaces is another key advantage. Federation breaks down barriers between industries and countries. It connects partners across borders and invites broad participation. This approach keeps the digital economy flexible, resilient, and full of fresh opportunities for everyone involved. Initiatives like IPCEI-CIS/8ra demonstrate how federations can bring together diverse stakeholders from different industries and countries, fostering a vibrant and resilient digital economy.

In sum, building federated data ecosystems is not simply an IT exercise. It requires partners to co-create shared rules, common standards, and governance frameworks. Partners invest in strong long-term cooperation, where trust must become a core principle. It needs to be supported by technological safeguards while rooted in shared values and open dialogue.

By embracing federation, organizations and societies can unlock new opportunities for cooperation, innovation, and sustainable development – while maintaining control and sovereignty over their digital assets. With this mindset, Europe can build digital ecosystems that are resilient, innovative, and serve the entire economy and society.

> “Federation breaks down barriers between industries and countries.

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3.

How Federation Can Be Done

Products in both consumer and B2B markets are increasingly connected. They generate and exchange large volumes of data that flow between previously separate actors. Artificial intelligence pushes this trend even further, making access to data a key resource for innovation and economic success. Companies that embrace this shift can achieve new levels of growth and competitiveness.

Businesses now have a unique chance to succeed using state-of-the-art, secure, and legally sound ways to share and acquire data. First, secure and scalable data exchange is no longer a distant vision. Federations already enable data providers and consumers to interact in protected environments. Federations automate processes, prevent misuse, and create trust, essential conditions for collaboration in a digital economy.

Second, flexibility combined with standardization opens new paths for growth. Businesses can adapt these solutions to their specific industry needs while maintaining common standards. This balance ensures interoperability without sacrificing individual requirements. It allows companies to exchange data with diverse partners and still operate within a predictable, reliable framework.

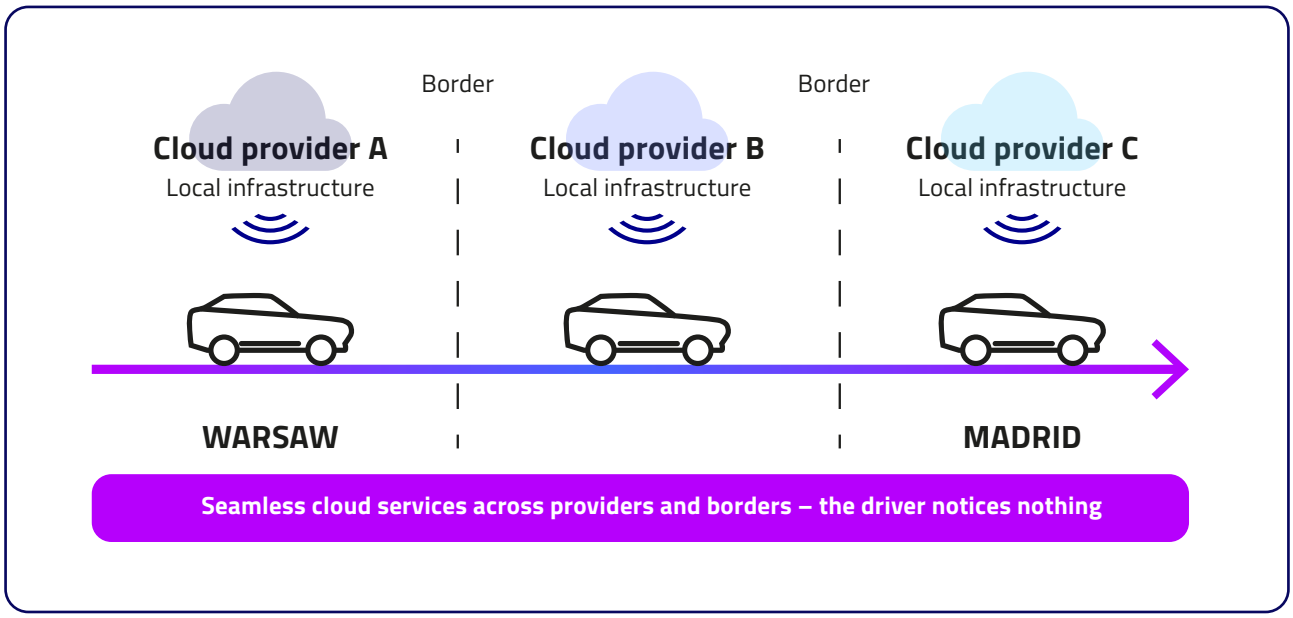
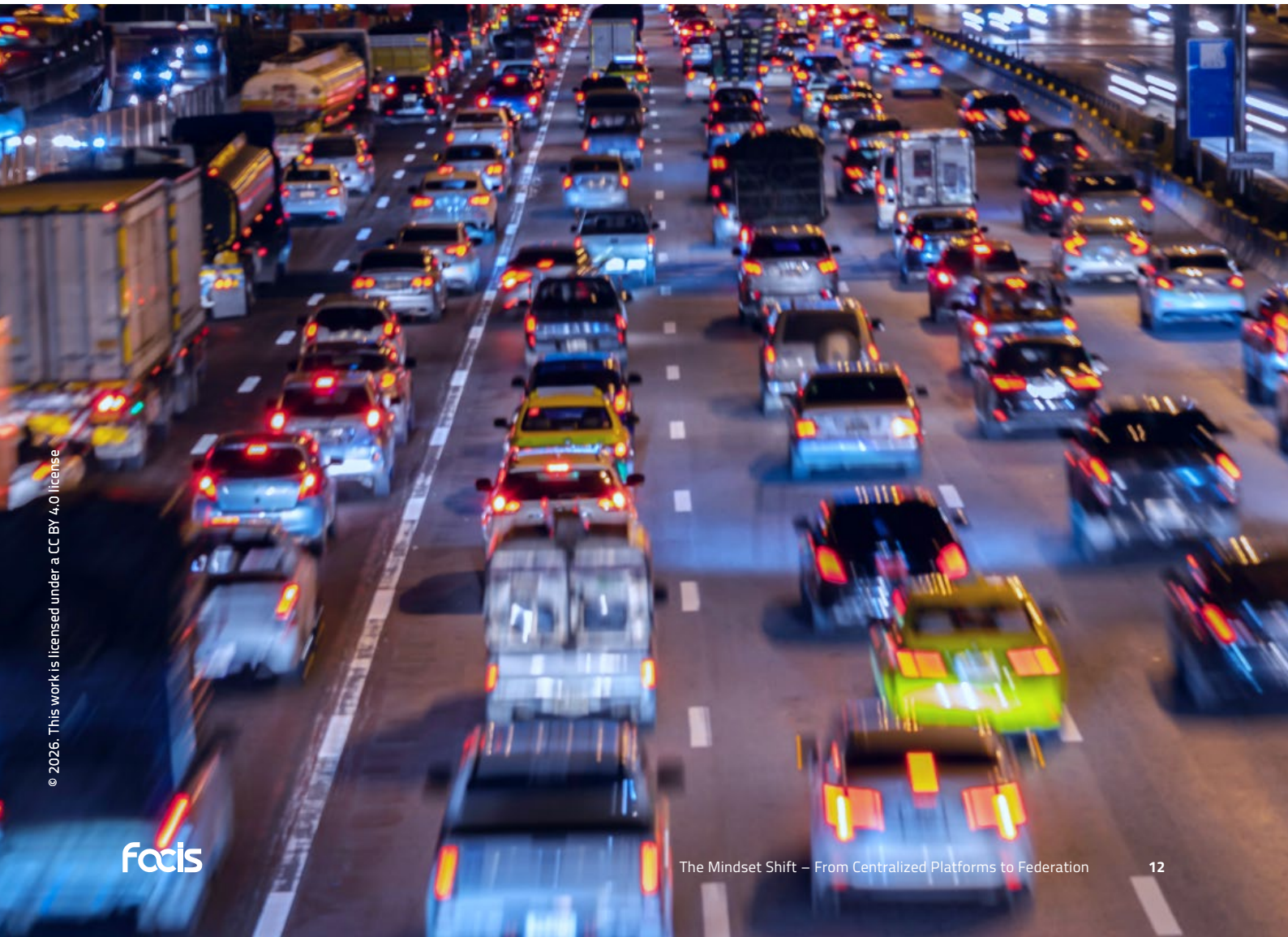


Figure 2. **Autonomous driving – exchanging data with multiple trusted cloud providers**

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Federations reduce complexity while enabling innovation. Think of mobile roaming: users move seamlessly across providers and borders without losing connectivity. Now imagine a similar concept for data: the “roaming of clouds.” Networked products could seamlessly exchange data with multiple trusted cloud providers across countries and industries. This is the promise of federated data ecosystems: openness without chaos, security without barriers, and global interoperability without legal uncertainty.

> “Think of mobile roaming: users move seamlessly across providers and borders without losing connectivity.



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Trust and identity: Cultural and technological perspective

The economy is moving from locked-in company data to data that flows easily across organizations and sectors. In this new reality, businesses exchange information with partners they often do not know personally. Because personal trust no longer scales, trust must be built into digital ecosystems with strong identity management and transparent governance.

In federations, trust is not dependent on personal relationships but is ensured by shared rules, technical safeguards, and collective oversight. At the same time, companies can share data with far more partners than ever before. This shift lets organizations collaborate securely across borders – even with unknown partners – and unlock new forms of collaboration, innovation, and business models.

Federation thrives on trust, and trust begins with identity. For businesses to benefit from federated data ecosystems, billions of devices, users, and services must be reliably identified and authenticated across global borders. This is not a trivial challenge. It requires a common framework that guarantees security, compliance, and interoperability without sacrificing autonomy.

The Cross Federation Service Components (XFSC)[11] toolbox shows how federations enable safe and simple sharing of data. Instead of relying on personal contacts, these services use clear rules and digital tools to build trust between all partners. For example, every company and device get a secure digital identity. In this way, you always know who you are dealing with.

Special digital "wallets" let businesses access services safely, without giving away private information. These federation services implement automated checking tools that ensure rules are being followed, so sensitive data stays protected, and privacy laws are respected. Finally, there are shared directories that help everyone find and use the right services, making cooperation simple and transparent for all involved.

With federated identities, companies can work together smoothly, even on complex tasks like managing supply chains or delivering services, while still following all the rules that apply in their industry or region. A clear digital identity is not a technical detail – it is the foundation of secure and reliable digital cooperation. With this foundation of trusted identities, federations offer the openness, independence, and innovative spirit that set them apart.

11 https://projects.eclipse.org/projects/technology.xfsc

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Governance

Technical innovations will only reach their full potential when companies learn to work together under shared rules. A neutral, pre-market governance organization provides this framework without owning or accessing data. This is not about losing control – it is about enabling trust. It gives participating companies a shared foundation for trust and innovation, which ensures that each participant retains full sovereignty. As a new organizational approach, governance organizations for federated data ecosystems enable participating companies to shape this new world together.

A governance organization can be an independent association (like Catena-X e.V.[12]) or a not-for-profit company (like Datenraum Mobilität GmbH for the Mobility Data Space[13]). As the backbone of a federated data ecosystem, it coordinates all stakeholders through structured committees, ensures fairness and transparency, and is controlled by its members. This guarantees equal participation and transparent decision-making for rules and standards.

The governance framework supports different levels of participation to meet varying company needs. It establishes shared principles and values, defines usage policies, and assigns clear roles and responsibilities, especially essential services such as identity management.

It offers support services to help participants onboard and comply with governance requirements. At the same time, it guarantees compliance with legal requirements and international standards like those promoted by the IDSA or Gaia-X. Governance also stays strictly separate from data storage to protect data sovereignty. This separation ensures that every participant retains control over its own data while still benefiting from shared structures. It also introduces trust mechanisms for sensitive processes such as AI model training. In such cases, a data trustee can be installed, who aggregates anonymized data without exposing raw information, enabling shared innovation while protecting privacy.

The governance approach is already visible in real-world initiatives. Catena-X in the automotive industry shows how governance builds trust among manufacturers, suppliers, and service providers by enabling secure sharing of production and logistics data. Manufacturing-X applies the same principles to industrial production, allowing companies to collaborate on digital twins and predictive maintenance without losing control of their data.

The Mobility Data Space connects automotive manufacturers, public transport providers, infrastructure operators, and service platforms under a shared governance model. It enables controlled and

12 https://catena-x.net/
13 https://mobility-dataspace.eu/

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transparent exchange of traffic, vehicle, and infrastructure data, creating benefits such as optimized traffic flows, improved charging infrastructure for electric vehicles, and new mobility services.

These examples demonstrate that governance is the key to scaling data exchange beyond bilateral agreements into open, federated data ecosystems. These ecosystems open opportunities to develop innovative solutions like dynamic route planning or cross-provider mobility apps without building costly proprietary systems. In the automotive sector, suppliers and manufacturers can share sensor data for predictive maintenance under clear usage rules and with a neutral arbitration process in place.

In cross-border logistics, companies can exchange shipment data securely because governance defines common standards for authentication and compliance with European regulations. In manufacturing, several companies can pool production data to train AI models for quality control, knowing that anonymization rules and technical orchestration are guaranteed. Even identity management for billions of Internet of Things (IoT) devices becomes feasible when governance mandates secure onboarding standards and lifecycle management, ensuring interoperability across vendors and markets.

Governance is not bureaucracy. It is the key enabler of trust, fairness, and innovation. Without it, technical solutions remain isolated and fragmented. With it, federated data ecosystems become a powerful engine for growth, efficiency, and global interoperability.

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4.

8ra/FACIS as an Enabler

Together with more than 120 partners, the 8ra Initiative fosters open collaboration to create a resilient and scalable digital infrastructure tailored to Europe's needs. Its goal is to build a sovereign, interoperable, and secure Multi-Provider Cloud-Edge Continuum.

What may sound futuristic is in fact a seamless network between large cloud data centers and smaller computing units close to data-generating devices at the edge. Instead of imagining cloud and edge as two separate worlds, they should be imagined as a continuous spectrum. Some tasks happen at the edge (fast, locally), others in the cloud (large-scale processing, globally), and many in between. Importantly, in the spirit of federation, actors in the continuum are not limited to one company's cloud or edge services but can use multiple providers. These providers need to work together seamlessly so applications can run smoothly across different digital environments without breaking.

Thus, 8ra is laying the foundation for Europe's digital future. 8ra connects many different technology providers so businesses can work together smoothly and securely. This means factories, hospitals, energy companies, and others can use the latest digital tools, like real-time data and smart automation, without being locked into one system. 8ra does not just talk about innovation; it delivers easy-to-use and open-source solutions that help organizations turn big ideas into real results.

FACIS builds on 8ra to make digital collaboration safe and simple. It gives organizations a clear, reliable way to work together, no matter how many partners are involved. FACIS offers ready-to-use templates (Federation Architecture Patterns, FAPs) and practical guides. These tools help companies set up secure collaborations, sign digital contracts quickly, and manage agreements with multiple partners in a transparent and easy-to-follow manner. They supply the toolbox for setting up federations. In short, FACIS turns complex digital cooperation into something straightforward and trustworthy.

> "A two-month proof of concept proved that federation quickly adds real value – even in highly regulated sectors.

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Proof of concept: Aircraft as flying edge devices

8ra and FACIS demonstrate their value through validation of their open-source solutions. The first FACIS Proof of Concept (PoC) sets out to demonstrate how federated services can transform collaboration in one of the most complex and highly regulated industries: aviation. Together with the aviation industry, we created a PoC to see how federation-based collaboration works in real aviation environments. We have proven that federation is not just a technical concept but a practical enabler for secure, efficient, and scalable business processes.

The PoC shows how organizations collaborate under trusted governance – sharing data and services without losing control or compromising security. This approach addresses a critical challenge in aviation: the need for seamless cooperation among airlines, manufacturers, service providers, and airports, all while maintaining sovereignty and compliance.

Imagine the following scenario:

When a plane is unexpectedly grounded due to a technical issue, the traditional response usually involves countless phone calls, emails, and manual checks, wasting precious time. In a federation, everything happens seamlessly, securely, and fast:

- → The pilot and ground crew simply log in using trusted digital credentials that confirm their identity and qualifications.
- → They instantly access a shared aviation data network, where the mechanic's app retrieves the exact error code from the aircraft and cross-checks it with the manufacturer's documentation.
- → The system then identifies the spare part needed, verifies its authenticity, and checks availability in the airport's inventory.
- → The part is dispatched to the right gate, and the certified mechanic receives precise digital instructions.
- → The result? Faster repairs, minimal downtime, and complete security, because the right data reaches the right people at the right time.

One of the most innovative aspects of this PoC: aircraft act as "Flying Edge Devices". This concept turns an aircraft into an active digital participant in the federation that securely exchanges data in real time with ground systems and partners.

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By doing so, the PoC demonstrates in a testbed how operational processes, such as aircraft maintenance, passenger services, and fueling, can be optimized through trusted, identity-based interactions. Instead of relying on fragmented IT systems or proprietary solutions, federation creates a common layer of trust and interoperability that accelerates collaboration and reduces complexity.

FACIS provides the essential components for federations to scale:

- **Scalable Trust Chains:** FACIS builds a digital network of trust. All partners, like airlines, airports, and service providers, can be sure they are working with legitimate organizations. This keeps every exchange safe and only lets trusted partners see sensitive information.
- **Federated Catalogue:** Think of this as an online directory where companies can easily find and offer services to each other. Everyone stays in control of their own data and rules, making cooperation easy and transparent.
- **Digital Wallets:** Like a digital version of an ID, these wallets securely store credentials for people and companies. This makes it quick and easy to prove who they are and what they are allowed to do. This verification is essential in high-risk sectors like aircraft maintenance.
- **Service Level Agreements:** FACIS supplies a framework including a semantic classification (taxonomy) for clear digital agreements that spell out what each service must deliver. These contracts are easily adaptable to an individual purpose and ensure everyone knows what to expect from a service. They provide means to control quality and reliability even when working with many different providers and across borders.
- **Technical Orchestration:** Automated systems manage onboarding, workflows, and access rules, ensuring that only the right people and organizations can access services. This reduces risk, increases efficiency, and keeps everyone compliant with European regulations.

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These building blocks are not abstract. A two-month PoC validated them in a test environment and proved that federation quickly adds real value – even in highly regulated sectors. Each newly created example provides further material for extending the building blocks, patterns, and templates easily reusable for further collaboration and opportunities.

Most importantly, this PoC goes far beyond connecting IT systems. It is about demonstrating the transformative potential of federated services for trusted, identity-driven business processes. In aviation, where safety, reliability, and compliance are paramount, federation offers a way to modernize operations without sacrificing control. By creating a shared framework for collaboration, FACIS enables faster partnerships, more flexible service models, and alignment with European principles of openness and digital sovereignty.



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5.

The Transformative Potential

When organizations move toward federated data ecosystems, everyone is invited to join and benefit: large or small companies, think tanks or public administrations, experienced or new to the game. Federation does more than just change the rules.

Federation makes us rethink how we work, connect, and grow in the digital world. Instead of sticking to old boundaries, participants shape new ways of doing business. They spark innovation that reaches far beyond financial gains. Federation encourages people to act, collaborate, and create solutions that serve society and drive progress.

By embracing this shift, members build stronger partnerships, launch new ideas, and unlock potential that was previously out of reach. Let us now explore what this transformation means for business, society, and innovation.



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Benefits for businesses: Cost sharing and digital business models

Federated data ecosystems have the power to transform businesses and unlock incredible opportunities for growth. By joining in federations, companies increase the availability of high-quality, accessible, and reusable data. This foundation makes it easier to build innovative, data-driven business models that work seamlessly across existing value chains.

Federated data ecosystems also open the door to cost-sharing solutions. Standardized processes and connected data spaces help organizations collaborate effectively. A great example is the joint training of specialized large language models (LLMs). By pooling resources and data, businesses can achieve results that would be impossible alone.

Finally, decentralized infrastructures strengthen resilience. Distributed systems and built-in redundancies help protect value chains from disruptions, ensuring stability and continuity. These collaborative frameworks not only reduce costs but also make operations more robust and future-ready.

Federations make network effects and economies of scale, the success factors of platform models, accessible to everyone. As more members join a federation, each participant gains access to a growing pool of data and new opportunities to create value. Unlike traditional platforms, federations keep the benefits with the data owners, decentralizing the return on investment. This approach democratizes data monetization – without heavy platform fees or restrictions. The result? A fairer, more competitive market where pre-competitive collaboration drives growth for all.

Europe's small and medium-sized enterprises (SMEs) have a unique opportunity to thrive in the digital era. Open and interoperable data spaces are key to unlocking their full potential[14]. By embracing a federated approach, SMEs can compete on equal terms with larger companies, gaining access to the same digital advantages. This approach opens doors to growth, sparks innovation, and helps businesses expand into new markets, empowering them to shape the future of Europe's data economy.

Federated data ecosystems are transforming the way businesses operate. They do not just improve access to data and boost efficiency but also open the door to shared innovation and fair market participation. By encouraging collaboration, reducing reliance on single providers, and allowing flexible integration, these models give companies the tools to succeed in a world that is increasingly connected and driven by data.

14 zvei. (2025). Datenräume und Manufacturing-X. Digitale Souveränität in der vernetzten Industrie durchsetzen

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Societal value: Good data for better services and policies

Beyond the benefits for private companies, federation holds enormous potential for society. To unlock this value, we need a mindset shift that reaches not only businesses but also the public sector and civil society. When public administrations join federated data ecosystems, they gain access to diverse data sources, which empower smart services for smart cities and countries.

Traffic management, e-government services, or flood protection are only a few of the areas that profit from a combination of different live data sources, clear identity management, and a secure and sovereign infrastructure. By sharing and using decentralized data, administrations at every level can deliver innovative services and design policies that create real impact for citizens.

Civil society groups, NGOs, and associations can unlock the power of federations to amplify their missions and create stronger, more impactful communication. By building compliance with key legal frameworks into the design, federated data ecosystems encourage responsible data use and highlight the real value of doing things right. This approach not only boosts trust but also turns compliance into an opportunity for growth and collaboration.

A strong and diverse foundation of data is key to building smarter cities and regions. By combining open and proprietary data in federations, policymakers can make better decisions. With better insights, governments can manage policies with precision. Better information helps focus on the desired impact. For example, data-driven initiatives also help reach sustainability goals more efficiently. The use case "Energy Consumption and Load Management" by Factory-X[15] and Marispace-X, an initiative for setting up a data space for maritime data, are notable examples.

Federated data ecosystems make it much easier for companies to handle legal questions about sharing and using data. Instead of leaving rules about data use unclear, these systems set out exactly who can use which data and for what purpose. This helps companies avoid legal disputes, especially when creating AI training materials. With FACIS, digital agreements are clear, automated, and easy to check, so everyone knows how data can be used. In this way, federation turns legal risks into opportunities, helping both data owners and users work with data confidently and without conflict.

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15 Open Industry 4.0 Alliance Implementation GmbH. (2025, March 17). TP 2.09 Energieverbrauch und Lastmanagement

Promoting innovation: Better data, better research

Promoting innovation through federated data ecosystems represents a major leap forward for research and development. At its core, innovation thrives on access to reliable, well-structured knowledge. Federations are designed to bring together data from business, civil society, and public life, making it more accessible to researchers and scientific institutions. By integrating diverse data sources, federations create a strong research base and open entirely new fields of inquiry.

Projects such as the German National Research Data Infrastructure (NFDI) exemplify how improved data availability and interoperability can accelerate innovation. With open interfaces and standards, federation fosters exchange across disciplines and sectors, driving new scientific and technological advances. This elevates Europe's standing in global research.

Importantly, the benefits of research extend beyond academia. Federated data ecosystems have a powerful impact on business-driven research and development (R&D). Federated approaches give companies secure access to cross-industry data and enable new products and better processes. This collaborative environment accelerates the pace of innovation, as businesses can more easily experiment with new data combinations, validate ideas, and bring novel solutions to the market.

The ability to share and access standardized, high-quality data also reduces duplication of effort and fosters synergies between companies, research institutions, and other stakeholders. As a result, federated ecosystems not only support scientific progress but also drive competitive advantage and sustainable growth for businesses engaged in R&D.

Federated data ecosystems let researchers and businesses combine data from many sources and drive innovations that benefit science and society. By breaking down silos and promoting collaboration, these systems lay the groundwork for a more dynamic, interconnected, and innovative future.

> "Unlike traditional platforms, federations keep the benefits with the data owners.

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Moving to a world where companies share and use data together is not always easy. FACIS helps make this shift possible. It gives businesses the tools to grow, stay secure, and work smoothly with others. FACIS uses open-source technology and follows important European rules like the GDPR and the AI Act, so companies can trust the system from the start.

With automated digital agreements, everyone knows the rules and can act with confidence. This means leaders in business, government, and research can make better decisions, move faster, and work together across borders. FACIS encourages companies to team up, share costs, and build new business models that reach beyond their own markets.

Table 2. **Benefits of federated data ecosystems across business, society, and innovation**

Property	Business	Society	Innovation
Cost reduction	Increased data availability and usability Efficiency through cost-sharing in standardized use cases	Verifiable impact-orientation through use of open data	More and better research data
Value generation	Data sovereignty – yields of data products remain with the data owner Extended digital business models – on top of services previously supplied	Use of everyday data through IoT to improve quality of life (e.g., smart cities) Data-based decision making	Experimental, yet reproducible R&D environments Recency and traceability of data
Governance	Services à la carte instead of lock-in Legal compliance by design	Transparency and data protection by design Democratization of the data economy	Innovation ecosystems across actors and borders in many sectors

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6.

Conclusion

Europe stands at a crossroads. For two decades, businesses have relied on centralized platforms. Platforms are comfortable and familiar but are increasingly risky. They concentrate power, lock in users, and stifle innovation. Platforms dictate terms, limit transparency, and expose organizations to price increases and regulatory uncertainty. The more data they aggregate, the harder it becomes for companies to switch, collaborate, or control their own digital destiny.

But the digital economy is changing fast. Today, openness, trust, and agility matter more than ever. Federation is the answer. Instead of one actor calling the shots, federations bring businesses, public institutions, and service providers together on equal terms. Everyone keeps control of their own data and decides how to contribute. Federation means sharing data, collaborating on standards, and innovating together without giving up sovereignty. It breaks down barriers, sparks new ideas, and lets organizations move quickly, securely, and confidently.

The benefits are real and growing. Federated data ecosystems scale rapidly, connect industries, and unlock new opportunities. They reduce costs, boost resilience, and democratize value creation. SMEs gain access to the same digital advantages as large enterprises. Civil society and public administrations develop smart services. Researchers and innovators combine data in new ways, driving breakthroughs across sectors.

What makes federation truly transformative is the new approach to trust and governance. In the past, trust depended on personal relationships or the reputation of a single provider. Now, federated data ecosystems embed trust in shared rules, transparent governance, and robust digital identities. Governance organizations like those behind Catena-X, Manufacturing-X[16], or the Mobility Data Space create neutral frameworks where participants shape standards, assign roles, and ensure compliance. This structure guarantees fairness, supports innovation, and preserves data sovereignty.

With artificial intelligence, the world economy's digital transformation is taking the next big leap. For Europe to lead, not to follow, politics, business, and society need to create the right conditions and

16 https://mx-guidanceboard.org/

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engage in secure, federated data ecosystems, open collaboration, and robust governance. Only by engaging in federation can Europe harness AI's full potential, protect its values, and drive sustainable growth.

8ra is at the heart of this transformation. It builds a resilient, scalable digital infrastructure for Europe. Its FACIS architecture enables seamless collaboration across cloud and edge environments, letting organizations work together securely and flexibly. FACIS makes trust and cooperation practical: it provides ready-to-use federation architecture patterns and digital wallets and enables automated contracts. The FACIS proof of concept in aviation shows how federated services can deliver real value, even in highly regulated industries. Federation is no longer just an idea – it is happening now.

What matters most is action. Decision-makers must rethink their approach to the digital economy. Do not wait for the perfect moment or for others to lead. Start sharing data, embrace decentralized cooperation, and capture the benefits of technological progress. The time to act is now.

> "Decision-makers must rethink their approach to the digital economy.



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The Mindset Shift – From Centralized Platforms to Federation

ISBN: 978-3-9828074-3-0

www.facis.eu