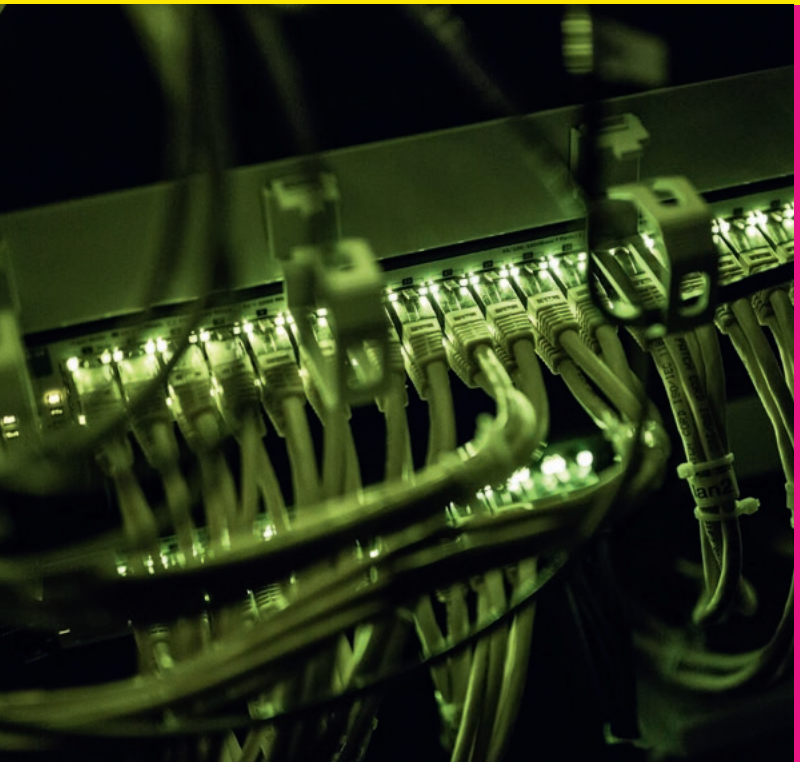

Data Sharing

Technology Report

Vienna,
November 2021

Dear readers,

Vienna is currently home to approximately 9,100 companies in the “manufacturing sector”, which employs more than 170,000 people. The product offering is broad-based and in addition to production of goods, also includes mining and extraction of stone and earth, energy supply, water supply, wastewater and waste disposal, elimination of environmental pollution, and construction. These manufacturing companies generate a total gross value of approximately EUR 29 billion each year, which corresponds to just under 33 per cent of Vienna’s value creation.

According to various studies, Vienna also scores particularly high in innovative strength, comprehensive support of start-ups and strong focus on sustainability. Vienna is also consistently high in the “smart city” rankings. Furthermore, the location is impressive with its research-friendly and technology-friendly climate, geographic and cultural proximity to growth markets in the east, high quality of infrastructure and the educational system, and not least the worldwide highest quality of life.

With its “Vienna 2030” strategy, the federal capital is focusing on those areas where the city is particularly successful, and thus desires to provide answers to the major challenges of the coming years – from climate change to digitalisation. The aim/goal is to be among the world’s best in six areas within the next 10 years and to develop particularly powerful innovations (“Vienna solutions”). One of the Vienna’s key topics is “Smart production in the big city”. By integrating high-quality digital solutions and using state-of-the-art production technologies, Vienna’s manufacturing companies are recognised around the world as trendsetters in modern production technologies. Vienna is also setting new international standards in the area of greening production processes and thus assuring an exportable quality of place.

New approaches, such as sharing data, open up opportunities for transparently and securely implementing new business models and optimised processes in Viennese quality.

In order to fully exploit the potential of its location, the Vienna Business Agency functions as an information and cooperation platform for Vienna technology developers. The agency networks companies with business, scientific and city administration development partners, and supports Viennese companies with targeted monetary support and a variety of advisory and support services.

With due consideration of experts, actors and activities in Vienna, this technology report provides an overview of the diverse trends and developments that concern “data sharing in production” in Vienna.

We hope you enjoy reading it!
Your Vienna Business Agency team

vienna business agency

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Contents

The origin of the apt phrase “data is the oil of the 21st century” can no longer be determined with certainty. Data is not compared with oil as a raw material in other versions of the phrase, but is identified as “the gold of the future” – in other words, it is the intrinsic value; its weight just needs to be measured and then minted into coins so that this value can also be exchanged. In any case, the fact that high expectations are imposed on the informative value of data has been accepted for decades. But the focus has likewise shifted over time, just as the terminology has changed.

“Data sharing” is a collective term that denotes the perception that data only becomes useful information when it is interlinked. There is no fixed definition of data sharing. In general, the term refers those “practices, technologies, cultural elements and legal boundary conditions” that are relevant for data that is shared within and between different companies and organisations.

What is new is the emphasis on “sharing” data. Thus, unlike previous models and ideas, the emphasis is no longer on linear transmission of a numeric value from point A to point B, where it can retrieved and used for a specific functionality. The emphasis is on the provision of data to one or more recipients, who share information from their own data pool in return. The underlying assumption is that faster and more productive insights, business models and ideas arise from knowledge that is shared as openly as possible, than is possible with other forms of information dissemination. We could also say: Linear data transmission models represent a formal lecture at a conference or a Power Point presentation at a meeting, on the other hand, data sharing represents the creative exchange of views about the lecture or meeting during coffee breaks or over dinner in a restaurant.

Although this analogy emphasises the creative process, triggered through informal sharing of knowledge and ideas, there is another economic trend that must be considered when analysing the opportunities and risks of data sharing. The term sharing economy commonly refers to business models that are based on the reciprocal provision of objects, spaces and areas. Private individuals, in particular, transition from consumers to active traders in a sharing economy. It is an established fact that these models have led to disruptive changes in some industries: Examples range from Airbnb and Ebay to Uber and other car-sharing variants. This shared economy is made possible through the exchange of data on online platforms. This exchange is non-hierarchical: There are no major hurdles preventing customers from becoming providers; both parties have the same information status relevant for the exchange transaction, and in the exchange transaction, both parties start with the principle of trust that the other party is pursuing the same objective. In addition, reciprocal open assessment via social media ensures that any misuse of this principle of trust will be penalised quickly. Classic linear business models that are built on a clear separation of buyers and sellers are already under pressure in many industries. For some time now, the sharing economy has no longer been restricted to the exchange of physical objects or services: Today the term is also used in reference to the sharing of information and knowledge. Digital availability of data is the basis for all of these exchange models.

2.1 From the programmable logic controller to data sharing

For half a century, digitalisation has been part of the manufacturing industry. The invention of the programmable logic controller (PLC) in 1969 laid the foundation for the advance of digitalisation into manufacturing facilities. In the 1970s, the logic of the interaction of sensors and actuators was the foundation for the era of automation, with repercussions to the present day: In many production facilities controllers and standalone solutions from the pioneering days of digitalisation are still intact and in operation. In the 1980s computer-aided-manufacturing (CAM) offered a direct digital transfer from the desk to the machine for the very first time: Scanning CAD data into a CNC machine promised faster, error-free transmission compared to manual transmission, and an easier modification of the production sequence, if necessary. The 1990s saw the triumphal march of mobile communications and thus a boom in machine-to-machine communication. For the first time ever, a hard-wired connection between two machines was no longer needed to exchange information between a data end point and a data integration point, and this breakthrough enabled automated processes, such as the re-ordering of material or the triggering of maintenance processes when a specific level of wear is reached. The ever-increasing volume of digitally generated data intensified the desire to extract insight, beyond the linear control of equipment. In the first decade of this century, various methods were developed to elicit additional information out of big data: Data from heterogeneous sources was brought together in data warehouses, where data mining was carried out. In many respects this process resembled the proverbial looking for a needle in a haystack. The hope of detecting regularities which could bring about optimized physical production, merely through analysis of the data, was only rarely fulfilled. Nevertheless, in 2011, proclamation of the era of Industry 4.0 definitively drew attention to digitalisation and the networking in industry. It was thought that Industry 4.0 would enable self-organising and self-optimising production. The Industrial Internet of Things (IoT) in interaction with artificial intelligence would make people and their faulty interventions superfluous, and at the same time give us the freedom to concentrate on creative and social activities. Today, we understand that economic activity is conducted by and for people, and consequently production devoid of human beings is neither desirable nor can it be realistically implemented.The questions remain: How can digital data be used in industry? What data is crucial in this regard? And what can small and medium-sized companies, in particular, do with this data?

2.2 The sources: Where data is generated in production

Production companies can access a variety of data that is generated in the company along the value chain. The degree of digitalisation, quality and formats in this are extremely varied. Consequently, if you want to make data usable the very first thing you must do is obtain an overview of the data situation in your own company. This applies equally to one-off production, series production, mass production and to the process industry.

The formats in which this data is available are just as varied as the origin of the data. Consequently, before a use can even be considered, an overview of the available data and its quality is necessary. Look at the non-digital data first. Non-digital data is still part of the daily routine. For work preparation and quality control in particular, check-lists and work records are drawn up by hand, and this is also the case in sales and service. On the other hand, machine-related data is usually available in a digital form.

2.3 Standardisation of data

In the past, the varied forms in which data is available was the factor that inhibited use of the data. Along the established automation pyramid, usually there are five levels that must be taken into account in manufacturing companies: From the sensor/actuator level with AS interfaces, or more recently IO-Link with digital data transmission via the field level, where a large number of field buses exist, to the control level where proprietary systems of the controller manufacturers are dominant, the process control system and the operational control system which is the interface to ERP. Along with digitalisation aiming at making the data from the sensor uniformly available – from the sensor level up to the enterprise level, and even further up to the cloud – and the concomitant replacement of the automation pyramid, industry players are also working on open, common standards. The best known of these standards is OPC UA, a machine-readable data exchange format.

Together with the TSN transmission protocol, which should make real-time transmission possible via Industrial Ethernet, controller manufacturers have great hopes for a standard that will replace the proliferation of field buses and enable a uniform digital system.

2.4 Data model/asset administration shell

The standards used are by no means critical for data sharing, however, especially in the production context. What is critical is the data model that is used, emphasizes Alexander Sztatecsny, one of the managing directors of Tributech, which specialises in cross-company data sharing in the industrial context. Here is a concrete example from the day-to-day production routine:

If the number 7 is displayed in the “temperature” field, then the operator working at the machine clearly understands or can verify at a glance whether Celsius or Fahrenheit is meant and whether a plus or minus precedes the number. Then, based on experience and the operating instructions, the operator can draw the correct conclusions from this information. If however, multiple machines with different data formats communicate with each other and the information concerning the actual temperature will also be processed in other programs, the context in which the “Temperature 7” occurs, must be defined unambiguously. The concept of the “administration shell’ has become established for industrial communication. Separate standardisation committees were organised to determine this framework and thus make unambiguous data sharing possible across different levels and standards.

3.1 Internal data sharing: Breaking up data silos

The first step in data sharing is interleaving the data within a company. The first step in a manufacturing company is to obtain an overview of what manufacturing-related data is present, to allow insights for optimisation of the production process to be drawn. The Center for Digital Production, based in Vienna, has been working for five years on digitalisation and manufacturing automation processes. Managing Director Christoph Pollak concludes: “Data sharing is not possible without domain knowledge”. Knowledge of the physical processes and the production correlations is key to digitalisation. For Pollak, the CDP demonstrated that domain knowledge is the basic prerequisite for the success of a project. Pollak: “Austrian industrial production has such a high level of maturity that there is really no more optimization potential that can be externally identified purely through data analysis.” The more precisely the data is undergirded with knowledge of the physical processes, the greater the prospects for success.

A second essential point when preparing data in a company: Data has gaps, it is faulty, it is not secure against change – in a nutshell, without checking the completeness and quality of the data, there is a risk of going wrong. Plausibility checks help, but sometimes simply having sufficient domain knowledge does too: Is what the data asserts even remotely probable, given the described processes?

A third point relates to the meaningfulness of the data: Is the information that is relevant from the machine level actually available everywhere? This is where additional sensor systems can quite easily provide a remedy, ideally in conjunction with additional edge devices that immediately process the data and prepare it for exchange on the spot.

Another point relating to preparation does not apply to the technical system, but rather to the work organisation: Today, as in the past, for example, checklists are prepared, filled out, and filed by hand as part of the daily routine. However, digitalising this human-generated data is not a technical issue, but an organisational issue, and an issue with great potential.

○ From small scale to lot size 1

A typical application that makes digitalisation of production and internal data sharing economically necessary is the trend towards small scale production all the way down to “lot size 1”. Customer demands for individually tailored products, the necessity of satisfying many different taste preferences, and market demand for fast responses to changing needs, necessitate ever smaller production runs extending down to the proverbial lot-size 1.

At this point, conventional retooling has reached its limits. But lot size 1 affects more than just production: Upstream and downstream processes, such as purchasing, material flows, warehouse logistics and delivery logistics must also be considered and enabled to exchange data autonomously.

○ Digital business models that safeguard the competitive edge

A survey conducted in 2020 by Deloitte shows the reasons why companies are seeking “data-driven business models”. The clear number one reason is to safeguard the competitive edge: Almost 88 percent of the survey respondents believe that without the path to digitalisation they will no longer be able to survive on the market. The second most frequent response shows that companies are driven towards digitalisation by the market: 74 percent of the survey respondents say that the demand for data-driven offerings from long-standing customers is important for the path to digital business models. At any rate, 63 percent are inspired by comparable products on the market.

3.2 External data sharing: Benefits along the value chain

For more than a century, the automotive industry has been considered the trendsetter in developing innovative industrial processes and as a model for other industry sectors. This is also true in data sharing: Catena-X is an automotive network with the ambitious goal of providing the first data-driven value chain for the automotive industry. This means exchanging data along the value chain and providing benefits for all participants through data sharing. The consortium includes automotive groups such as BMW, VW, and Mercedes, and suppliers and technology providers ranging from Bosch to Siemens and T-Mobile, to SAP, and with Fraunhofer as research partners. The use cases that Catena-X has identified as the most promising development areas are of particular interest; they can serve as blueprints for other industries. The ten use cases:

- Traceability of hardware and software components (meeting the requirements of supply chain law)
- Sustainability (verification of CO_2 consumption)
- Recycling economy (minimising the ecological footprint)
- Quality improvement (real-time & collaborative quality management)
- Requirements management/capacity management (security of supply)
- Business partner database (master data service)
- Digital twin (data-centric and model-centric development support and operations support)
- Modular production (plug & produce)
- Manufacturing as a Service (MaaS)
- Real-time control and simulation

Catena-X is also working on contiguous data chains from the manufacturer to the OEMs to the different delivery levels (tier 1, tier 2, tier 3). More and more partners involved in a specific value creation process are collaborating on the respective service. And is as so often the case in the automotive industry, the goal is ambitious: to have 1,000 partner companies connected in this data sharing network by 2022.

3.3 Special case – platform solution

The platform solution is a special data sharing case. It is also advancing in the market for near-production software. The strength of a platform solution lies in its ability to selectively obtain the needed solution at the right time. It is like Google-Play, where the wide variety of app providers upload their apps that can be downloaded and installed by anyone as needed. With platform solution integrators, special machine manufacturers or even machinery operators can get additional functionalities, bug fixes or useful add-ons.

The consulting company msg Plaut provides its Smart Factory Platform for digital use cases in the form of Software as Service (SaaS). This modular system enables production companies to obtain a needed microservice at any time and thus achieve fast and cost-effective further development of digital production systems at minimal risk.

The platform concept is not new: For example, three years ago the Austrian start-up SloopTools5 introduced a store where SCADA-oriented and HMI-oriented add-ons can be traded – a typical concept of the sharing economy: A person who has already taken the trouble to solve a problem with some programming effort, now makes this solution available to other users with a license and for a fee.

4. Industry offensives: On the way to trustworthy solutions

4.1 The clouds of the hyperscalers

One stumbling block on the way to a data-driven industrial landscape is the available infrastructure. Over the last 10 years, the infrastructure market has been dominated by cloud offerings headquartered in the US and Asia. In Europe a few offerings dominate: Amazon with its AWS (Amazon Web Service), Microsoft Azure, the Google Cloud Platform, plus several others from large software providers that are increasingly moving offensively into the lucrative industrial market. This oligopoly has been the brake on digitalisation of Europe's industry. There are too many unanswered questions: Where is the data? Other than the authorised parties, who else has access to sensitive corporate information? How can companies ensure that their data sovereignty remains with them? How are clouds protected from external accesses? In middle of last decade, the economy's requirements for a common strategy forced its way to Brussels.

4.2 IDS: Trust, security, sovereignty

The European Commission has adopted a Digitalisation Strategy. The goal is to confront the increasing dependence on the large technology corporate groups with a European solution. The Commission estimates that at least 90 percent of small and medium companies will be using fundamental digital applications in the next decade. The EU has established the term "digital sovereignty" as the key concept for the digitalisation strategy in the EU.

The first joint response to confront the challenge of the global hyperscalers with a European solution was the initiative for "International Data Spaces" (IDS). The IDS started in a broad-based German research project, initiated in 2016 under the direction of the Fraunhofer Institute. Even at that time, the aim was to create a cross-domain data space, which would enable companies of any size to maintain sovereign and autonomous management of their data. Today, more than 100 members from industry and science have come together under the aegis of the IDS Association. The association focuses on certification and standardisation activities.

While the IDS was being launched, another important industry player was increasing pressure for data sharing: In April 2017, the German Mechanical Engineering Industry Association (Verband Deutscher Maschinen- und Anlagenbauer (VDMA)), which has more than 3,000 members and is the largest industry association in the world, published a white paper entitled "Sharing the Future – Industrial Data Economy". The paper advanced the hypotheses that the exchange of data will become essential for networked industry in general and for machine and plant manufacturing in particular. The data spaces of the future and the networked value chains must meet four basic conditions, according to the VDMA:

- Protection of know-how and business secrets
- Protection of property rights to the data and secure licensing of use
- Identification of data silos that hinder innovation along the value chain
- The answer to the question of why the development of "data markets" is advancing so slowly The VDMA formulated several expectations and recommendations for future European data markets from these basic conditions.

5. The European GAIA-X project

The second, even bigger step towards a sovereign European data space started two years ago. GAIA-X was first introduced at the 2019 Digital Summit. The project was launched by two Member States. The original consortium was composed of 22 companies and organisations from the two largest EU industrialized countries, including the IDS, industrial groups such as BMW and Bosch, and providers from the IT and telecommunications sector such as Atos and Telekom. GAIA-X was committed to an open source approach and European standards from the start. In June 2020, the next step was announced: the founding of a transnational organisation headquartered in Brussels. This step in January 2021 set out the adopted strategy with even greater clarity: GAIA-X does not view itself as competition to the hyperscalers, but rather as an integrative project. A project that now numbers more than 300 members, including the hyperscalers either directly, or indirectly as cooperation partners. The aim of GAIA-X is to strengthen the digital economy and provide a secure, trustworthy framework for it. Therefore, individual cloud offerings are not excluded: Whoever offers data spaces that comply with the standards defined by GAIA-X should be able to participate. Service providers must be certified in order to operate a GAIA-X node. According to the GAIA-X principle, owners of the data retain the sovereignty of the data over they have shared. Physically, the data remains on the servers of the owners; the owners themselves decide what data will be made accessible, in what form and in what depth. There also will be no central office in this container environment. So copying, forwarding or downloading the data will not be possible. In addition to guidelines for operation, there will also be guidelines for the hardware that must be used (chip sets for example) and guidelines for the open-source software.

5.1 First GAIA-X platforms in just a few years

“Manufacturing is only one of the many use cases that will be developed in the GAIA-X framework”, says Michael Wiesmüller, Department Head “Key Technologies for Industrial innovation” in the Austrian Federal Ministry for Climate Action (BMK). The focus is likewise on mobility, health, the energy sector, or media use. The GAIA-X website currently lists more than 70 use cases. So-called GAIA-X hubs now exist in many EU Member States. Austria is pursuing a course that differs somewhat from that pursued by other countries that have applied for a position to form such a hub. On behalf of the Austrian Federal Ministry for Digital and Economic Affairs, the consulting firm msg Plaut is currently working on getting as many interested parties as possible on board. “We already have more than 120 companies and advocacy groups”, explains project manager Horst Bratfisch. The goal was to establish a GAIA-X hub in Austria with the broadest possible base by the end of 2021. Results on the European level are expected soon: Michael Wiesmüller believes that the first platforms could be available in 3 to 4 years.

EIT Manufacturing views sharing data as an important step in supporting innovation leadership in Europe. The integration of technologies, digital process chains and digital interfaces offers incredible potential for flexibility, eco-friendly production and reduced costs.However, standardisation, i.e. standardisation of data, datasets, interfaces and semantics, is a prerequisite for integration. Participation in these platforms will be inevitable, particularly for medium-sized companies that have supply contracts with large companies and multinationals. According to Johannes Hunschofsky, Managing Director of EIT Manufacturing CLC East: “To organise the sharing of machine data with the highest possible level of security, it is essential to integrate the GAIA-X principles and SMEs on national and European level. This is the only way we can successfully implement the digital sovereignty that the EU envisages in practice”.

The activities cited are a small selection of the possibilities for data sharing in production and production-related services. These services range from manufacturing, logistics, and maintenance to energy optimisation.

○ ECOM-X Aspern Data Circle

Renewable energy communities through data sharing
Renewable energy communities are an important factor for the energy transition, which will also be accelerated through appropriate legal framework conditions such as the EU's Clean Energy Package. This legal framework makes it possible to form groups of people and/or companies who collectively generate and consume renewable energy.

Among other things, technical implementation of energy communities requires a secure and independent sharing of data between the various participants. GAIA-X with focus areas such as data protection and data sovereignty is a suitable initiative on the European level, and thus it could particularly be applied in sensitive areas such as energy use.

The ECOM-X project pilots an energy community based on GAIA-X between residential buildings and TU Wien's Pilot Factory in Seestadt Aspern. The project attempts to merge the concepts of energy communities and data sharing, and investigate feasibility or implementability. The analysis includes economic considerations (business case) and possible technical implementation, wherein GAIA-X principles are complied with for data sharing.

Participating companies include Siemens, AIT, and TU Wien.

○ EuProGigant: A nascent manufacturing network

Work is already underway on the practical, usable implementation of GAIA-X for manufacturing companies. EuProGigant[1], an Austrian-German research project, was launched in March 2021. EuProGigant stands for "European Production Giganet for calamity avoiding self-orchestration of value chain and learning ecosystems". The project furthers the vision of a smart, resilient and sustainable European manufacturing industry. The project's goal is to establish a location-independent, digitally networked manufacturing ecosystem, and is based on the GAIA-X principles. In addition to 16 project partners, more than 25 companies associated with the project provide support in the Industry Committee. In addition to the TU Wien Pilot Factory Industry 4.0, which coordinates the project on the Austrian side, companies such as EIT Manufacturing CLC East, the AI specialist, craftworks, as well as Plasser & Theurer, world market leader for track construction machines, are also on board.

○ RHI Magnesita/Voestalpine

The refractory industry is particularly energy intensive. This also applies to those industry sectors for which the products are produced, such as the steel industry. Each small reduction in energy consumption, any optimisation of the production process, brings savings and reduces the ecological footprint. RHI Magnesita[2], the refractory giant headquartered in Vienna, and Voestalpine[3] have demonstrated the potential offered by structured data sharing in a joint pilot project. At the Linz Voestalpine location, sensitive production data is acquired via cameras, temperature sensors and vibration sensors, and uploaded to the cloud platform. Using Tributech's DataSpace Kit, Voestalpine can now precisely determine which data, in what depth will be shared with refractory supplier RHI Magnesita. The supplier uses the application data in its Breitenau plant in the Austrian province of Styria for automated process control, primarily for preventive maintenance of the refractory equipment in Linz. Precise planning of maintenance deployments reduces downtime, a factor that is particularly cost-intensive in the steel industry.

1 euprogigant.com

2 www.rhimagnesita.com

3 www.voestalpine.com/group/en

Microsoft Azure is the cloud that is actually used for peer-to-peer data sharing. However, other major cloud platforms, such as Siemens MindSphere, can also be used with Tributech as host. Even company servers are possible. blockchain architecture is used in the core for the DataSpace Kit: A system of distributed databases enables the data provider to share only those sections of a datastream that are necessary for the application. This means that the overall scheme – with any potential inferences relating to protected business processes, such as the "steel recipe" in this case, remain inaccessible for the refractory supplier.

The problem of completely different IT and OT (operational technology) systems of supplier and producer, which is also the case for Voestalpine and RHI Magnesita, is solved by means of container technology. This established IT standard that grew out of software development, can be used to make data and applications from one environment available virtually to another environment. Physically, however, the data and applications remain on the server that the data owner trusts. Theoretically, the number of partners that can make the shared know-how and data available here, is unlimited. In the bilateral application with RHI Magnesita Voestalpine was so impressed by this aspect that a broader implementation as part of the standardised IoT architecture is being discussed.

○ Plasser & Theurer digitalises the track network

This global market leader for track construction machines, headquartered in Vienna, is committed to digitalising the railway. Plasser & Theurer[4] started several projects within the framework of the GAIA-X EuProGigant research project. The enterprise's investigation of the potential offered by continuous acquisition and transmission of data by the machine on the track is impressively forward-looking. Plasser & Theurer has developed the EM100VT, an experimental measurement vehicle that feeds sensor data into the GAIA-X infrastructure in running operation via the mobile phone network, or even WLAN in the future. The data collected in this process is the track geometry based on IMU (inertia measuring unit), track width, the driver's view video system, and radar systems for capture of the entire ballast bed in depth, structure gauge, including distance to the adjacent track, catenary wire height and position, as well as platform detection and other relevant data. Some of the data is transmitted en route in real time via LTE with encryption ensured via SSL/TLS with cloud computing certificates. High-volume data, such as videos, is then transmitted via WLAN, as soon as the measurement vehicle arrives in the depot. This data is made available to customers and partners with time stamp and position stamp.

Thanks to the new system architecture on measurement vehicles and track construction machines, now for the first time it is possible to aggregate work data, measured data, and machine data. This capability provides a holistic, overall view of the track superstructure, which allows a broad range of subsequent analyses. All participants benefit: The suppliers of the measurement systems, the infrastructure operators, fleet managers of track construction machines, and of course the companies that build the machines as well. The collected data always belongs to the asset, and thus is the property of the asset owner. However, the asset owner can use the GAIA-X environment to make excerpts available to partners as needed for further development of systems.

○ Project example – predictive maintenance

Predictive maintenance is the use case for cross-enterprise data sharing that promises the fastest benefits. How this works can be shown using one of the largest smart city projects in Europe as the example. Siemens, Wien Energie, and Wiener Netze have been researching solutions for the future of energy in the urban space for the "Aspern Smart City Research" (ASCR)[5] project since 2013.

Real data are used; analysis of this data is used to optimise power grids and buildings. There are a number of projects under the auspices of ASCR, which are brought together under the four pillars Smart Building, Smart Grid, Smart User, and Smart IKT. The bandwidth extends from electromobility charging solutions, energy-efficient room cooling, to optimisation of switch settings in the low-voltage network with the goal of using infeed data and consumption data to control energy flows as precisely and loss-free as possible.

One project involves the "Smart Maintenance" concept, which is also relevant for industrial production, and demonstrates how well-founded predictions enable early fault prevention and enable smooth operation. Data from different sources in the four participating buildings is used: the building control technology, the HVAC equipment, the fire alarm system, the access control system, the solar thermal energy system and photovoltaic system, and the digital twin of the buildings. In this project, first the relevant system states and their interactions are virtually mapped. The patterns of malfunctions and faults are learned through data-driven models, and thus can be detected early on. This results in selective recommendations for risk minimisation, remote elimination of faults and support of service employees on site, through fast locating of faulty components and provision of the necessary information.

4 www.plassertheurer.com/en

5 www.ascr.at/en

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○ SMiLe – Secure Machine Learning Applications with Homomorphically Encrypted Data

This project focuses on the practicality of machine learning beyond company boundaries on the basis of encrypted data. In April 2021, a consortium including the mechanical engineering company Fill, data specialist Tributech, and the Hagenberg Software Centre launched a 2.5 year project under the direction of Fraunhofer Austria.[6] The advantages and disadvantages of machine learning on homomorphically encrypted data are compared with the advantages and disadvantages of alternative approaches that are based on synthetic data, transfer learning, secure multi-party computation or differential privacy.

○ Stand Pi – crowdshipping

Under the direction Fraunhofer Austria, the “Stand Pi”[7] project strives for an interleaving of private and commercial data sharing. The project site is the OPEN.mobil LAB in Seestadt Aspern and researchers have undertaken two approaches. One approach is the unchanged dense road traffic. Every day 160,000 vehicles are underway on Vienna’s “Südosttangente” alone; this road has the heaviest traffic in Austria. Delivery traffic volume is also increasing and will not decrease in future, due to the growing online shopping segment and just-in-time production requirements in industry and the construction sector. The other approach is the classic freight exchange concept where freight forwarders and carriers seek to optimally utilise the cargo capacities of their lorries. But what if you could also use the boot space in private cars as transport space? This would eliminate almost 430 truck trips per day just on the “Südosttangente” alone if appropriately small packages – 31.5 kg is the maximum weight defined in the project plan – could be taken along by private persons. The reduction in CO_2 emissions is correspondingly high.

Under the direction of Fraunhofer Austria’s Logistics Centres and Network Planning Unit, the project consortium includes Schrack, which specialises in products and solutions for power and data distribution, and Johann Weiss which specialises in transport logistics. Potential suppliers range from pizza deliverers who wants to add to their income, to field sales or service employees whose job requires them to be on the road constantly, to managing directors who shuttle back and forth between their residence, a business park and office buildings every day. A machine-learning based algorithm should provide optimal matching between the loading industry, transporters, the crowd and end consumers. This type of networking – which extends not only along the familiar value chains, but along familiar value chains extended to include private service providers – demands a high willingness to exchange data and a high level of trust in data security at all levels. One benefit this would offer to drivers in this crowdshipping integrated network, would be the professional logistics data concerning weather, road conditions and traffic jam alerts, which these drivers would get, just like professional drivers get behind the wheel.

○ Digital Playground

Talking about data sharing is one thing, actually trying it out is another. For SMEs in particular, the time, money and know-how to do this so far has been lacking. Tributech Playground[8] wants to enable this ability to precisely test data sharing along the value chain based on concrete examples from the company itself, to exhaustively test digital business models without having to enter a contract with a service provider. In this non-commercial but near-reality test environment, companies can get their first experiences with data-driven services together with other like-minded companies. This service, which considers itself part of the GAIA-X environment and seeks to make an initial practical application of the European data infrastructure available, is targeting three groups of companies as participants:

- Data providers – these are plant operators, machine tool manufacturers or service providers from the manufacturing industry. The applications of this group produce an enormous amount of data everyday which previously has not been used by the companies.
- Data consumers – these are providers that need their customers’ data for their service offerings. This group particularly includes software-driven companies and start-ups, providers of AI solutions and other digital products.
- Integrators – this group is the traditional connecting link between the manufacturing industry on the one hand and the providers of components and IT and OT solutions on the other hand. Integrators can use data sharing to develop a new business area for themselves and for their customers.

These three groups can enter into a non-binding exchange on the “playground”; they can also try out their own applications in eight different concrete use cases. The eight use cases are: Monitoring plant status & OEE; detection of data anomalies and predictions; energy consumption and CO_2 tracking; use-dependent financing models (PPU and EaaS); product wallet / digital machine CV; data notarisation & digital audit verification; data quality management via the digital twin; monitoring of the data sharing & and visibility over the entire delivery chain.

○ FIWARE

The FIWARE platform[9] came about as part of a broad-based European Commission initiative for a “future Internet” – the European Future Internet Public-Private Partnership. The aim was to provide a number of easy-to-use service interfaces as context interfaces and make a next generation information model and programming interface available. The original main application areas of the standard were various integrated systems or cyber-physical applications, for example, in Smart Cities, the Internet of Things (IoT) or in the manufacturing industry (I4.0).

Vienna serves as an example of how FIWARE combined with solutions, supports cities in realising their digital vision, in driving development of intelligent solutions faster and easier with more interoperability and more cost-efficiency, and in the process pursues an open source approach that avoids brand commitment.

The Vienna Business Agency has been working in close coordination with the City of Vienna for some time on the concept and regularly organises gatherings of the FIWARE Community, events and workshops and is a member of the FWARE Foundation.

6 www.fraunhofer.at/de/forschung/digitalisierung_und_ki/SMiLe.html

7 www.mobillab.wien/stand-pi

8 tributech.io/playground

9 www.fiware.org/community/smart-industry

7. Services of the Vienna Business Agency

The objective of the Vienna Business Agency is the continuous development of international competitiveness by supporting both Vienna-based companies and their innovative strengths, and the sustainable modernization of the city as a business location. To achieve this, the Agency provides free consultations to all entrepreneurs in Vienna on the topics of business creation, business location or expansion, business support and financing. Furthermore, networking contacts in the Viennese economy are also made available.

The Vienna Business Agency supports and helps businesses complete their research and development projects with both individual consulting and monetary funding. Depending on requirements, they will receive information about sponsorships, financing opportunities, possible development partners, research service providers, or research infrastructure, according to their needs.

The Vienna Business Agency sees itself as a network of the Viennese Green Tech & Social Tech industry and supports businesses with consultations, as well with distribution and networking among themselves. Events and workshops on topics from the sustainability sector are held regularly.

Additionally, the Vienna Business Agency helps with company relocations or internationalization services. Assistance is provided to business founders and young entrepreneurs in the start-up area. Free workshops and training sessions on topics of everyday business are offered as well as small, affordable office spaces.

Founders Labs[10] support aspiring entrepreneurs and founders with a two-month, part-time program to help them get started.

All funding programs of the Vienna Business Agency can be found here: viennabusinessagency.at/funding/programs

10 viennabusinessagency.at/startup-and-grow/lets-talk-founding-1/founders-labs

8. Companies in Vienna

In the alphabetical listing[11] on the following pages, we offer you an overview of selected companies from Vienna that offer services in the field of Data Sharing.

Companies in the field of Data Sharing

COMPANIES	DESCRIPTION	WEBSITE
A1 DIGITAL	A1 Digital is part of the A1 Telekom Austria Group; it implements digitalisation projects with companies. A1 Digital focuses on industry-specific applications for the Internet of Things (IoT), cloud-based products for the modern workplace, as well as security solutions for cloud and IoT.	www.a1.digital
ATOS IT SOLUTIONS AND SERVICES GMBH	Atos is one of the world's leading providers of digital transformation with 110,000 employees in 73 countries. As Europe's market leader for cloud, cybersecurity, and high-performance computing, the Atos Group offers holistic solutions for orchestrated hybrid cloud, big data, business applications and digital workplace.	www.atos.net
CLOUDFIGHT	As a digital service provider, Cloudfight designs, implements and operates resilient Cloudfight solutions, and accompanies customers in their growth process with consulting, defining digital strategies and operating scalable solutions. Cloudfight's offering for the industry sector includes digital twins and digital business model development with monetising strategies.	de.cloudflight.io
CONCIRCLE	Concircle is a consulting company for digitalisation solutions, particularly in the areas of supply chain management, enterprise operations and manufacturing. Concircle focuses on industrial manufacturing companies. In the EuProGigant project they develop innovative solutions for production data extraction and distribution, which are based on redesign of information architectures in conjunction with GAIA-X. In this project, Concircle implements practical applications employing artificial intelligence for data analysis in the production environment in order to efficiently and selectively process large volumes of data with major benefits for the customer.	www.concircle.com

11
This list is not intended to be exhaustive.

COMPANIES	DESCRIPTION	WEBSITE
CRAFTWORKS	craftworks develops custom AI and software solutions for predictive quality and predictive maintenance in industrial companies. craftwork's essential objectives are research, concept development and implementation of scalable and reusable machine learning models for the implementation of predictive maintenance solutions. This also includes service offerings in interaction with GAIA-X.	www.craftworks.ai
PLASSER UND THEURER	The Austrian family company Plasser & Theuer stands for efficiency and innovation in the constructions of tracks. The company employs approximately 1,900 people. Since 1953, the company has delivered approximately 16,700 machines in 109 countries. Most of these machines are manufactured in the main plant in Linz. The range of machines covers virtually all work procedures that are required for maintenance and new construction and conversion of railway tracks. The range extends from simple tamping machines to high-performance machines up to 200m in length. As a complete solutions provider, the company ensures comprehensive customer services around the world in cooperation 19 partner companies: Training, spare parts supply and technical service. Plasser & Theurer recently demonstrated their role as a technology leader on the global market for track construction machines by launching the first, completely electric tamping machine.	www.plassertheurer.com
FPRIMEZERO	FPrimeZero offers tools for the supply chain with their SUPPLYBRAIN software. Here the focus is on digital twins, real-time optimisation and artificial intelligence.	fprimezero.com
SIEMENS ÖSTERREICH	Siemens AG is a highly diversified multinational company with focus areas in industrial automation and digitalisation, infrastructure for buildings, distributed energy systems, mobility solutions and medical technology. Siemens has a number of tools for data sharing. Starting with MindSphere for development of personalised IoT solutions, extending to digital twins and seamless interaction on open ecosystems through a unique automation concept – Totally Integrated Automation (TIA).	new.siemens.com
TTTECH INDUSTRIAL AUTOMATION	TTTech helps its customers reach their goals for intelligent automation, better data access and greater production flexibility, with industrial IoT solutions. In addition, TTT Industrial also offers robust, reliable communications solutions, and integrates open standard technologies in flexible platforms that connect, control and manage machines.	www.tttech-industrial.com

COMPANIES	DESCRIPTION	WEBSITE
TIETO	The Austrian subsidiary of the largest Northern European IT service provider Tieto EVRY, combines global resources with local presence. Among other things, Tieto supports digital transformation processes for production and value chains.	www.tietoevry.com/at
RESEARCH AND TRAINING FACILITIES		
AIT – AUSTRIAN INSTITUTE OF TECHNOLOGY	The AIT Austrian Institute of Technology is Austria's largest non-university research institution. With seven centres and over 1400 employees, the AIT views itself as a highly-specialised research and development partner for industry and is engaged in the central infrastructure issues of the future. The AIT concentrates on a few strategic research topics. In this way, the AIT establishes a clearly-defined position in the international research landscape and signals its claim to assume leadership on these topics. Connecting factors with the data sharing area, include cryptographic mechanisms that protect sensitive data, or digitalisation and automation of production systems.	www.ait.ac.at
ASCR – ASPERN SMART CITY RESEARCH	Aspern Smart City Research GmbH & Co KG is the largest and most innovative energy research project in all of Europe. Launched in 2013 by Siemens, Wien Energie, Wiener Netze, Wien 3420 and the Vienna Business Agency, ASCR uses real data from the urban development zone of Aspern Seestadt to explore solutions for the energy future of our cities. Data sharing between different partners with different prerequisites is an essential component for conducting realistic energy research. In this way production, living and public institutions interact in various projects.	www.ascr.at
CDP – CENTER FOR DIGITAL PRODUCTION	The Austrian Center for Digital Production supports companies with digitalisation and automation of discrete manufacturing and production processes. The competence portfolio includes virtual mapping of products and production systems, automation of design tasks, machine-to-machine communication, including sensor integration and integration with IT systems and in IT systems, all with due consideration of socio-economic aspects.	www.acdp.at
FRAUNHOFER AUSTRIA RESEARCH GMBH	Fraunhofer Austria Research GmbH conducts research in the business segments of factory planning and production management, logistics and supply chain management, advanced industrial management and visual computing.	www.fraunhofer.at

COMPANIES	DESCRIPTION	WEBSITE
UNIVERSITY OF APPLIED SCIENCES TECHNIKUM VIENNA	The University of Applied Sciences Technikum Vienna is Austria's only purely technical university of applied sciences. It offers bachelor's and master's degrees in 30 courses of study and has 4,400 students. The Research & Development area at the University of Applied Sciences Technikum Vienna has experienced significant growth in recent years; focus areas include automation & robotics, embedded systems & cyber-physical systems. In addition, it offers a digital factory for teaching and research in typical practical Industry 4.0 scenarios.	www.technikum-wien.at
TU WIEN – FACULTY OF INFORMATICS	The study programs offered by Faculty of Informatics reflects the variety of a dynamic science sector. Thus, the thematic focus areas of the programs extend from classic disciplines such as technical information technology and software engineering to current areas such as business, media, and medical informatics. The faculty is represented in many industrial projects and research projects that involve data sharing.	informatics.tuwien.ac.at
TU WIEN – INSTITUTE OF MANUFACTURING ENGINEERING	Research at the Institute of Manufacturing Engineering and Photonic Technologies (IFT) at TU Wien is concerned with the development of innovative manufacturing processes as well as the necessary machine technologies and production systems. The institute is on the Industry Committee of the EuProGigant project.	www.ift.at
TU WIEN – PILOT FACTORY	The TU Wien Pilot Factory Industry 4.0, is a learning, innovation and demonstration factory for smart production and cyber-physical production systems. It focuses on new concepts and solutions for multi-variant series production in the discrete manufacturing industry, which is typical for many Austrian enterprises. In an approximately 900 m² facility, all phases of the process are presented with state-of-the-art infrastructure and robots – design, automatic manufacturing of parts, assembly and shipment to end customers. In addition, it implements machine-to-machine communication with the equipment of different manufacturers.	www.pilotfabrik.at
INTERMEDIARIES		
DIO – DATA INTELLIGENCE OFFENSIVE	The association for promoting the data economy and optimisation of data technologies. The Data Intelligence Offensive seeks to drive and promote business models for data sharing and data monetisation in accordance with the most rigorous ethical and legal standards. To do so, DIO strives to establish a data space where secure, overarching data sharing takes place beyond departmental, organisational, and/or industry boundaries, and the combination of relevant data is efficiently enabled all along the value chain.	www.dataintelligence.at

COMPANIES	DESCRIPTION	WEBSITE
EIT MANUFACTURING EAST GMBH	The European Institute for Innovation and Technology (EIT) is an integral part of Horizon Europe, the EU's framework programme for research and innovation, and supports the development of dynamic, Europe-wide partnerships. EIT Manufacturing is an innovation community of the EIT with the goal of bringing together European representatives of the manufacturing industry in innovation ecosystems to increase the value of their products, processes and services, and at the same time shape Europe's manufacturing industry so that it is competitive and sustainable. EIT Manufacturing East GmbH, headquartered in Vienna, is a EuProGigant project partner	eitmanufacturing.eu
OSSBIG – OPEN SOURCE SOFTWARE BUSINESS INNOVATION GROUP	The OSSBIG – Open Source Software Business Innovation Group is an association of responsible, high-ranking IT managers, Austrian companies from different industrial sectors and public administration. It supports implementation of new digital business models and public administration through intensive use of digital technology.	www.ossbig.at
PLATFORM INDUSTRIE 4.0	Platform Industrie 4.0 supports networking of business, politics, science and media with the aim of promoting digital technologies in industry. Data sharing plays an important role; a role to which the platform is consistently committed, at events, for example.	www.plattformindustrie40.at

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The Project "Fit für die Zukunft" contributes to the development of corporate research and innovation activities in Vienna, encourages cooperation and awakes enthusiasm for research and innovation among young Viennese. Additional information on the www.efre.gv.at/en

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Mariahilfer Strasse 20
1070 Vienna
www.viennabusinessagency.at

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Contact
Peter Kuen
Technology Services
kuen@wirtschaftsagentur.at

Text and Editing
Klaus Paukovits of WEKA Industriemedien GmbH
together with the Vienna Business Agency

Photos
Vienna Business Agency / Alexander Chitsazan
Vienna Business Agency / Karin Hackl
Vienna Business Agency / Klaus Vyhnalek

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Contact

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Mariahilfer Strasse 20
1070 Vienna
viennabusinessagency.at