



Position Paper

Data Sharing Models in the Electro and Digital Industry



Imprint

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1 Data sharing models in industry

1.1 Introduction

In the context of the digital economy many discussions are ongoing how to create additional value based on data while maintaining and guaranteeing data sovereignty, data security and data integrity for the stakeholders involved.

A concept of data sharing models is proposed to offer participants common, trustworthy transaction rooms via which data can be provided and jointly evaluated or managed. Such data sharing models are based on a basic structure, an elementary pattern that involves three different roles from a business viewpoint: a data generator, a data user, and a data space operator. The data space operator enables the interaction between data generator and data user by providing a data space that is defined by technical, legal, and business principles.

There are already numerous examples observable in the industrial market where companies create additional value based on data. A common challenge across all these examples is often to improve the economic scalability of these applications.

The data sharing models illustrate the economic potential that is based on common technical, legal, and business principles. As they are enabled by a data space operator, specific added value in the individual examples can be more easily transferred to other applications. In addition, data spaces also offer the potential to open new solutions and business models.

However, the specific requirements of the involved stakeholders in terms of data sovereignty, data security and data integrity depend very much on the application, so that in addition to the technical capabilities the cost-benefit ratio of a data space must also be considered.

Analyzing existing data sharing activities at the market, one can distinguish the following five data sharing models. They use different types of data and offer specific values propositions along the product life cycle.

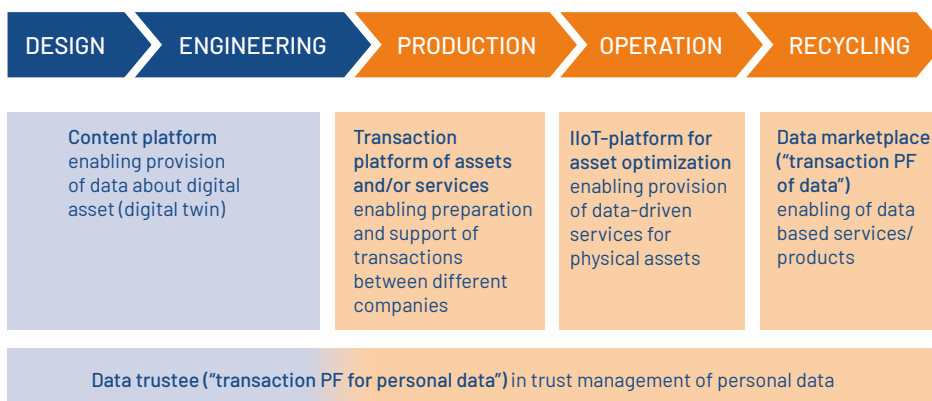


Figure 1

Five industrial data sharing models along the product life cycle

© ZVEI

1.2 Methodology

In the context of data sharing, it is typically not enough to consider a dichotomous data provider – data consumer relationship but an overall value network. In such a value network a convincing value proposition for all participants should be developed. This conceptual approach is aligned with the methodology proposed by the working group “Digital Business Models” of Plattform Industrie 4.0 to analyze practical examples, see [1]. Thus, the starting point for the analysis and documentation of data sharing models is the description of a value network. An example of a value network is illustrated in Figure 2.

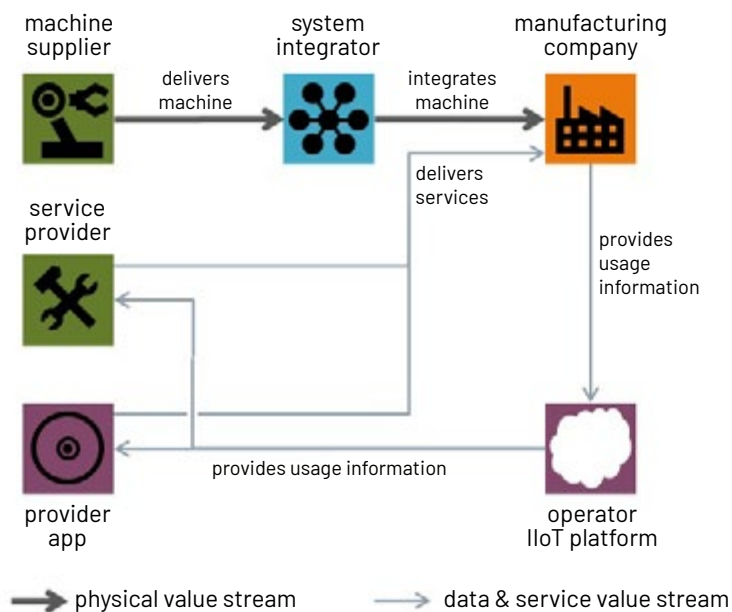


Figure 2
Description of value networks
(illustration), © ZVEI

A value network is a directional graph consisting of nodes and edges. The nodes of the graph are business stakeholders, and the edges of the graph are business relationships. Each node represents a business role and comprises a description of the underlying business model. Each edge represents a value proposition of a provider to a customer.

The individual business roles in a value network are assumed by enterprises. This is indicated by coloring the business roles, whereby each enterprise is represented by a specific color. An enterprise may assume several business roles, thus, business roles coded by the same color are assumed by a single enterprise.

Following this approach, the business benefit of data sharing for all stakeholders involved in the value network is illustrated. This is the basis to derive in a next step recommendation for action, both for technical implementations and for regulatory boundary conditions.

[1] Digital business models for Industrie 4.0, online: Plattform Industrie 4.0 - Digital business models for Industrie 4.0 (plattform-i40.de)

2 Typology of five industrial data sharing models

2.1 Basic structure as elementary pattern with three roles

The various data sharing models are based on a general basic structure, with a data generator making data available to a data user. Both use the services of a facilitator, which we call "data space operator" to exchange and manage the data, see Figure 3. From this point of view a data space means the interaction sphere of more than two companies providing and using data in order to achieve data-based value creation.

The individual data sharing models can be regarded as different types or specifications of this basic structure, for example by considering further business stakeholders or adding specific value-added relationships. It is conceivable that the role of the data space operator is assumed by the data generator, the data user or a third party.

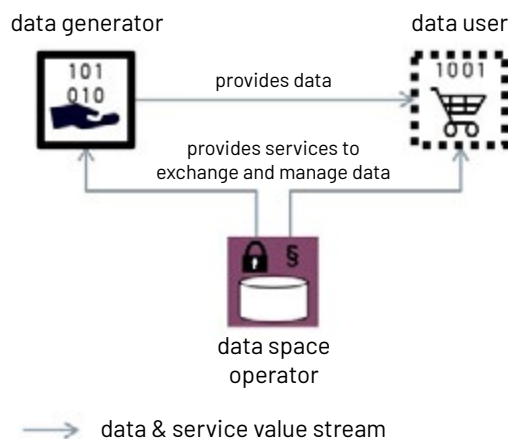


Figure 3
Basic structure of data sharing models, © ZVEI

The different roles usually act according to the following principles:

- A data generator will typically make its data only available if this creates own benefits.
- A data user will typically use the provided data to optimize the own internal processes or to expand the own product and service portfolio.
- A data space operator will make a strategic decision as to which platform business model is operated, including possible additional services offerings.

Being a data generator or being a data user can be covered by different roles in the value network depending on the individual use case. A company can be assumed as data generator in one use case and as a data user in another use case.

2.2 Asset optimization platform

In this data sharing model, a user of an asset acts as a data generator and makes data about the own usage of the asset available to other companies, which then act as data users. In return for providing the usage data, the data users analyze the provided data and then offer data-driven services to the asset user so that the asset user can optimize the use of the asset. In this data sharing model, an asset optimization platform operator acts as data space operator, see Figure 4. Asset optimization platforms are often also called IIoT platforms.

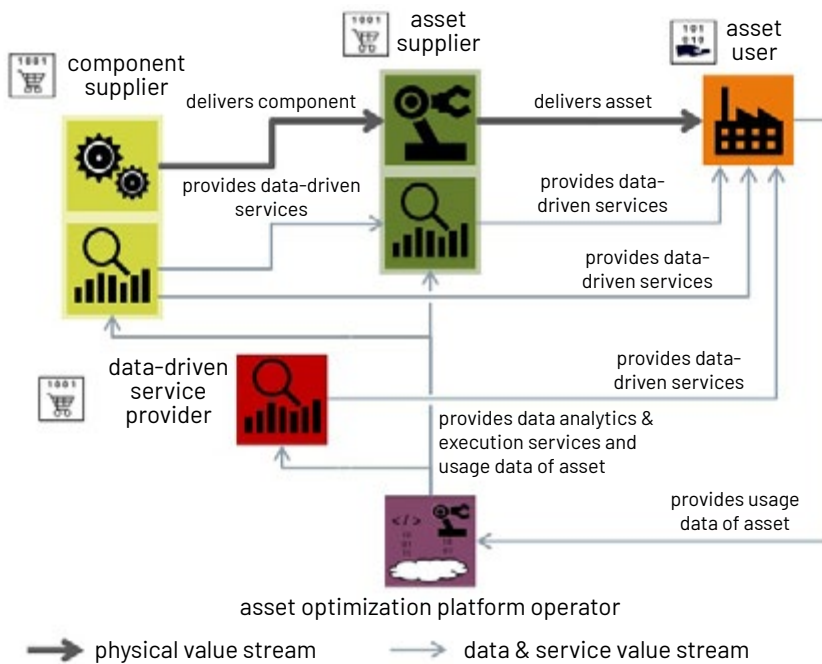


Figure 4
Asset optimization platform, © ZVEI

Value proposition

- An asset optimization platform provides connectivity capabilities to exchange usage data of assets, provides development capabilities to create data analytics applications and provides services to analyze usage data of assets with data analytics applications.
- On this basis, asset users can provide data about the usage of their asset to data user, which in turn offer data-driven services by evaluating this usage data to the asset user as data generator. The asset user consumes these data-driven services to optimize the use of the asset.
- The data-driven services provider can be, for example, the asset supplier or a component supplier who has supplied a key component to the asset supplier, but it can also be an independent company that provides such data-driven services.

Kind of data

- The asset optimization platform focuses on usage data of assets and therefore offers suitable connectivity and data transmission capabilities so that the data can be continuously provided to the data user over time.

Data exchange / governance

- The asset optimization platform operator defines general conditions according to which data can be exchanged and managed using the platform. The usage policy regarding the data payload is negotiated individually between the asset user as the data generator and the data-driven service provider as the data user.

Use cases: Asset optimization platform

Siemens MindSphere – Optimization of usage of consumables

Calvatis, one of the leading Detergent Suppliers in the world, was asked by one of its large customers in the Food & Beverage industry to supply dispensing units and the cleaning detergents for its washing lines, with a central monitoring and control system. This system is required to (i) regularly and closely monitor and document the process parameters of the washing lines; (ii) help optimize the resource usage: water, energy, detergents, and food ingredients; and (iii) provide the solution on the cloud, so all results are readily available and can be accessed from a central location. Calvatis chose Siemens MindSphere providing secured end-to-end solutions for connecting devices, storing data and developing and running applications on a managed service platform. MindSphere helped Calvatis to optimize resource usage and to achieve a 10 percent reduction in downtime and a six percent reduction in the use of cleaning fluid. This also enabled Calvatis to offer additional value-added services to its customers.



kiconn Kitchen Management System – Monitor temperature and health status



In large commercial kitchens like in canteens data exchange is essential. Temperatures in cooking and cooling devices have to be monitored constantly to comply with hygienic regulations. Critical temperatures need to be detected, escalated and documented centrally. In addition, technical failures should be displayed. The kitchen manager receives support, how to operate and which service partner is in charge. The Kitchen Management System from kiconn monitors when maintenance is due and offers checklists for service tasks. To connect all kitchen appliances the HKI (Industrieverband Haus-, Heiz- und Küchentechnik) has developed the communication standard DIN/TS 18898 based on OPC UA. For numerous product families the standard defines the data on a semantic level. This sets the base for a manufacturer independent communication. Devices equipped with this interface are able to communicate with Kitchen Management Systems. Once this standard DIN/TS 18898 is established numerous applications (apps) can be implemented: Temperature Monitoring, Asset Management, Predictive Maintenance, etc. For this purpose, kiconn processes the raw data out of the data lake and visualizes the results e.g., temperature curves. The standard interface will also be used to send recipes to the cooking devices in future. There are three levels of users: kitchen manager (asset user), service partner (asset service partner) and manufacturer (asset supplier) who are in need of processed data.



2.3 Content platform

In this data sharing model, a user of an asset acts as a data user and requests for information about an asset. Usually this is static data in the sense that the data do not change in value in the short term, for example configuration data or operation manuals of the asset. The requested information typically is provided by the supplier of the asset, or the components integrated in the asset, therefore the asset supplier and component supplier act as data generator. In this data sharing model, a content platform operator acts as data space operator, see Figure 5.

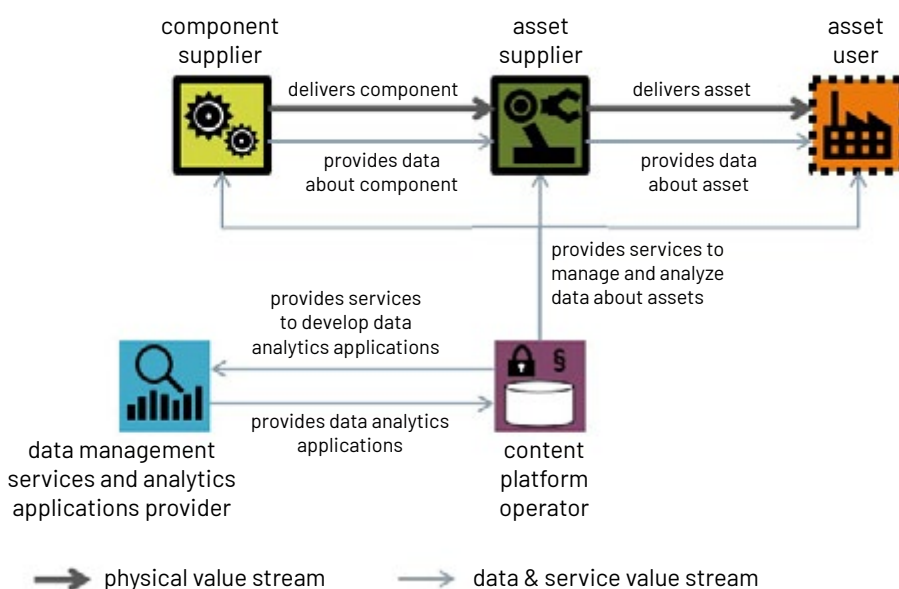


Figure 5
Content platform, © ZVEI

Value proposition

- A content platform provides capabilities to manage and provide data about assets. This includes version management and notifications about changes of the data as well as a legal framework for security and usage policies of data and its enforcement.
- In addition to the asset and component suppliers as data generators, service providers for the asset or service providers for auditing and certification of the asset user can also act as data generators.
- In addition, a content platform provides development capabilities to 3rd parties to create specific data management services and data analytics applications and to sell these services and applications to data generators and data users using the content platform.

Kind of data

- The content platform focuses on data about assets, which does not change in value in the short term, and therefore offers suitable capabilities to manage data about assets including version management and notifications about changes.

Data exchange / governance

- The content platform operator defines general conditions according to which data can be exchanged and managed using the platform. The usage policy regarding the data payload is negotiated individually between the asset user as the data user and the asset and component supplier as the data generator.

Use cases: Content platform

Siemens DocuHub – Keeping technical documentation of equipment up to date



Today, document handling drives operational expenditure and risks during operation of complex equipments. Documents are exchanged in many technical ways based on highly manual, specific, and thereby costly workflows. Often there are more than 10,000 equipment per plant and more than 20 documents per equipment. Therefore, today equipment information often is not available when needed, for example 80% of maintenance time is needed to find the correct information.

To address these challenges Siemens provides DocuHub, a shared system offering services to assign metadata to documents and to legally exchange documents between equipment provider and equipment operator. Using these services an equipment operator has up to date and consistent documentation of equipment and an equipment provider can make the documentation for an equipment available in an easy way. In

addition, an equipment provider can offer additional documentation related services over the lifecycle of the delivered equipment, for example notification services regarding updated documents.

True Demand MPC Survey

The Bullwhip Effect intensifies demand changes drastically and poses a challenge for planning in semiconductor supply chains. To overcome these issues, collaboration and industrial data sharing with regard to demand are of high importance.

A pilot project called “True Demand MPC Survey” aims to remove the incentive for communicating tactical demands in an anonymous true demand survey platform utilizing Multi-Party Computation (MPC). The anonymity removes the incentive to communicate a tactical inflated demand since demand shared through the survey platform is not used for ordering. In addition to true demand, other survey questions about industry indicators such as backlog, inventory, pressing issues, or important semiconductor nodes can be included for an even better picture of the supply chains’ state. The surveys should be conducted by an independent third party not directly involved in the supply chains that are surveyed.

True demand information can then be used to get a better overview of the demand picture and deduce further actions for the participants from all tiers including OEM, Tier 1, and others. The complexity of the surveys can be handled with Semantic Web to structure and semantically describe data. Introducing an anonymous true demand survey platform for regular surveys facilitates more transparency, collaboration, and exchange along the whole end-to-end supply chain to mitigate the bullwhip effect and further chip shortages in a sustainable way.



2.4 Transaction platform

In this data sharing model, an intermediary in form of a transaction platform operator enables the negotiation between a requester of a product or service and provider of products and services. The transaction platform addresses especially use cases where a requester and a provider are made known to each other because they were not previously in a value-added relationship with each other. The requester and the provider both act as data generator and data user. The requester acts as a data generator by providing data about its request and as a data user by receiving data about offers from the provider. The provider acts as a data generator by providing data about its offerings and as a data user by receiving data about requests.

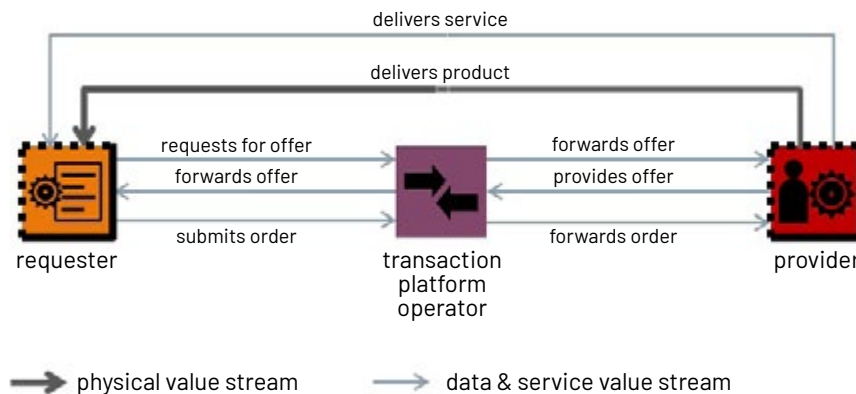


Figure 6
Transaction platform, © ZVEI

Value proposition

- A transaction platform provides capabilities to a requester to formulate a request and to a provider to formulate an offer.
- A transaction platform also provides matching capabilities to support the negotiation between requester and providers by searching for and selecting possible provider and forwarding the offers of the selected providers to the requester.
- In addition, a transaction platform can also provide capabilities to manage the transaction between requester and provider, for example by offering payment services.

Kind of data

- The transaction platform focuses on data describing transactions between two parties, for example a request, an offer, and an order. This includes technical, financial, and legal aspects.

Data exchange / governance

- The transaction platform operator defines general conditions according to which data is exchanged between the platform operator and the platform users and also defines the concrete content, which is exchanged.

Use cases: Transaction platform

PLCnext Store – the digital marketplace for software applications

Cooperation, partnership and networking are the most important answers to the rapidly changing requirements in industrial automation. With the open ecosystem PLCnext Technology, automation specialist Phoenix Contact offers new perspectives. As part of the ecosystem, PLCnext Store was launched in 2018 as a platform for the exchange and trade of software solutions. It is an industrial marketplace for digital services, with the aim of harnessing the accumulated know-how of the industry.

The app users, often medium-sized machine and plant builders, benefit from accelerated development times and the associated shortened time-to-market through the use of software apps. The PLCnext Control becomes even more versatile in its functions and possible applications through the use of software apps.

The software developers get a new distribution channel with a broad customer base, where prices can be freely set. Through the integration of a payment service provider, the processing of payments is possible for the developer without any effort. By means of the PLCnext Store, pure software providers also gain market access to different industries within the automation sector.

Thus, all participants benefit from the digital platform PLCnext Store.

Unite – Connecting buyers & sellers for mutual benefit

Unite connects the economy for sustainable business. Its pioneering B2B platform brings buyers and sellers together for mutual benefit. With its digital solutions, Unite enables effortless sourcing, buying and selling, transacting, and collaborating. Built on Mercateo's prominent spot-buying expertise and history, which began in 2000, the company has already established strong foundations: fair competition, trusted partnerships and European data sovereignty. Unite's head office is located in Leipzig, Germany. The company is active in 15 European countries.

Unite's solutions include the integrated Spotmarket with millions of products for ad-hoc demand, the Mercateo Procurement Portal that meets professional procurement needs and Financial Services (in partnership with an authorised Electronic Money Institute), elevated by a smart network hub. Unite's ever-growing ecosystem covers buyers, suppliers, manufacturers, distributors, technology partners, and networks.

Buyers and suppliers can build and manage their own network of business partners, enabling them to tackle challenges like volatility and sustainability.

Buyers can centrally collect, enrich, retrieve and analyse their procurement-related data, creating full transparency to control and optimise purchasing.



PLCnext Technology[®]
Designed by PHOENIX CONTACT



2.5 Data marketplace

In this data sharing model, a data marketplace enables a data generator or a data user to develop new products or services based on the provision or consumption of data. The data marketplace addresses especially use cases where a data generator and data user are made known to each other because they were not previously in a value-added relationship with each other. In addition, a data marketplace supports a peer-to-peer exchange of data payload between data generator and data user and is therefore not involved in the concrete transmission of the data. In this data sharing model, a data marketplace operator acts as data space operator, see Figure 7. Compared to the other data sharing models, the degree of commercial implementation of data marketplaces in the industry is even lower.

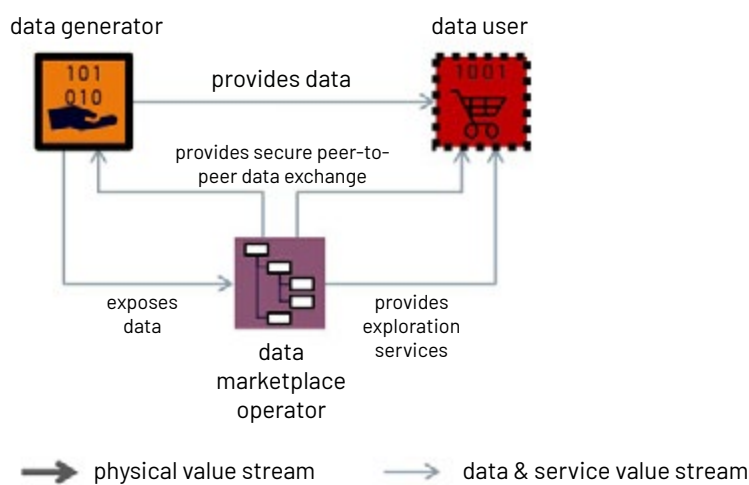


Figure 7
Data marketplace, © ZVEI

Value proposition

- A data marketplace provides exposure services for data. These exposure services can be used by a data generator to publish, what kind of data the data generator can provide under what conditions.
- A data marketplace provides exploration services for exposed data. These exploration services can be used by a data user to search for data of own interest.
- A data marketplace establishes the contact between a data generator and data user so that they can enter into further negotiations. The data marketplace also offers a secure peer-to-peer data exchange between data generator and data user.

Kind of data

- The data marketplace addresses in particular those use cases, where general sharing of data is necessary, but peer-to-peer exchange of data payload between the data generator and data user is important.

Data exchange / governance

- The data marketplace operator defines general conditions according to which data can be exposed to the marketplace by a data generator and how the exposed data can be explored by a potential data user. The usage policy regarding the data payload is negotiated individually between the data generator and data user.

Use cases: Data marketplace

Caruso

Data from connected vehicles is the foundation for future mobility services. Currently, acquiring data from a larger number of vehicles from different brands is a challenge due to diversity and a lack of central access. The Extended Vehicle standard aims to provide a technical baseline for accessing vehicle data. Caruso has established the first comprehensive B2B dataplacel, offering access to in-vehicle data across different brands through a single API. As part of this process, Caruso has established a comprehensive catalog of data points and defined an harmonized format for all vehicle manufacturers. The Caruso data catalogue currently covers over 500 data items. As an industry initiative from in the Independent Automotive Aftermarket (IAM), Caruso's mission is to provide an open, fair, and non-discriminatory access to car data for all players in the mobility sector.



Catena-X Automotive Network – Alliance for secure and standardized data exchange



Catena-X sees itself as a rapidly scalable and expandable ecosystem, which allows all contributors in the automotive value chain to participate equally. The goal is to provide an environment for the creation, operation, and collaborative use of end-to-end data chains along the entire automotive value chain. Catena-X addresses challenges such as resilience, sustainability, and geopolitics.

Due to initial use cases, Catena-X is the nucleus for initial answers to the top issue of data exchange in the automotive industry. Catena-X establishes the connection cross-industry networks and technologies for data infrastructure (GAIA-X) and data exchange. An operational holistic system is created in which industry outfitters and adopters are connected. The Catena-X network is open, and the technologies provided are scalable for any company size.

For the companies involved, competitiveness is improved by

- Consistent data chains for relevant value creation processes
- Integrated SMEs
- Industrialized data ecosystem
- Value-added services through network-based, innovative approaches
- Systemic (copy) protection for the European automotive industry

2.6 Data trustee

In this data sharing model, a data trustee offers in trust management of data to the data generator and data user. In this data sharing model the data trustee acts as data space operator, see Figure 8. Compared to the other data sharing models, the data trustee often does not act as an in-dependent platform operator, but as a service provider on behalf of the data generator or data user, or on behalf of a third party.

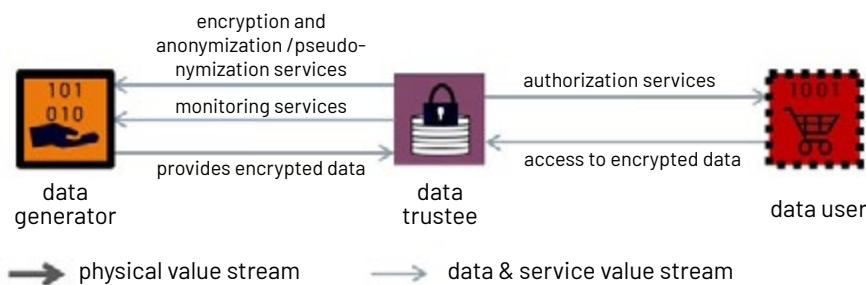


Figure 8
Data trustee, © ZVEI

Value proposition

- A data trustee provides transmission and management of encrypted data by advocating the interests of data generators.
- A data trustee provides anonymization and pseudonymization services, which can be used by a data generator.
- A data trustee provides access to encrypted data to authorized data users.
- In addition, a data trustee can also provide monitoring of data usage.

Kind of data

- The data trustee focuses on personal data for which encryption and may be anonymization or pseudonymization are important.

Data exchange / governance

- The data trustee defines general conditions according to which data is exchanged between the data trustee and the data generator and data user. In the case of personal data these general conditions must comply with GDPR.

Use cases: Data trustee

CenTrust der Bundesdruckerei



A data trustee can help to create trust by acting as an independent intermediary between the data generator and the data user. This trustee can take on different tasks: From securing data access and the secure identification of the parties involved in data exchange to organizing access authorizations, right through to data processing which is coordinated with the data providers and users (e.g. pseudonymization, clustering and filtering of data). With CenTrust, Bundesdruckerei GmbH offers a data trustee platform that can be used for various applications.

The so-called trust agency service is a central application of the CenTrust data trustee platform. Data from different sources can be linked and pseudonymized via the trust agency service and then made available to authorized data users. Pseudonymization of the data ensures that no conclusions can be drawn regarding individuals, making it particularly suitable for patient data in the healthcare sector and in research.

Telematics Infrastructure: data sharing and trust management for the German healthcare sector

Gematik

The Telematics Infrastructure (TI) is Germany's national platform for the digital health system. Electronic identities ensure that only authenticated users can access services on the TI. A federated identity management system is being implemented for this purpose. So far, this has been based on special smartcards in combination with a hardware connector. Now, electronic identities (eIDs) are also to be introduced. Identity provides approved by gematik will take over the authentication of users. A single sign-on with the identity provider is sufficient to be able to use all applications and services.

The introduction of eIDs also enables distributed services on the TI. These distributed services can bring together data and processes from different services either through a client / app or through direct interaction of individual services.

So far, a closed network with physical access points and hardware connectors has been an essential feature of the TI's security architecture. In future, users who have authenticated themselves either with their smart card or their eID will be able to access TI services via the internet, whether on a computer or a mobile device. Security will be guaranteed by the principle of „zero trust networking“. Each connection is secured end-to-end where both sides of each connection must authenticate each other. In addition, devices must be registered and approved. Furthermore, systems must be in place to detect misuse of TI services.

Description by Hans-Peter Bursig (ZVEI) based on public information on: <https://www.gematik.de/telematikinfrastruktur> [online, May 2022].

3 Summary

- The five industrial data sharing models have illustrated different types of data sharing value networks in industry, showing that there are already many applications in the market, although industrial data economy in Germany and Europe is still in an early development phase. This is due to the complexity of the industrial value networks and the complexity of data involved.
- Asset optimization platform, content platform and transaction platform are three platform-based data sharing models that allow to optimize physical assets, digital assets and transactions between companies based on data exchange. A lot of examples for each type can already be found on the markets so one can assume that the uptake of industrial data economy will start within these three types.
- Data marketplaces and data trustees can also be found on the markets; however, they are still in an evolving stage. Data marketplaces seem to address complex interaction processes within the value network and data trustees especially address access options to personal data.

4 Outlook: Industrial Data Sharing needs private investment

- The analyses have taken place from a business point of view, which is often too much neglected in the ongoing discussions of how to foster data economy.
- From a business perspective there seem to be two major challenges:
 - Elaboration of a compelling value proposition to all stakeholders involved in the value network
 - Improving the economic scalability of offerings.
- The challenge of scalability is addressed by data sharing models that constitute data spaces based on common technical standards, legal frameworks, and business principles.
- In all five data sharing models the role of the operator of the data space is crucial to enable the interaction and value creation between data generator and data user. This role can be assumed by different stakeholders in the value network, be it a data generator, a data user or a third party.
- One bottleneck for the uptake of industrial data economy are the required significant investments of a data space operator. These investments typically only pay back in the medium or even long term. Thus, a well-considered scale-up strategy is required.
- The participation in a data space typically also needs upfront investments by the other participants, too, because data sharing must be integrated into the existing value creation processes of a company.
- Consequently, from the business viewpoint of our analysis the facilitation of business investments seems crucial to foster the uptake of industrial data economy.
- That industrial data economy is rapidly growing and will even accelerate which has been shown by a recent survey among the ZVEI members, where companies expect a rapid growth of the share of digital products and services within the next five years and a massive increasing share of their digital revenue (ZVEI Survey 2021).
- The speed of the expected uptake will massively depend on the investment readiness of companies to establish and operate data spaces or to participate in them.



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