Gaia-X Domain Industry 4.0 / SME

Position Paper Version 1.0 2021

Contents

Plattform Industrie 4.0 invites to shape tomorrow's digital ecosystems

In the era of the digital economy, data-based value generation will depend on global data spaces that safeguard and guarantee data sovereignty, data security and data integrity. Plattform Industrie 4.0 drives the formation of the Data Space Industrie 4.0, a data space that accelerates future value creation in industrial manufacturing and production.

Defining the Data Space Industrie 4.0: Enabling the paradigm shift towards multilateral collaboration

Typically, today's business value in production and manufacturing is generated in a global production value network. This network is built on single, bi- and multi- lateral business relationships among organizations in the production ecosystem. It is highly complex, globally widespread and involves multiple players and stake- holders (e.g. OEMs, suppliers, service vendors, etc.). They are cooperating across different regions, markets and increasingly also industries. Flexible production value chains are being built dynamically inside the pro- duction value network based on bilateral agreements to fulfil specific business objectives.

However, this bilateral nature of cooperation hinders multi-stakeholder collaboration down- and upstream the value chain. It lacks the requirements of modern business and regulatory needs: Use cases with both highest business and societal impact. Examples, that rely on full digital transparency and an integral "sovereign flow of data" within the entire data ecosystem are

- efficient supply chain traceability and quality management,
- modular production and manufacturing-as-a-service or
- a sustainable, CO_2-neutral circular economy.

To realize these highly impactful use cases, depends on a fundamental paradigm shift in the global production ecosystem: To satisfy future business requirements, organizations must evolve from bilateral collaborations. In many cases, these are restricted to individual first tier relations along the production value chain. Instead, multilateral collaboration, allowing end- to- end data exchange in a fully interoperable and sovereign data-oriented ecosystem is required: The Data- Space Industrie 4.0.

Multilateral collaboration and data-sharing – two directions of impact, one target

With its 10th anniversary, many manufacturers world- wide already benefit from Industrie 4.0 implemented on the shop floor. Now, established Industrie 4.0 concepts and solutions must be seamlessly integrated to initiate the next stage of the fourth industrial revolution: The

implementation of digital, cross-enterprise collaborations within a data-value-oriented ecosystem that provides flexibility and supports dynamic changes.

An "enabling structure" for a competitive digital ecosystem requires business-related mechanisms as a basis to collaboratively share data within an interoperable (scalable by design) and sovereign architecture. This fundamental architecture for collaborative data sharing will not only streamline current business processes and enable future business cases. It will also provide the foundation to develop new business models and new potential revenue streams for existing organizations and emerging start-ups in the production landscape, e.g. with use of data-marketspaces

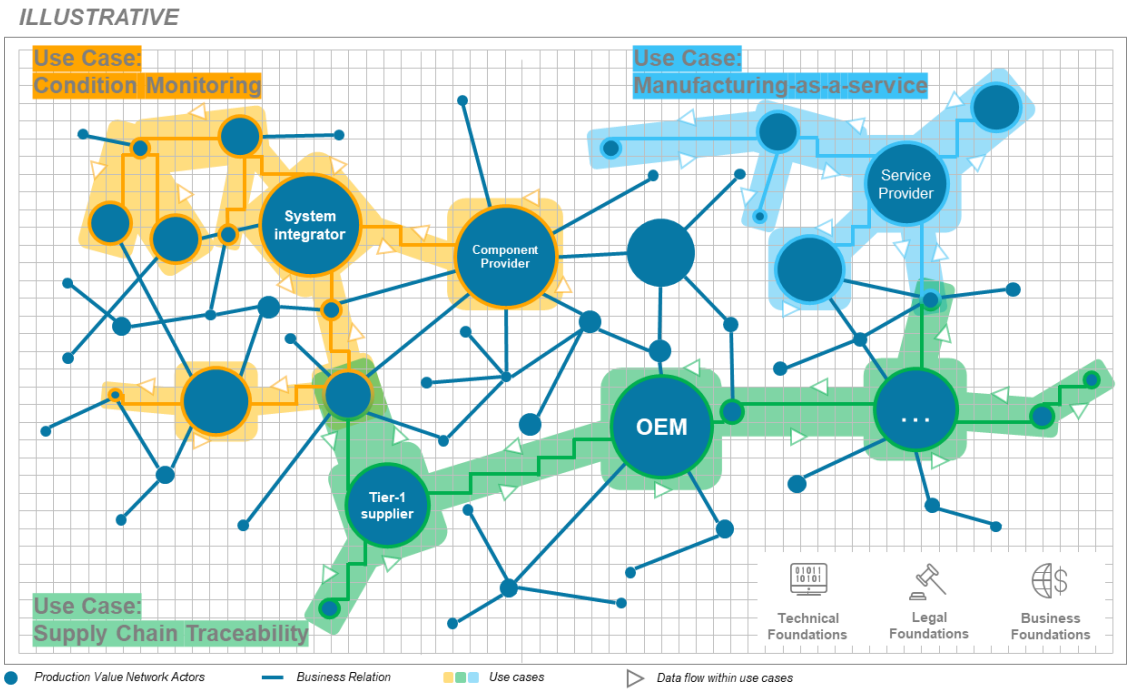

Figure 1: The DataSpace Industrie 4.0 lays a „collaborative mesh" of technical, legal and business foundations underneath the production value ecosystem. Organizations can use the „collaborative mesh" as common basis for multilateral data-sharing and collaborate

The Data Space Industrie 4.0: A common set of technical, legal, and business foundations

A common base foundation must be established and agreed among all stakeholders. This enables multilateral collaboration and data-sharing based on trust, integrity, security, and individual sovereignty in the Data Space Industrie 4.0. A basic set of precompetitive foundations provide the "collaborative mesh" underneath the digital production ecosystem. Organizations can build on such a mesh to initiate and accelerate multilateral collaboration and data-sharing.

From today's perspective, the architecture of the mesh is defined by examining at least three essential dimensions on the production landscape that must be considered comprehensively: business, legal, and technical foundations. Consequently, the Data Space Industrie 4.0 is

described by a set of common basic foundations all stakeholders agree on. In this sense, the Data Space Industrie 4.0 does not include any individual business processes, specific technologies or use cases. The foundation of the data space rather prescribes frameworks, routines, standards, and guidelines that are agreed upon in a precompetitive context. It can be used to initiate efficient crosscompany collaboration and data-sharing.

Plattform Industrie 4.0: Implementing the Data Space Industrie 4.0 as a joint approach of public and private stakeholders

In recent years, the partners of the Plattform Industrie 4.0 have jointly developed concepts and endorsed solutions alongside the various dimensions describing the Data Space Industrie 4.0. With the Asset Administration Shell (AAS) a coherent information model has been developed and approved by industry to ensure cross- company interoperability. Further models describe industrial specifications for e.g. secure and trustworthy collaboration as well as the fundamental legal requirements associated with digital ecosystems.

Based on a well-established structure and world-wide network, the Plattform Industrie 4.0 together with its partners will now strive to describe a coherent architecture of precompetitive foundations defining the Data- Space Industrie 4.0:

Merging of individual perspectives into a coherent architecture for the Data Space Industrie 4.0

In a multi-stakeholder approach recent concepts on technical, legal and business foundations are developed and agreed within the Plattform Industrie 4.0. The aim is to create a coherent set of specifications defining the Data Space Industrie 4.0 in accordance with industry needs.

Implementing prototypical industrial use cases for the Data Space Industrie 4.0

With the implementation of lighthouse projects the business, ecological, and societal benefit of the collaborative sharing of data will be demonstrated. This happens through representative use cases with a strong footprint, e.g. in the automotive or process industry. We will address questions of architecture, governance, and business models to assess value creation. This will be the launchpad to start the journey on establishing pragmatic and ready-to-use frameworks that reduce scepticism and reluctance towards change. Consequently, results from these pilots will be communicated and transferred into the broader industrial landscape to enable a broad market uptake of the digi- tal ecosystem.

Building the Data Space Industrie 4.0 on Gaia-X

The Data Space Industrie 4.0 and related business models fundamentally rely on a cloud/edgecloud infrastructure. This allows for a sovereign and transparent hosting and processing of data and services. With the European initiative Gaia-X numerous stakeholders

are setting the foundations for a federated cloud infrastructure, empowering the creation of dataspaces in various sectors. The architecture for the Data Space Industrie 4.0 will be developed in close collaboration with the European Gaia-X foundation and national Gaia-hubs. In this way industrial requirements can be organically integrated within the Gaia architecture and vice versa.

Fostering a world-wide lead-market for digital industrial solutions in Europe

We will advocate the broad roll-out of common foundations for the Data Space Industrie 4.0 throughout the industry – in close alignment with European partners from industry, government, academia and the European Commission. This initiative will boost a collaborative culture that fosters digital entrepreneurship, promotes agility, and reduces reluctance against progressive change. The implementation of the Data Space Industrie 4.0 will accelerate the digital transition of the industry into the digital age.

The creation of the Data Space Industrie 4.0 will be successful as a joint effort that is orchestrated on European and international level. Here, Plattform Industrie 4.0 will develop governance structures that moderate and perpetuate multi-stakeholder dialogues among diverse international organizations. National and international organizations are invited to engage in this process and shape the tomorrow's digital ecosystems.

With ten years of experience Plattform Industrie 4.0 now pioneers the next phase of the digital transformation: Industrial concepts and solutions from different perspectives and disciplines developed so far, will be brought together into a coherent foundation for the data space, facilitating the >> 2030 vision of Industrie 4.0: An interoperable, sovereign and sustainable frame- work – enabling global, digital ecosystems!