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MISSION STATEMENT

DIGITIZATION MADE IN GERMANY

Fraunhofer ISST stands for digital business engineering. Based on this engineering approach, we support enterprises from all industries in the process of digital transformation. The business solutions we develop have their focus on data. The goal is to enable companies to efficiently share and exchange their data across entire value chains while making sure data sovereignty is guaranteed for all data owners.

In the era of Industry 4.0, enterprises from rather »traditional« industries are facing the challenge of extending their proven skills – which is to produce physical goods of excellent quality – towards the production of physical goods combined with digital services on top of them. Located in the heart of the Ruhrgebiet, one of Germany's most industrialized regions by tradition, we are well aware of this challenge, and we address it with our own, dedicated strategy: »Digitization made in Germany«.

Fraunhofer ISST is a one-stop shop for everything companies need for their digital transformation. We design new business processes, develop digital business solutions, and support our clients in building up new, digital services themselves. Companies seeking partnership with us benefit from the expertise of an IT research institute that has been operating with great success for 25 years now, and which perfectly combines scientific rigor and economic thinking. With creativity and scientific spirit, we leverage the potential of state-of-the-art information technology to develop digital business solutions tailored to specific requirements.

WHO WE ARE

WHO WE ARE AND WHAT WE DO

Fraunhofer ISST is a research institute that operates in close collaboration with industry. We assist our clients and partners in everything that has to do with the megatrend of digitization.

Our research and development activities are organized in three business units: »Digitization in Logistics«, »Digitization in HealthCare«, and »Digitization in Service Industries«. In each of these business units, our employees are working on the development of digital solutions shaping the future of business.

Fraunhofer ISST is one of seventy-two research institutes organized under the umbrella of Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V., Europe's largest organization for applied research.



FRAUNHOFER INSTITUTE FOR SOFTWARE AND SYSTEMS ENGINEERING

At the premises of Fraunhofer ISST in Dortmund, currently about seventy employees are working on the design and development of innovative, application-oriented solutions for digital services. We support our clients at all stages of digital transformation up to the implementation of digital business solutions. Managing Director of Fraunhofer ISST is Prof. Dr.-Ing. Boris Otto; additional Directors are Prof. Dr. Jakob Rehof and Prof. Dr. Dr. h.c. Michael ten Hompel.

At the core of all research and development activities of Fraunhofer ISST is data. The central research question we address is how companies can use data most efficiently and effectively in order to accomplish their strategic business goals. Apart from making the results and findings gained in preliminary research available to academia, the general idea is to transfer these results and findings to projects with industry. We do contract research both for industry and in projects funded by the European Union, the German federal government, or the state government of North Rhine-Westphalia.

Our guiding principle: Digitization made in Germany

Our focus is on developing technologies, systems, and methods that can be used to establish digital, data-centric business solutions. »Digitization made in Germany« targets the specific situation of Germany's long-time established, highly successful industrial enterprises known for producing excellent products. Our goal is to familiarize these enterprises with the new opportunities offered by digitization, but also to help them address the numerous challenges arising from these opportunities. To the product portfolios of these enterprises, the impact of digitization is highly disruptive. At the same

time, however, knowing how to leverage this megatrend allows establishing agile, highly efficient business processes. For this purpose, data is a strategic resource.

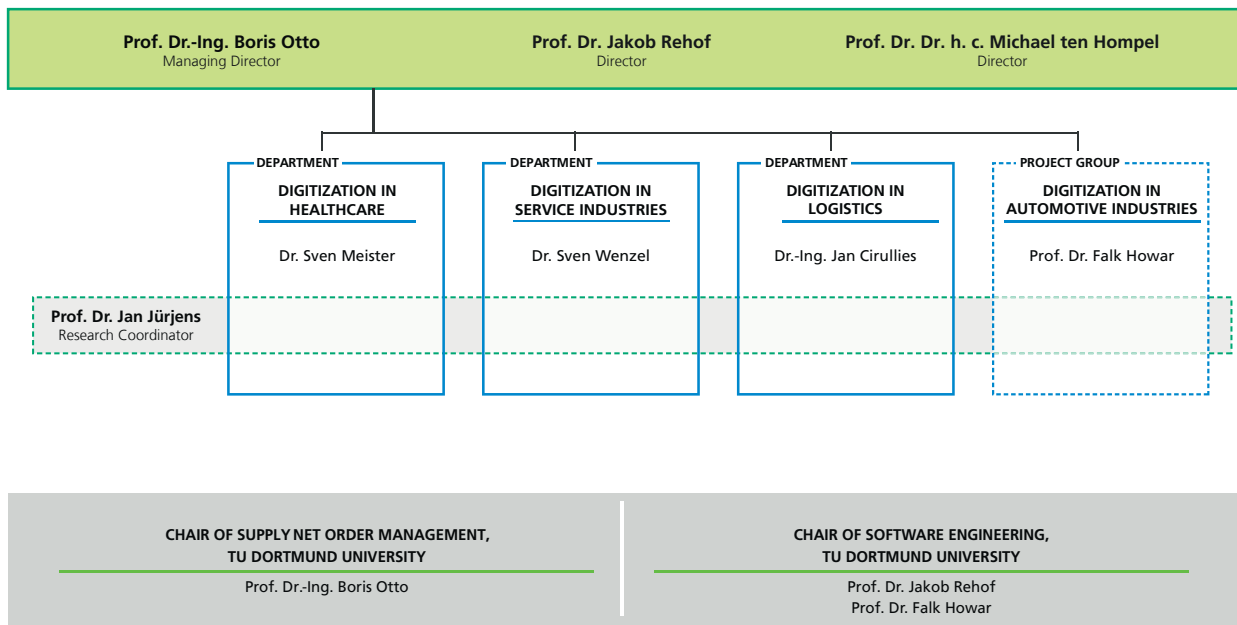
Together with the University of St. Gallen, Fraunhofer ISST has developed an approach called »Digital Business Engineering«, allowing consistent planning and control of the process of digital transformation. We thereby address project managers and line managers from marketing, sales, supply chain management, etc., as well as the people responsible for digitization in enterprises. Digital Business Engineering is a model-driven, method-based approach for transforming enterprises in view of the requirements of the digital economy. Providing guidance and orientation in a relatively unexplored field, the methodology is beneficial for large enterprises and SMEs alike. It has been developed taking into account the experiences made in numerous industry projects, and it is continuously being refined and adapted, as our experts regularly take up new findings gained in more recent projects.

What we do for our clients

As an independent research institute with long-standing experience in digital business and software engineering, Fraunhofer ISST offers enterprises support and assistance from the initial idea up to the development and implementation of a new, digital business solution. In addition, we provide trainings, conduct market and feasibility studies, and make situation and market potential analyses.

WHO WE ARE

Organization chart



Fraunhofer ISST in numbers

At its premises in Dortmund, Fraunhofer ISST currently employs about seventy people working in the three business units, the »Digitization in Automotive Industries« project group, and administration. Our research assistants are graduates both from universities and universities of applied sciences, coming mainly from the fields of computer science, information management, engineering, mathematics, physics, business administration, or economics. They are supported in their daily project work by numerous student assistants.

	2017
Total costs [in million euros]	3,663
Thereof personnel costs [in %]	73
Revenues from contract research with industry and in publicly funded projects [in million euros]	2,692
Grants from federal and state government [in million euros]	0,971
Invest [EUR]	179.300

NEW HEAD OF DIGITAL BUSINESS ENGINEERING

Since January 2017, Prof. Dr.-Ing. Boris Otto has been new Managing Director of Fraunhofer ISST



Prof. Dr.-Ing. Boris Otto

Together with Prof. Dr. Jakob Rehof (with a focus on research) and Prof. Dr. Dr. h.c. Michael ten Hompel (with a focus on business development), Prof. Dr.-Ing. Boris Otto constitutes the board of institute directors of Fraunhofer ISST. Under their direction, the institute has developed into an innovation partner for businesses striving to meet the requirements posed by digitization and the data economy. The main objective of the institute is to develop digital business solutions for companies from diverse industries (such as logistics, health care, or insurance).

Before joining our institute, Mr. Otto, who was born in Hamburg in 1971, worked with Fraunhofer IML (Fraunhofer Institute for Material Flow and Logistics, Dortmund) and the University of St. Gallen in Switzerland. For the latter, he built up the Competence Center Corporate Data Quality, from which CDQ AG was spun off.

Mr. Otto is also head of the »Industrial Data Space«, which is a strategic research initiative of Fraunhofer-Gesellschaft (s. pp. 72-79). Furthermore, he holds the Audi-endowed chair of Supply Net Order Management at TU Dortmund University, a position he took over in September 2013.

His ties with Fraunhofer date back to the beginning of the 2000s, when he worked as a research assistant for Fraunhofer IAO (Fraunhofer Institute for Industrial Engineering, Stuttgart) and in 2002 received his doctorate degree at the University of Stuttgart under the supervision of Prof. Dr. Hans-Jörg Bullinger, former president of Fraunhofer-Gesellschaft.

»DATA IS TURNING INTO A COMMODITY, WHICH CAN BE TRADED JUST LIKE STEEL OR ELECTRICITY«

Boris Otto, Managing Director of Fraunhofer ISST, on the role of data in the future, and what is needed to exploit its full potential.



Mr. Otto, what are the main areas of research of your institute?

Our primary focus is on developing digital business solutions. We are investigating the structure of hybrid product and service offerings, by which we mean a combination of physical products, traditional services as we have known them for a long time, and new, digital services. We develop these solutions together with our partners from industry in our three business units, »Digitization in Logistics«, »Digitization in HealthCare«, and »Digitization in Service Industries«. Let me give you an example: Together with DB Schenker, which is the world's leading global logistics provider, we have developed INSTALL4SCHENKER, which is an integrated business solution for transportation and installation of residential appliances such as water heaters, for example. With this solution, DB Schenker is able to orchestrate its entire ecosystem of dealers, craftspeople, carriers, and so on – all for the benefit of the customer.

What are the trends that can be observed at the moment?

When we speak about digital business models, offering such hybrid products or services is clearly one major trend that we can observe. We can find that in almost every industry, both in the B2C market and the B2B market. For creating these hybrid products and services, the mission-critical factor is data – that is data about the customer, about the product or service itself, about suppliers, partners, and so on. But also very important is what we call context information, such as location data, weather data, or traffic data. Providers of digital business solutions must address all of this data, and they must ensure that the rights of the data owners are respected. So what is happening is that data is turning into a commodity, which can be traded just like steel or electricity.

Together with the University of St. Gallen, Fraunhofer ISST has developed an approach named »Digital Business Engineering«, which supports companies in the process of digital transformation. Tell us about this approach. Has it been applied in concrete use cases yet?

The method, which originally was called »Business Engineering«, was initialized by Prof. Oesterle from the University of St. Gallen, who supervised my habilitation during my time in Switzerland. Over the years, we developed the method further together

with our colleagues in St. Gallen, until it became what it is called today, »Digital Business Engineering«. Digital Business Engineering gives companies security when striving for sustainable digital transformation. It works like a »cooking recipe«, which we use together with our partners in order to ensure a consistent procedure and avoid the risk of overlooking important elements when developing a digital business solution. The big advantage of the method is that it integrates three different perspectives: a strategic, a process, and a systems perspective. Viewing these perspectives together basically is the major challenge in the process of digital transformation. At the moment, the business world is changing dramatically and in every respect. For successful digital transformation, it is mission-critical to always look at the big picture – and this is exactly what Digital Business Engineering allows us to do. And yes, we have used the method successfully in multiple projects with industry already, also, for example, in the INSTALL4SCHENKER project that I mentioned.



What must companies do in order to adapt their product and service portfolio and succeed in the digital economy?

First of all, companies must build up the capability of creating value from the use of their data. They must create customer value by offering customers hybrid products and services, which are tailored to meet specific needs. Such offerings can be used in practically any area of life – when we work, when we travel, when we study, when we want to stay healthy, when we go shopping, etc., etc. At the core of such digital business solutions is data. And this is why it is not enough anymore for companies to make external data from public sources or partners available and usable. They also, and above all, need to get to grips with their own data. To do that, companies need to pull out data management from the »engine room« of the organization. They must understand that data management has a value creating function for the organization. So the big challenge here is to change the »data world« in the enterprise. In the past, we had the world of OLTP¹ and OLAP², so basically ERP, CRM, etc., on the one side, and the world of reporting and business intelligence on the other side. Today, these two worlds are merging. Also, today we are dealing with entirely new types of data: we have streams of sensor data in manufacturing facilities, we have virtual and augmented reality data, we have real-time logistics data, and so on. In order to make their own digital transformation a success story, companies need to manage these massive amounts of heterogeneous data consistently, so that they can exploit the full potential of digitization.

Excerpts from an interview conducted with Prof. Otto in 2017. The full interview (in German) can be found in the »DE« magazine of the German-Chilean Chamber of Industry and Commerce (AHK Chile).

¹ Online Transactional Processing.

² Online Analytical Processing.

FORMS OF COLLABORATION WITH FRAUNHOFER ISST

HOW ENTERPRISES CAN PARTNER WITH US

As a research institute operating in the field of information technology, it is Fraunhofer ISST's vital interest to develop innovative digital solutions. We operate at the interface with industry in order to come up with solutions that are of high practical relevance and meet the specific requirements of businesses. For any enterprise looking for a partner offering comprehensive support in the process of digital transformation, Fraunhofer ISST is the right choice.

To enterprises seeking partnership with us, we can offer three basic forms of collaboration:

1. Strategic innovation process consulting and management in »Enterprise Labs«

We use the concept of the »Enterprise Lab« to act as a think tank accompanying an innovation process that is planned or has already been initiated in the client's organization. An Enterprise Lab usually has a duration of three years, during which our skilled staff jointly works with the client's staff on selected areas of innovation that have a strategic impact on the client's organization. Choosing this interdisciplinary co-working approach, clients will benefit from receiving valuable know-how on important topics of innovation. The Enterprise Lab is a flexible instrument of collaboration, as new developments in the client's organization, new trends in society, or new opportunities offered by new technologies can be taken up, allowing the collaborators to quickly address new topics or challenges.

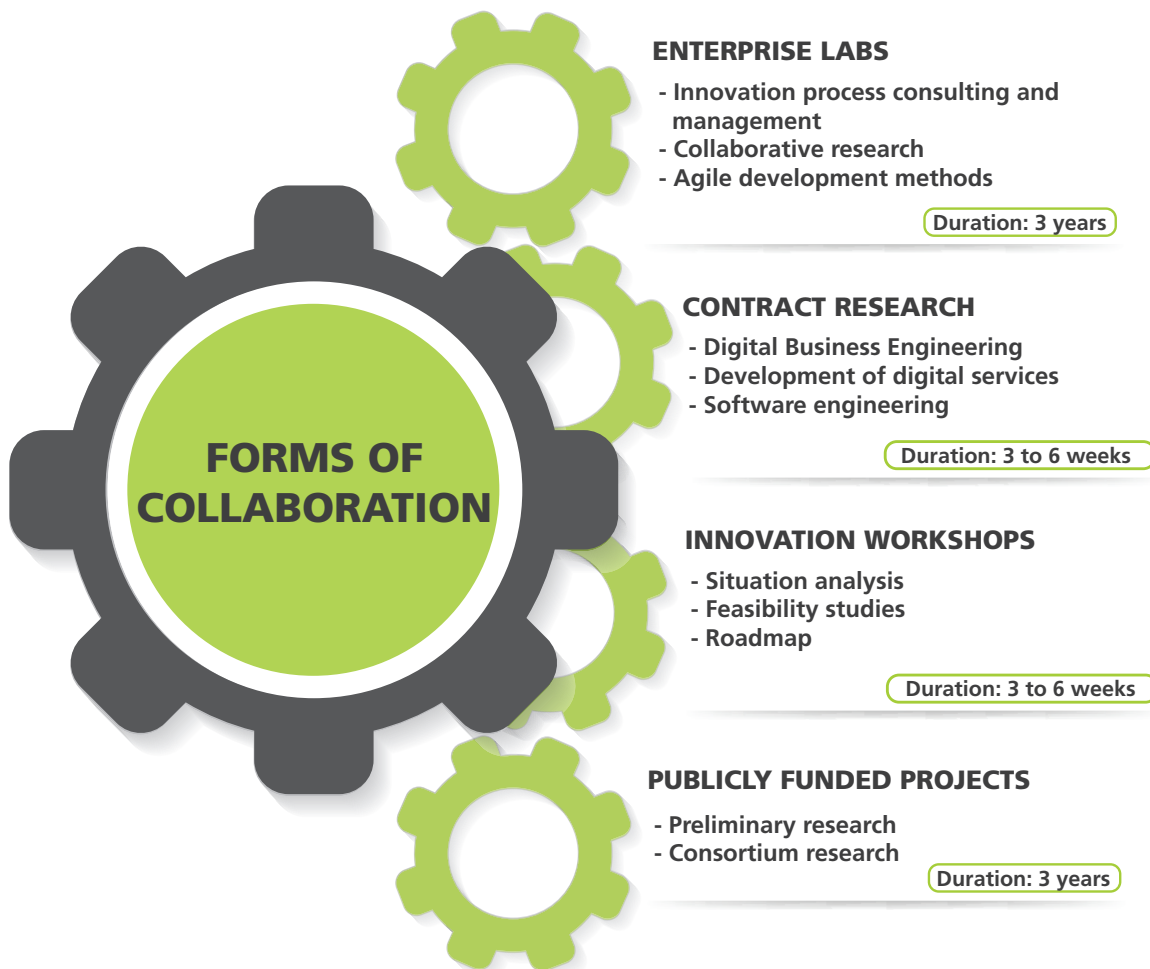
The basic idea of the Enterprise Lab is to create new, agile forms of interdisciplinary collaborative research and development that facilitates efficient exchange of knowledge between industry and research. The spectrum of topics to be addressed by an Enterprise Lab is broad, ranging from prototype implementation to establishing a new, digital business model. To address our clients' needs and requirements most adequately, we often team up with our partner institute, Fraunhofer IML (Fraunhofer Institute for Material Flow and Logistics), which is also located in Dortmund. This collaboration allows us to offer our clients an even broader service in terms of driving forward and managing innovation in the organization with regard to logistics and information technology – two of the most pressing fields of innovation companies are currently facing.

2. Selective innovation process consulting and support in single projects

A single project is the right instrument if an enterprise has a demand for research and/or development with regard to a distinct topic. If this is the case, we will act as an independent partner consulting the client and offering them our support. A single project may range from a one-day innovation workshop, in which we conduct a situation analysis or a feasibility study, for example, up to a three- to nine-month contract research project, in which we use our Digital Business Engineering approach to develop and implement a new, digital business solution tailored to specific company requirements.

3. Collaboration in publicly funded projects

If an enterprise recognizes a demand for research, or wants to drive forward innovation, in a field that is of relevance not just to them but to their industry or society as a whole, then initiating or joining a publicly funded project and working together with partners from business and research can be the right thing. We have extensive expertise regarding projects funded by the European Union, the German federal government, or the state government of North Rhine-Westphalia, and we are part of a large network of partners from research and industry.



RESEARCH HIGHLIGHT 2017: INDUSTRIAL DATA SPACE

»Germany must secure itself a position at the cutting edge of system-related innovations. Right here and now, we have a compelling opportunity for Germany to take the lead in the digital transformation of industry by creating a *de facto* standard that has every chance of being adopted throughout Europe and even worldwide. Data sovereignty is the key to success for many businesses. Our initiative provides the ideal data security framework.«

Prof. Reimund Neugebauer, President of Fraunhofer-Gesellschaft

»Companies operating in Germany and throughout Europe can rest assured that the Industrial Data Space is a concept that will keep their data safe. And if we can establish the concept as an international standard, German industry will be the first to benefit.«

Prof. Johanna Wanka, former German Federal Minister of Education and Research

Source: <http://s.fhg.de/Myf>

A SOLUTION FOR EXCHANGING DATA IN BUSINESS ECOSYSTEMS ENSURING DATA SOVEREIGNTY

The megatrend of digitization currently underway is a major driver of innovation in the economy and in society. For the product and service portfolios of companies, digitization is highly disruptive. It requires from companies to increasingly offer their customers hybrid products, which come as a combination of physical goods and digital services tailored to the specific needs of each customer.

To meet customer requirements more effectively, more and more companies are teaming up to form so-called business ecosystems. In such business ecosystems, companies share a common perspective on an end-to-end customer process, for which they jointly develop innovative, hybrid products and services. A big advantage of these ecosystems is their dynamism, as they form and dissolve much faster than traditional networks of value creation. Examples of business ecosystems are numerous and can be found in practically every industry.

The strategic resource for creating such novel, hybrid product and service offerings is data. To participate in business ecosystems, it is crucial that companies need to get to grips with their own data first of all. However, that alone will not be enough. Together the companies participating in a business ecosystem need to find ways to master data exchange and data management. To do so, a key capability for companies to develop is data sovereignty. Data sovereignty means that the data owner alone decides what may be done with their data and who else is allowed to use it and for what purpose.

For data sovereignty to work, appropriate economic and legal procedures and standards are needed. At the same time, for data sovereignty to be technically implemented, an adequate IT infrastructure is required. With that goal in mind, twelve Fraunhofer Institutes started out in October 2015 in a research

project named »InDaSpace« in order to develop the »Industrial Data Space«. The Industrial Data Space is conceived of as a virtual environment allowing standardized, secure data exchange between multiple trusted entities, while making sure each of these entities always has control over their data. The pre-competitive project, which is funded by the German Federal Ministry of Education and Research (project ID number: 01IS15054), focuses on the development of a scalable, secure architecture allowing to establish such a virtual environment with the help of state-of-the-art information technology.

In addition to the research project, the »International Data Spaces Association« was founded. The goal of the Association is to ensure that the research activities take needs and requirements of business into account. Furthermore, organizations joining the Association receive access to the research results and have the chance to implement specific Industrial Data Space use cases.

Being a generic concept, the Industrial Data Space is open to companies from any industry. One example in which the Industrial Data Space works great is supply chain management in the automotive industry. Manufacturers and their suppliers have long since exchanged data (such as dispatch notifications or credit notes) via electronic data interchange (EDI) in relation to physical goods being supplied. Today, however, it becomes more and more necessary to exchange also sensitive data, such as

- data on ranges of certain, critical components,
- data on manufacturing processes for critical components in the supplier network,

- data on the structure of the supplier network, or
- real-time data regarding transportation conditions of goods (e.g., to check what ambient temperature cargo is being exposed to, whether cargo is being exposed to mechanical shock or vibration, etc.).

In this case, the Industrial Data Space provides the basis for exchanging such sensitive data, as it ensures data sovereignty for either side.

Key features of the Industrial Data Space

Guided by the goal of guaranteeing data sovereignty, the Industrial Data Space aims at establishing a »network of trusted partners«. This and the other followings aspects are key features of the Industrial Data Space:

— Data sovereignty

The data owner alone specifies how their data may be used by other participants of the network. To do so, the data owner may attach data usage restriction information to their data. The data consumer may then use this data only if they fully accept the data usage policy specified by the data owner.

— Secure data exchange

A concept of different levels of security allows scalability with regard to data protection during the process of data exchange.

Security is guaranteed not just in bilateral data exchange but also when data is exchanged across entire data supply chains.

— Network of trusted partners

For the Industrial Data Space to work it is crucial that the participants have trust in each other's identity and integrity.

In order to establish trust across the entire network, each participant may only connect to the Industrial Data Space only via a certified software component: the so-called Connector. The Connector also provides functionality for authentication and authorization of participants.

— Distributed data storage

Since the Industrial Data Space materializes as a distributed network of participants, there is no central entity responsible for data storage. The Industrial Data Space thus presents an alternative to concepts of central data storage (such as data lakes, for example) on the one side and distributed networks without any common rules of the game on the other side. What type of architecture is to be implemented in a concrete use case depends on which is most economic and beneficial; this is why the Industrial Data Space initiative presupposes the coexistence of various types of architectures.

— Data governance

Since there is no central entity controlling how participants interact with each other, the Industrial Data Space builds upon data governance principles in the form of common rules of the game to be followed by any party. These principles determine the rights and duties of every participant in terms of data management and data exchange.

— Network of platforms and services

The Industrial Data Space brings together data providers on the one side and data consumers on the other side. Data providers may be organizations (mostly enterprises), but also individuals – and »things« (i.e., entities in the internet of things, such as vehicles or machines). Other possible data providers are data platforms or data marketplaces currently emerging in various industries. In addition, the Industrial Data Space makes available data services from various services providers; these data service are offered via an AppStore.

— Economies of scale and network effects

Making data services available that allow secure exchange and easy linkage of data, the Industrial Data Space works as a technical infrastructure. Among other things, using the Industrial Data Space facilitates the development and provision of smart services. While these smart services rely on data services as offered by the Industrial Data Space, they are not part of the Industrial Data Space infrastructure and functionality itself. For the Industrial Data Space to become a success story, economies of scale and network effects thus are mission-critical. The more participants the Industrial Data Space has, the more beneficial participation will be for data providers, data consumers, and service providers alike.

— Open, user-driven, participatory approach

The Industrial Data Space is a user-driven initiative that is based on a participatory approach with regard to the reference architecture model to be developed. Design decisions are jointly made by the Industrial Data Space research project and the International Data Spaces Association.

These key features allow the Industrial Data Space to function as a link between the internet of things and the world of smart services.

For more information, we refer you to a Fraunhofer white-paper entitled »Industrial Data Space – Digital Sovereignty Over Data«.

Download: <http://s.fhg.de/juA>



WHY JOIN THE INDUSTRIAL DATA SPACE?

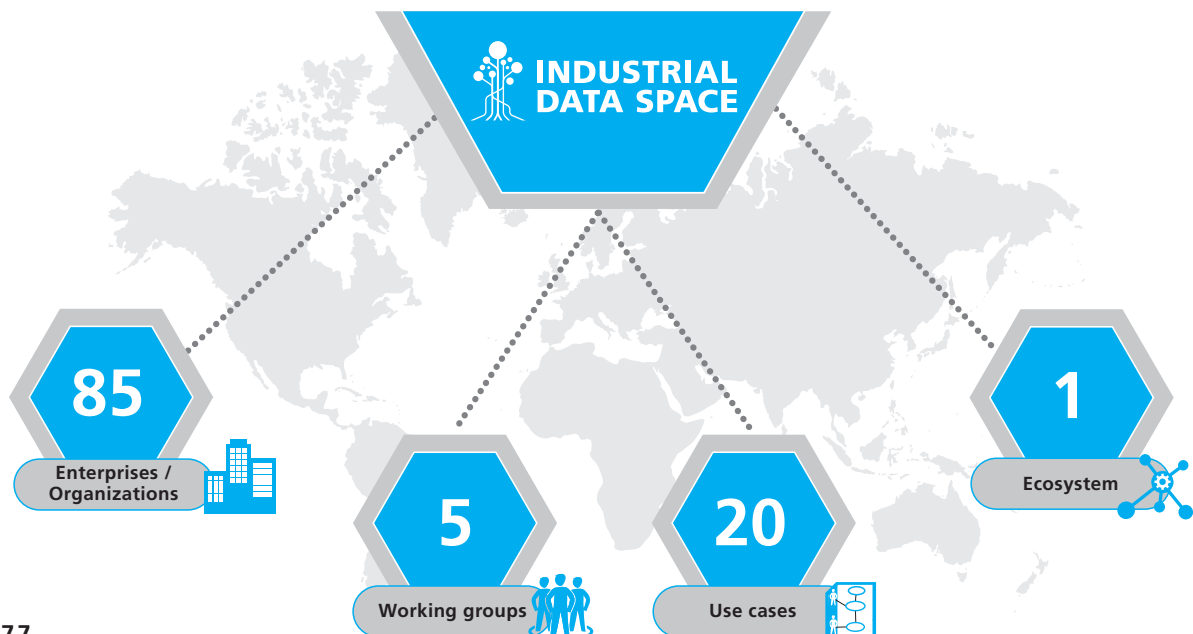
The more enterprises are able to gain value from their data, the more the value of that data itself is increasing. A great way for enterprises to increase the value of their data is to share it with others. What is required to do so with all kinds of data (i.e., including sensitive data) is a new, proper code of conduct though. This led to the idea of the Industrial Data Space as a virtual environment allowing secure exchange and easy linkage of data in a trusted business ecosystem using common standards and governance models.

Data owners in the Industrial Data Space have full control over what is done with their data and who else is allowed to use it and for what purpose. They alone decide whether they want to make their data available to a requesting party. In the best case, two or more partners mutually agree on their trustworthiness and team up to create a value creation chain. In such a value creation chain, each partner has access to certain data of other partners, which they can use to make their business processes more efficient, establish a new, digital business model, or initiate new, innovative value creation processes.

Gaining a competitive edge

Data sovereignty today is of highest importance for companies from any industry. By pursuing the idea of data sovereignty in a consistent approach, the Industrial Data Space allows companies to benefit from

- common, binding rules of the game for collaborating with partners,
- participation in a consistent concept both on a national and international level,
- data protection and information transparency when exchanging data with partners,
- consistent data integration and data management,
- a common perspective on end-to-end processes with suppliers and customers, and
- the development of new, digital business models.



Joining the Industrial Data Space

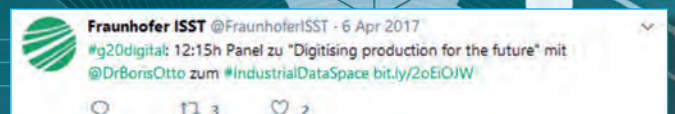
To enjoy the benefits of the Industrial Data Space, but also to actively contribute to its advancement, more than 80 enterprises from Germany and abroad have become a member of the International Data Spaces Association already. Members of the Association have access to all results and findings from the Industrial Data Space research project, and they may bring in their specific requirements to be taken up into the concept at an early stage.

Benefits from participation at a glance:

- implement the Industrial Data Space reference architecture in an own use case,
- contribute to the development of the architecture by bringing in your requirements,
- receive access to all results and findings from the research project,
- exchange views with researchers and other practitioners,
- contribute to the definition and implementation of standards,
- contribute to the design of measures for certification,
- contribute to the development of new, digital business models based on a cross-industry approach,
- take part in common events,
- exchange views and network with other members of the Association.

The International Data Spaces Association has established, and will continue to establish, liaisons with cognate initiatives. In addition, it serves as a platform to represent the interests and concerns of its members on an international level.

For more information, please go to www.industrialdataspace.org



WHAT'S UP NEXT FOR THE INDUSTRIAL DATA SPACE?

The Industrial Data Space research project was concluded in April 2018. Led by Fraunhofer ISST, the project was a huge success. Follow-up activities are numerous, and some have even started already.

Positioning the Industrial Data Space on a global scale

With the German Federal Ministry of Education and Research granting another five million euros of funding, the Industrial Data Space initiative is now entering a new phase. The goal is to position the Industrial Data Space on a global scale and in the context with other initiatives (such as the Industrial Internet Consortium in the USA or the Industrial Value Chain initiative in Japan), since in a global economy the exchange of data does not stop at national boundaries.

»The Industrial Data Space has raised an enormous international interest in workshops and panel discussions during Germany's G20 presidency. The idea of ›Data Sovereignty made in Germany‹ has been very well received«, says Boris Otto, head of the Industrial Data Space initiative and Managing Director of Fraunhofer ISST. »We are currently having very fruitful conversations with partners from the U.S., Japan, China, India, Argentina, or Mexico, to name but a few, which brings us closer to our idea of establishing the Industrial Data Space on a global level.« To ensure compatibility with a number of national and international standards, the researchers are now working on various technical solutions for data sovereignty.

Industry specific implementations of the Industrial Data Space: Medical Data Space and Materials Data Space

Two initiatives for verticalization of the Industrial Data Space concept were already launched in 2017 and will be integrated into the International Data Spaces Association over the course of 2018: the Medical Data Space and the Materials Data Space. Both build upon the architecture of the Industrial Data Space and will soon be established as working groups within the Association, thereby contributing to the reference architecture by defining their specific requirements and rules of the game. Fraunhofer ISST will contribute to both initiatives, bringing in our knowledge both from each application domain and from the technical development of the Industrial Data Space.

Meanwhile, more industry specific initiatives are just about to be launched, such as the Maritime Data Space, the Urban Data Space, the Science Data Space, or the Mobility Data Space.

Leveraging disruptive innovations: the Forschungszentrum Data Spaces

To bundle and concentrate the competencies regarding data sovereignty, Fraunhofer-Gesellschaft, the umbrella organization of Fraunhofer ISST and all other Fraunhofer institutes, has established the Forschungszentrum Data Spaces, aiming at creating a comprehensive portfolio of methods and technologies for data sovereignty for international business. Unlike the Industrial Data Space research project, which has had its

focus on innovation brought about by integration of existing methods and technologies, the Forschungszentrum Data Spaces also focuses on leveraging disruptive innovations.

With this initiative, Fraunhofer wants to leave a mark on three levels: it responds to an urgent demand of business, contributes to Germany's reputation as a nation of great software developers, and takes a leading role in the scientific community with regard to the topic of data sovereignty. The Forschungszentrum Data Spaces, which is headed by Prof. Otto, is organized in the form of a 5-year research program.

Mouthpiece for business: the International Data Spaces Association

All initiatives taking place in the data space realm are seeking close collaborative ties with the International Data Spaces Association. The Association is continuously growing and has already turned into an important mouthpiece for business for being heard in the political arena and in the general public.

Fraunhofer ISST has assumed a strategic key role in all initiatives and activities currently undertaken. For any company interested in joining the Industrial Data Space or one of its offsprings, we are the party to turn to.

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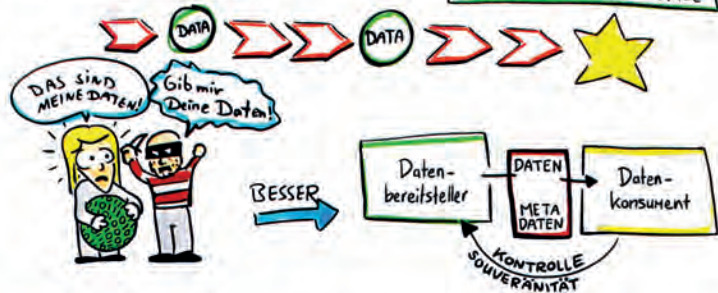
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BUSINESS UNIT »DIGITIZATION IN LOGISTICS«

DIGITALISIERUNG IN DER LOGISTIK

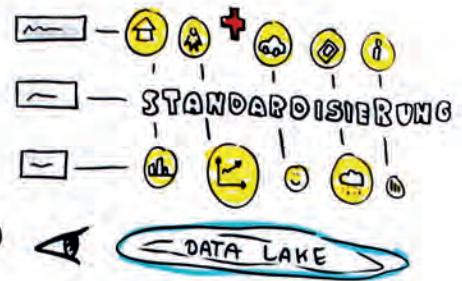
Dr.-Ing. Jan Cirullies
Hans-Jürgen Berndt &



Ich bin 50+ :
Digital Immigrant



"Datensouveränität steigert die Transparenz von Lieferketten. DATA-SPACE-USE CASE AUDI"



Regeln
Ethik
Grundsätze
Qualität
Daten

Ich sehe das, was du nicht siehst
Ich sehe auch das, was du siehst

NUTZEN (Benefit)



The cartoons on this page were made by Patrick Rebaz during a presentation entitled »Digitalisierung in der Logistik – Datensouveränität steigert die Transparenz von Lieferketten (Industrial Data Space Use Case Audi)«, which was held by Hans-Jürgen Berndt (Audi AG) and Dr.-Ing. Jan Cirullies (Fraunhofer ISST) during the ceremony celebrating the 25th anniversary of Fraunhofer ISST on September 20, 2017.

WITHOUT IT NOTHING HAPPENS IN TODAY'S LOGISTICS

Digitization strategies for a data-driven industry

With an annual turnover of over 200 billion euros, logistics is the third largest market in Germany after automotive and mechanical engineering. On a global level, logistics even ranks number one (according to the Worldbank's International Logistics Performance Index 2016). For manufacturing enterprises and wholesalers alike, logistics is by far not only a cost factor, but has become a factor to make a difference in terms of gaining a competitive edge.

In recent years, logistics has developed from its classical manifestation (basically comprising three steps, i.e. transportation, loading/unloading, warehousing) into a rapidly growing market for complex and increasingly customized services that can only be provided with the help of tailor-made IT support. Digitization has a massive impact not only on long-time established logistics processes but also on logistics companies as a whole and on their ecosystems. As a consequence, companies need to develop new business models for intelligently combining traditional and novel services – together with partners and using state-of-the-art technology.

»Digitization in Logistics« is Fraunhofer ISST's business unit supporting companies in meeting the requirements digitization poses on logistics. We use our Digital Business Engineering approach to assist companies in their effort of providing customized, cost-efficient logistics services fast and efficiently. Logistics companies, but also manufacturers, are increasingly thinking about how they can define a digitization strategy on the basis of which they can develop new service offerings and process innovations for their customers. To succeed in this endeavor, it is crucial that companies develop a hybrid service portfolio comprising both traditional and new, digital services.

At the core of such new, innovative service portfolios is data. A distinctive feature of the digital transformation currently underway is that companies increasingly need to be able to handle massive quantities of data that is highly heterogeneous in structure and format, comes in at a high frequency, and is characterized by different levels of quality. This complexity results mainly from the fact that data today originates from multiple sources, and not just from companies' long-time established operational information systems anymore. So companies today need to handle and manage

- high-frequency sensor data coming from the Internet of things,
- third-party data resulting from an increasing digital interconnection of organizations across entire data value chains,
- unstructured personal/public data coming from Internet websites (mainly from social media platforms).

PROJECT FAST FACTS

SMART HOME CLEANING TROLLEY

Project goal Making the products of a cleaning device manufacturer »smart«.

Benefit Using the prize-winning »Smart Home Cleaning Trolley«, the manufacturer is now able to build up a digital service offering comprising features such as quick analysis of cleaning processes or automatic completeness checks regarding accessories.

Contribution of Fraunhofer ISST Development of a prototype solution working with beacons (i.e. Bluetooth radio transmitters).

Funding State government of North Rhine-Westphalia / European Union (Project ID number: EFRE-0800712)

Project completion Dczember 2017

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To fully exploit the value of data in their everyday business processes, companies need to establish a proper IT and data architecture. They must build up capabilities to handle different data formats efficiently, link data intelligently, and control dataset specific quality requirements effectively (also for data coming from outside the company). To support companies in this endeavor, Fraunhofer ISST is devoted to the development of innovative concepts, technologies, and architectures for digitizing processes in logistics and industrial manufacturing. We have long-standing experience in designing innovative services, modeling efficient business processes, and developing, migrating and consolidating complex IT systems. For companies operating in the logistics market, we are a competent partner when it comes to establishing highly effective and efficient solutions helping them stand their ground in a highly competitive market.

DIGITIZED PRODUCT DOCUMENTATION PROCESSES

Project goal Designing smart processes for more efficient and flexible digitized documentation of a metal processing company's products.

Benefit With the help of these digitized documentation processes, the company was able to reduce the time required for making inquiries on the processing of products by 90 percent, and the time required for data capture and evaluation by 30 percent.

Contribution of Fraunhofer ISST Development of the technical concept and the data structure.

Project completion May 2018

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To help our clients, we use an approach we call »Smart Data Engineering«, allowing us to develop company wide data architectures, or data architectures applicable for entire data supply chains, on a use-case driven basis. The type of data architecture we develop comes as an organizational and technical concept for data storage, data creation, and data maintenance. It takes important use-case specific criteria into account, such as data validity (local data vs. data valid for the enterprise or supply chain as a whole), data management (central vs. decentral), or data model (logical vs. physical), alongside with aspects such as data quality management, data identifiability, or data redundancy. Smart Data Engineering is used by companies from various industries already, such as pharmaceuticals, chemicals, automotive, or mechanical engineering.

In addition to designing and developing data architectures, the business unit develops and implements IT-supported prototype solutions on a broad scale. For example, we develop technical devices (such as »sQUADRIC« for capturing and processing of beacon signals), we design and help establish data lake solutions (in order to make data available for being analyzed by methods of big data analytics, such as SMACK platforms), we develop machine learning algorithms, and we offer trainings for specialized staff (e.g. work integrated learning).

In the following, we have listed some examples illustrating what the »Digitization in Logistics« business unit is doing for our clients:

- For a car manufacturer, we developed a vision for a new data architecture. The specific challenge in this project was how to link and make available data that is used by a number of production sites and functional departments on various hierarchical levels. Beside the data architecture, a major outcome of the project was a new organizational strategy envisaging the establishment of a Chief Data Officer.
- For a metal processing company, we conceptualized the digital documentation of the production of parts and their assembly up to the final product. The concept was implemented by one of our IT partners.
- For a manufacturer of commercial cleaning products, we conducted a feasibility study on the basis of which we developed and evaluated solutions for offering »smart products« combining physical products, services, and IT components (e.g. beacons, sQUADRIC). The company meanwhile received a prestigious award for one of its new products, which is now being mass produced.

- As a member of the Fraunhofer-Innovationszentrum Logistik und IT (Fraunhofer Innovation Center Logistics and IT, abbr. FILIT), Fraunhofer ISST has co-developed »Sherlock Bot«. Conceived of as an approach to big data analytics, this chatbot recognizes speech and uses machine learning algorithms to allow users to calculate complex metrics and make intuitive inquiries. Users benefit from using this tool as they no longer need to be able to analyze and understand the data they are retrieving; instead, they can simply ask Sherlock Bot.

»Digitization in Logistics« is Fraunhofer ISST's business unit offering clients comprehensive knowledge and skills for digital transformation in logistics. Together with Fraunhofer IML and other partners, we are joining forces in FILIT and with »Digital. Hub Logistics«. The latter offers companies the opportunity to develop data-driven products and services following a customizable path by selecting from over 50 modules.

PROJECT FAST FACTS

MULTIFUNCTIONAL DATA LAKE

Project goal	Establishing a data lake for a pharmaceutical company.
Benefit	Using linked data from the data lake allows the company to conduct product related analyses faster and more accurate, and to significantly reduce costs otherwise incurred from redundant data collection.
Contribution of Fraunhofer ISST	Conceptualization of the data lake, the semantic data structure, and the data loader.
Project completion	April 2018
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OUR VALUE PROPOSITION

For any company aiming to develop and implement a digitization strategy with regard to logistics, Fraunhofer ISST's business unit »Digitization in Logistics« is the solution provider to partner with:

We set new impulses.

In close collaboration with specialized staff of our clients, we analyze the potential of digitization in two-day or three-day workshops, in which we address questions such as the following:

- How can processes in logistics and production be optimized?
- To what extent have Industry 4.0 principles been established in the company already?
- How can the product and service portfolio be extended by new, data-centric products and services?

To determine the level of maturity of an organization with regard to Industry 4.0, we use the »Industrie 4.0 Maturity Index« developed by acatech (the German »National Academy of Science and Engineering«). For developing data-driven business models, we use our approach named »Digital Business Engineering«. To get an impression of our clients' business processes, we visit them on site. The workshops we organize can take place at our premises (of the Digital.Hub Logistics, for example) in order to offer our clients a creative environment outside their usual, everyday business routine.

We make more of your data.

We use Smart Data Engineering to address the following questions:

- What types of data is the organization using and must be handled by it?

- What are the business processes the data is used in?
- What are the benefits of using linked data?
- Who is responsible for making data available throughout the organization?
- Who is responsible for data quality?
- Is the data properly protected?
- How is staff supposed to use data in the future?

In many enterprises, a lot of data is exclusively used by certain functional departments or business units. Such data silos not just lead to process mismatch and redundant data storage, but also prevent cross-source data analysis, which is needed for forecasting peaks of demand, assessing risks, or identifying inefficient product segments. Using linked data, together with defining clear responsibilities for data quality management and providing convenient access to data for all users, bears an enormous economic potential.

We conceptualize and design information architectures tailored to the specific needs of our clients. By means of concrete, future-oriented use cases, we analyze existing data sources and how they should be linked with each other (using a semantic information layer, for example). In that regard, we also investigate ways of cross-company collaboration ensuring data sovereignty (as made possible by the Industrial Data Space, for example). To ensure the availability of data and the establishment of responsibilities with regard to data, we develop concepts for data governance tailored to the given organizational structure.

We transform processes.

The digital transformation of business processes entails taking the specific requirements and limitations of organizations and their ecosystems into account. Off-the-shelf solutions in most cases do not lead to the desired results. When we develop individual

concepts for our clients, we typically ask the following questions:

- How can individual business processes be digitally transformed?
- Which data must be captured?
- What are the technologies suited best for that purpose?
- How is the data used in these processes?

With our knowledge of available technologies, and our experience driven from numerous projects with different clients, we develop an individual concept for each new client and implement a prototype solution. If deemed appropriate and useful, we employ smart devices (e.g. tablets or wearables) and technologies (e.g. beacons)

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BUSINESS UNIT »DIGITIZATION IN HEALTHCARE«

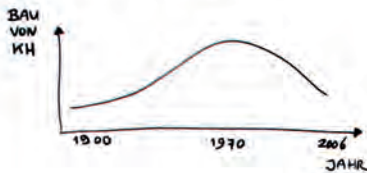


SESSION: DIGITALISIERUNG IM GESUNDHEITSWESSEN

Lars Ganzhorn Knudsen
Dr. Sven Meister

DIGITALE INNOVATIONEN IM
DÄNISCHEN SUPERKRANKENHAUS

→ EIN VORBILD FÜR DEUTSCHLAND?



Wir sind nicht an der Spitze

Gesundheits an die Spitze



16 Projekte



GRÖßE

Mit digitaler Gesundheits an die Spitze

WARUM?

Wir werden älter und sind gesünder



- Besserer und konsequenter Patientenfortschritt
- Schnellere Diagnose
- Höhere Patientensicherheit
- Bessere Ressourcennutzung

BSP: Aarhus Universitätsklinikum



ABER ES IST MEHR ALS DAS:

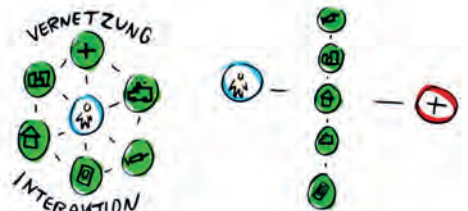
ES ÄNDERT DAS GANZE GESUNDHEITSSYSTEM

Digital Innovation:

- INFORMATION
- SERVICE LOGISTICS
- AKUT PATIENTEN
- PROZESSOPTIMIERUNG UND A.I.



Fraunhofer ISST prägt die digitale Gesundheit
- NEPHROTE
- Smith
- EPI tect



The cartoons on this page were made by Patrick Rebacz during a presentation entitled »Digitale Innovationen im dänischen Superkrankenhaus – ein Vorbild für Deutschland?«, which was held by Lars Ganzhorn Knudsen (Aarhus Universitetshospital) and Dr. Sven Meister (Fraunhofer ISST) during the ceremony celebrating the 25th anniversary of Fraunhofer ISST on September 20, 2017.

DR. DIGITAL, DEEP LEARNING, AND DIGITAL COMPETENCE

Challenges and opportunities in a digital healthcare sector

Have you used your medical app today to send your blood values to Dr. Digital for receiving an evaluation report created by a deep-learning system? Large IT and Internet companies today are demonstrating what is possible using smart sensors in combination with data processing algorithms. However, such innovative solutions are not common practice in everyday healthcare of patients, yet. Germany is one of the countries in Europe that still lag behind when it comes to offering people innovative, digital healthcare services. Regarding digitization in healthcare, many people still have the notion of a one-size-fits-all product that can be taken from the shelf and used for any purpose whatsoever.

But that is not what digitization in the healthcare sector should look like. Instead, more than in any other industry, digitization in healthcare must be conceived of as a transformation process, which impacts technology and people alike. Industry 4.0 is often equated with the notion of robots and machines autonomously working in deserted factories (which is not what Industry 4.0 is about, of course). However, this notion is totally unimaginable for the healthcare system, in which the individual human being will always play a central role – whether as a patient or as a physician, physical therapist etc..

To meet the specific requirements of the German healthcare system, Fraunhofer ISST's »Digitization in HealthCare« business unit collaborates closely with the Hochschule für Gesundheit (hsg), which is Germany's first state-funded university for healthcare professions. Together with hsg, which is located in the neighboring city of Bochum, our experts are working on the continuing development of a method we call »Digital Health Innovation Engineering«. This method allows users to analyze the individual situation of organizations (e.g. a hospital), quantify the level of maturity in terms of digitization, and develop possible digitization solutions. What is important in the process of applying the method is an early involvement of users (as user acceptance is crucial in healthcare) as well as the provision of models allowing sustainable establishment of innovative IT solutions.

Therefore, Fraunhofer ISST's contributions are guided by two principles: digital sovereignty and digital competence. The aim is to ensure a fruitful interplay of humans and technology in the healthcare sector. Digital transformation fundamentally changes processes and the way people interact therein with the support of digital products and services. Knowing about and understanding these digital products and services thus becomes a key competence for people to acquire. Probably more than any other competence humans can build up, digital competence is affected by change caused by very fast innovation cycles. Considering this, hospitals and other employers in the healthcare system need to understand that they must effectively support the process of digital transformation by offering their staff on-the-job training and other instruments of continuing education, particularly in view of the shortage of qualified personnel which especially the German healthcare system is currently facing. This creates digital sovereignty for staff, who are empowered to be more self-determined in their daily work, which in turn leads to more effective and efficient processes.

PROJECT FAST FACTS

HELP – HELP – HEALTH & LIVING PLATFORM

Project goal	Establishing cross-sector medical care management plus integrated community services for a self-determined living of chronically ill people in their community.
Benefit	The quality of medical care of patients is increased by improved information exchange between the various parties involved in the process (hospitals, family doctors, domestic care service providers, medical supply stores etc.) and by improved structures for effective community services.
Partner	Smart Living GmbH, Fraunhofer IML, DoGeWo 21 GmbH, Pflegedienst Hübenthal, Sanitätshaus Tingelhoff.
Contribution of Fraunhofer ISST	Conceptualization and development of the platform and the »Case Care Organizer« module.
Funding	Funded by the EU through its structural fund »EFRE NRW« for the state of North Rhine-Westphalia (Project ID number: EFRE-0800712)
Project completion	March 2020
Project URL	www.help-dortmund.de/
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This is what Digital Health Innovation Engineering aims to do. Through the collaboration of Fraunhofer ISST and hsg, students have the opportunity to develop specialized skills both with regard to healthcare and digital media, which is the basis of a user-centric digital healthcare system. The »Digitization in HealthCare« business unit leverages digital sovereignty and digital competence in order to promote two core topics of research and development: information logistics for management of medical data and human-innovation interaction.

Digitization has a significant impact on the importance and relevance of data. This general statement applies to the healthcare sector as well. Fraunhofer ISST has long since been dealing with the issue of data privacy in the healthcare system as specified by the Elektronische FallAkte (EFA), Germany's program for keeping medical data of individuals in an electronic case record available to all doctors, hospitals etc. the patient receives treatment from. EFA and other information highways, increase the availability of heterogeneous data and the emergence of so-called data silos, unspecifically stored data. Large internet companies have been demonstrating, how additional value can be generated from these data silos, using data processing algorithms, such as machine learning. In accordance, initial Studies, conducted by IBM or Google, show that methods of deep learning, applied to image data in the field of tumor detection, can lead to more exact diagnoses compared to control groups made up of doctors.

In 2017, Fraunhofer ISST's »Digitization in HealthCare« business unit launched, or continued to work in, a number of projects, among them

- EPItect (which is funded by the German Federal Ministry of Education and Research), aiming at the development of an innovative ear sensor system to be carried by epileptics in order to timely recognize the occurrence of seizures,
- ParkinsonCompanion (which is also funded by the German Federal Ministry of Education and Research), aiming at the development of a mobile system offering

support to people suffering from Parkinson's disease, and

- NephroTeTe (which is funded by the EU through its structural fund »EFRE NRW« for the state of North Rhine-Westphalia), investigating on tele-medical technologies for facilitating intersectoral treatment of patients with chronic kidney disease.

In addition, Fraunhofer ISST is investigating on methods for predictive and preventive analysis of data based on artificial intelligence mechanisms. Identifying characteristic features allows supporting the principles of the so-called »P4 medicine« (i.e. medicine that is predictive, preventive, personalized and participatory) in order to facilitate highly effective treatment of patients.

Digitization is changing the way humans interact with each other, but also the way humans interact with systems and devices (human-machine interaction). Using speech recognition systems, for example, the hospital staff can voice-control certain actions, such as the documentation of consumables in operating rooms. Another emerging technology is mixed-reality, linking virtual worlds with the real world and thereby allowing digitization to become visible. In connection with our approach of »Digital Health Innovation Engineering«, we speak of »human-innovation interaction«, by which we mean the interaction of humans being an integral part of an innovation process.

Besides engaging in collaborations with industry (such as with Boehringer Ingelheim, for example), Fraunhofer ISST managed to acquire funding for a number of R&D projects in 2017. One example is HealthReality, which is a project funded by the EU through its structural fund »EFRE NRW«, and in the course of which a living lab will be established for investigating on AR and VR applications to be used in the healthcare sector. The strong position of Fraunhofer ISST's »Digitization in HealthCare« business unit within the scientific community is underscored by a special success: Fraunhofer ISST is the only

Fraunhofer Institute represented in one of the consortiums (»SMITH – Smart Medical Information Technology for Health-care«) funded by the German Federal Ministry of Education and Research in its newly launched Medizin Informatik Initiative. The research program has a total budget of 150 million euros over the next four years.

PROJECT FAST FACTS

NEPHROTETE

Project goal	Facilitating intersectoral treatment of patients with chronic kidney disease using linked data to be exchanged via a central communication platform (EFA 2.0) between all parties involved.
Benefit	People with chronic kidney disease will benefit from well-coordinated medical care achieved by efficient exchange of digitized, structured medical information between hospitals, nephrologists, family doctors, domestic care service providers etc..
Partner	Universitätsklinikum Essen (Klinik für Nephrologie), MedVision AG, RZV Rechenzentrum Volmarstein GmbH
Contribution of Fraunhofer ISST	Conceptualization and development of the technical infrastructure, the data structure, and the communication platform.
Funding	Funded by the EU through its structural fund »EFRE NRW« for the state of North Rhine-Westphalia (Project ID number: EFRE-0800734 GE-1-2-011)
Project completion	March 2020
Project URL	www.nephrotete.de
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PROJECT FAST FACTS

EHEALTH PLATFORM (MDK MODULE)

Project goal Developing an online platform for using the Elektronische FallAkte (EFA) for efficient cross-sector communication in the German healthcare system (EFA is Germany's IHE-compliant program for keeping medical data of individuals in an electronic case record available to all doctors, hospitals etc. the patient receives treatment from).

Benefit The MDK module of the platform allows hospitals – which are still operating at a low level of digitization and system integration – to easily and timely put together documents on patients' treatments from a heterogeneous information landscape, and make these documents electronically available to the MDK, Germany's service provider for assessing the physical and mental condition of patients on behalf of the statutory health insurance providers.

Partner RZV Rechenzentrum Volmarstein GmbH, InterSystems GmbH

Contribution of Fraunhofer ISST Conceptual and technical consulting on IHE and EFA; participation in »IHE Connectathons« (which are multi-day events for testing the interoperability of information systems used in the healthcare sector); development of use-case specific portal solutions for eHealth Platform (e.g. the MDK module)

Project completion eHealth Platform is a continuing project; the MDK module of the platform is currently being used by five hospitals and two MDKs (Berlin-Brandenburg and North Rhine); participation of more hospitals and MDKs is in preparation.

Project URL <http://s.fhg.de/rhw>

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OUR VALUE PROPOSITION

Fraunhofer ISST's »Digitization in HealthCare« business unit is working hand in hand with other research organizations and with business. We identify and analyze problems and demands in order to develop and implement tailor-made strategies and solutions for the digital transformation of organizations operating in the healthcare sector. Our collaboration partners are healthcare service providers (e.g. hospitals), life science and pharmaceutical companies, and IT infrastructure providers.

Digital Health Innovation Engineering

We accompany and assist our clients, especially hospitals, on their way towards becoming a »healthcare service provider 4.0« – from developing a vision to implementing the digital transformation process. In workshops with the client we determine the current level of digital maturity of the client's organization. On the basis of this analysis, we jointly specify the goal to be achieved in terms of the organization's digital transformation. We identify the client's organizational strengths and weaknesses, develop technical concepts taking into account the client's specific organizational requirements, and develop concrete use scenarios. Our large network of partners and our knowledge of the market allows us to effectively support our clients when it comes to selecting the right IT solution provider.

Conceptualization and implementation of digital healthcare services

As a research institute specializing in software and systems engineering, we have more than 15 years of experience in the conceptualization and development of digital healthcare services. We support our clients in establishing IHE-compliant infrastructures. Furthermore, we have strong expertise regarding standards such as HL7's FHIR or CDA, which we use for the implementation of healthcare apps or web services.

Investigation and development of novel concepts of human-innovation interaction

We conceptualize, implement and evaluate innovative concepts of human-innovation interaction in the fields of speech recognition and mixed reality. Our clients benefit from our close, successful collaboration with the Hochschule für Gesundheit (hsg), Germany's first state-funded university for healthcare professions. The solutions we develop are subject to heavy usability testing, which is crucial for the solutions for being broadly accepted by the targeted user groups.

Investigation and development of methods for the analysis of medical data

In order to be able to provide patients with a personalized therapy, we investigate and develop algorithms for identifying relevant patterns in patients' medical data. These patterns can then be used to support decision making in the process of finding the therapy most appropriate for each individual case.

Supervision of infrastructure projects and calls for tender

Making use of the services of a construction supervisor has become good practice when building a house. To conceptualize strategies and develop solutions for establishing future-proof platforms for data exchange in the healthcare sector, a lot of industry and technology know-how is required. In these projects, we act as an independent »construction supervisor« making sure all requirements are taken into account and offering consultation when it comes to choosing the right IT solution provider. We also support our clients in making calls for tender by evaluating specifications and supervising the bidding process.

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BUSINESS UNIT »DIGITIZATION IN SERVICE INDUSTRIES«

DIGITALISIERUNG IN SERVICE INDUSTRIES



Boehringer Ingelheim

- > 130 Jahre Familienunternehmen
- 45.700 Mitarbeiter
- Eigene Forschung
- Weltweit
- Dienen Patienten
- Marktführer in Tiermedizin

ZUKUNFT IST DIGITAL

PHARMA WAR UND IST EINE DATENINDUSTRIE

Dienstleistungen sind datengetrieben



SERVICEN Qualität ist entscheidend!

- ORDNUNG
1. USER EXPERIENCE
 2. INTELLIGENCE
 3. DATA



Pass doch auf! Die Daten sind wertvoll!



- Thesen:**
1. Entscheidungen werden datenbasiert getroffen.
 2. Wir werden zum Arzt immer mit K.I. Assistenz gehen.
 3. Es wird essentiell sein, neue Wertschöpfungsketten zu generieren.
 4. Patienten und Konsumenten werden das Gesundheitssystem verändern und neue Lösungen verlangen.
 5. Plattformen-gestützte Geschäftsmodelle werden APIs unabdingbar machen.

Fair Price €
for your Data

The cartoons on this page were made by Patrick Rebaz during a presentation entitled »Digitalisierung in Service Industries – Die Rolle und der Wert von Daten in innovativen Wertschöpfungsketten«, which was held by Dr. Jasmin Saric (Boehringer Ingelheim Pharma GmbH & Co. KG) and Dr. Sven Wenzel (Fraunhofer ISST) during the ceremony celebrating the 25th anniversary of Fraunhofer ISST on September 20, 2017.

DATA AS THE RAW MATERIAL OF SERVICES

Opportunities offered by digitization in the service industry

Accounting for more than 70 percent of the gross domestic product, the service sector is Europe's strongest industry. While industries like manufacturing or construction have seen their shares in the European gross domestic product shrinking in recent years, the service industry has grown continuously. The highest growth rates can be identified for business services, financial services, rental services, and information services. All these services are knowledge intensive, with data being the raw material required for producing them. The central question is: How can this data be efficiently managed and used in times of digital transformation and digitization? This question is in the focus of Fraunhofer ISST's »Digitization in Service Industries« business unit.

The Silicon Valley provides numerous examples of data-driven business models. One of them is UBER, one of America's largest passenger transportation companies, claiming to serve over 40 million passengers each month – without calling any car used for rendering the service its own. UBER acts as a broker between people in need of a taxi service and private drivers offering this service. From a technical perspective, this is merely a question of information logistics, with UBER's core assets being data. New, digital services not just enrich traditional services (like using a taxi), but also add value to traditional, physical products. This way, services and products become »hybrid«. Hilti, for example, a multinational company producing power tools, has established a new business model on the basis of which customers can rent a tool; the rental fee the customer has to pay depends on the extent to which they actually use the tool, which can be calculated by means of usage data recorded by the tool and made available to the service center in real-time transmission. Thus, innovative suppliers use new value-adding services to gain a competitive advantage – with data being at the core of these services.

Industry 4.0 gives manufacturers the chance to engage in highly flexible mass customization. Data is the most important raw material in this process in order to specify the configuration of products and the parameters of production for autonomously working machines and systems

The growing importance of data

To meet new market requirements and offer data-centric services (or physical products combined with digital services), data needs to be managed sustainably. The »Digitization in Service Industries« business unit therefore views data as an economic good. We address the challenges service companies are facing with our proven approach: Digital Business Engineering. In a first step, we analyze which data is required in order to render a certain service. We then select and evaluate the data available, and we determine the value of that data. To do that, we use a self-developed, tool-based approach for cataloging and assessing data sources. This approach allows us to analyze both the data existing in an enterprise's own information systems and the data

PROJECT FAST FACTS

LEISTUNGSZENTRUM LOGISTIK UND IT

Project goal Investigating on current topics in logistics and information logistics, and developing a roadmap outlining strategic topics for being researched in the upcoming years and serving as a basis for further research programs to be launched.

Benefit Reinforcement of the position of the city of Dortmund as a place of scientific excellence, and securing of the competitive advantage of logistics companies in the state of North Rhine-Westphalia and in Germany as a whole.

Partners Fraunhofer IML, EffizienzCluster LogistikRuhr, TU Dortmund University, Leibniz-Institut für Arbeitsforschung at TU Dortmund University (IfADo), Boehringer Ingelheim, Graduate School of Logistics

Contribution of Fraunhofer ISST Development of »Data Network Engineering« as a new field of research focusing on data networks that consist of data supply chains, linking data sources and data sinks; provision of novel tools for visualization and configuration, by which new types of data linkages can easily be established and data flows (both within organizations and across organizations' boundaries) made transparent.

Project completion End of 2019

Project URL <http://www.leistungszentrum-logistik-it.de/>

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coming from external sources. We then connect this »data inventory« with the »functional inventory«, i.e. the processes and applications required to process the data. Both inventories together provide the basis for building »data value chains«, i.e. process chains for preprocessing data in order to make it available for its intended purpose.

With the help of our solutions, all data required for creating an innovative service can be identified and sustainably managed – together with the entire data ecosystem comprising providers, users, servers, applications etc.

Data as an economic good

The significance of data should not be reduced to the fact that data constitutes the building blocks of information. Especially when data is exchanged or traded across organizational boundaries, the question arises what value data has. The »Digitization in Service Industries« business unit views data as an economic good. Determining the real value of this economic good is a big challenge though.

In June 2016, Microsoft announced the acquisition of LinkedIn at a total price of 26.2 billion US-Dollars. Considering that LinkedIn – like so many other companies of the digital economy – owns only a few material assets, what Microsoft actually bought was the user data LinkedIn owned, together with the linkages of this data. With a total number of approximately 433 million users at the time of purchase, Microsoft paid 60.50 US-Dollars for a single user data record, so to say. Many experts doubted that this price was justified by any facts. But what are the criteria defining the price of a specific data record? And how can the real value of data be calculated reliably? These are central questions that the »Digitization in Service Industries« business unit addresses. Together with another important question: What are suitable methods and tools to manage data efficiently and sustainably?.

Data and data users

While it is true that data is at the core of novel, hybrid services, humans play a significant role as well. Oftentimes humans are the users and the providers of services. This is why the »Digitization in Service Industries« business unit is also devoted to exploring the user perspective of digitization. We support our clients and partners in finding out, when and where, which data is needed. We develop solutions allowing users to efficiently collect the data they need for a certain purpose, and to efficiently manage that data. »pomodoX«, for example, is a software facilitating customizable corporate documentation and process documentation; instead of a one-size-fits-all view, documents can be tailored to the needs of specific use contexts (e.g. for different organizational units, regional or national branches, etc.), without giving up the advantages of centralized document management.

Another central aspect we address is user interfaces. Especially for services that are rendered on a (partially) automated basis, user interfaces – ranging from classical »responsive design« web interfaces to augmented reality or speech recognition solutions – play an important role. HYBESO, for example, is a software offering support to staff conducting inspections in the field involving extensive documentation, with a digital assistant guiding the user through a complex inspection process and facilitating easy data collection and convenient creation of reports.

PROJECT FAST FACTS

DIVA – DATA INVENTORY AND VALUATION APPROACH

Project goal	Uniting the goals of data governance with the notion of data being a distinct economic good; DIVA is a scalable, user-friendly web application allowing systematic identification of data sources which are not limited to a mere description of the data, but also depict technical, economical and organizational attributes in accordance with our M4DG data model; DIVA thereby allows the definition of responsibilities, annotation of entities, and maintenance of distributions, as well as offering features for analysis and reprocessing of data.
Benefit	Beneficiaries of DIVA are CDOs, data managers, data owners, data citizens, etc.
Partners	Boehringer Ingelheim
Contribution of Fraunhofer ISST	Development and maintenance of the application; consulting regarding the use of the application in concrete use cases.
Project completion	First version of DIVA released in August 2017; the application is continuously being developed further together with the client.
Project URL	http://s.fhg.de/t5y
Contact	Markus Spiekermann markus.spiekermann@isst.fraunhofer.de Phone +49 231 97677-424

PROJECT FAST FACTS

INDUSTRIAL DATA SPACE PLUS

Project goal Investigation and development of architecture topologies for data sovereignty in business ecosystems on the basis of the Industrial Data Space.

Benefit Beneficiaries of the project are German and international businesses in general, and the 80+ member organizations of the Industrial Data Space initiative in particular.

Partner Eight other Fraunhofer Institutes: IAIS, IML, AISEC, FIT, FOKUS, IOSB, IESE, and FKIE

- Contribution of Fraunhofer ISST**
- Technology-agnostic configuration of Industrial Data Space Connectors
 - Development of a »Data Value Chain« configuration model based on the business process models in the form of a graphic notation
 - Promotion of the idea of viewing data as a distinct economic good
 - Data valuation by means of interdisciplinary indicators (e.g. use value, usage analysis, market demand), product features, and processes
 - Project management

Funding Federal Ministry of Education and Research (Project ID number: 01IS17031)

Project completion End of 2020

Project URL <https://www.isst.fraunhofer.de/disi>

Contact Dominik Lis
E-Mail: dominik.lis@isst.fraunhofer.de
Phone +49 231 97677-420

OUR VALUE PROPOSITION

The main focus of Fraunhofer ISST's »Digitization in Service Industries« business unit is on the development of software solutions allowing the establishment and management of data value chains. Processes and technologies for data management are in the center of our research and development activities. Furthermore, we implement technical infrastructures facilitating cross-organizational exchange of data. To come up with solutions that are of high practical relevance, we collaborate closely with our clients and partners.

Comprehensive support spanning the entire spectrum of digitization

Digitization is not a product you can buy and here you go. In fact, it is a process of organizational transformation. To address this process properly, we use Digital Business Engineering for looking at the big picture of that transformation, and not just at single facets. In their effort of becoming a »service provider 4.0«, we support our clients across the entire spectrum of tasks, from defining an overall strategy to designing and implementing processes to developing and implementing technical solutions.

Data management across entire data value chains

Operating from the standpoint that data is the raw material of services, we provide our clients with methods and tools for cataloging and managing data. Furthermore, we assist them in the assessment of data sources and we develop tailor-made concepts and processes for collecting, storing, processing and maintaining data across entire data value chains.

Optimizing and redesigning customer processes

As customer experience is a crucial factor in the service industry, we support our clients in the process of optimizing and redesigning customer processes. Adopting an end-to-end perspective, we analyze the actual needs and wishes of the customer, for whom the specific service they are requesting might only be one building block of something bigger they desire. Looking at the customer process from a certain distance allows identifying new potentials and setting new impulses for developing new, digital service offerings.

Conceptualization of new, digital services

Each innovation starts with a vague idea. We investigate for our clients whether an idea regarding a new service to be offered can be put into reality, and, if so, how this new service can be implemented technically. To do so, we conceptualize and develop data structures and algorithms needed for technical implementation. We then do extensive testing of these data structures and algorithms, as well as of the underlying, data-driven business models.

Development of custom software

Following conceptualization of services, we develop custom software for the service to be technically implemented. The spectrum of solutions we develop for our clients ranges from small tools and mobile apps up to scalable cloud applications. We also address the issue of data integration, and we implement interfaces and solutions for cross-company data exchange. All our solutions are user-friendly and tailored to user requirements.

CONTACT:

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25th ANNIVERSARY CEREMONY

FROM THE BEGINNINGS TO »DIGITIZATION MADE IN GERMANY«

In 2017, Fraunhofer ISST turned 25! We celebrated this anniversary together with guests from research, business, and politics with a great ceremony taking place at Zeche Zollern, Dortmund's former colliery, which was closed down in 1966 and then renovated in the following decades to become a museum and an industrial heritage site. We took this opportunity to present our guests what Fraunhofer ISST stands for, 25 years into its existence: a reliable, innovative, strategic, and neutral partner for anyone considering the digital transformation of their business.


We were very pleased by the keen interest of all attendees as well as the encouraging welcome speeches held by Isabel Pfeiffer-Poensgen (Minister of Culture and Science of North Rhine-Westphalia), Alfred Gossner (Member of the Board of Fraunhofer-Gesellschaft), Ullrich Sierau (Mayor of the city of Dortmund), and Reinhold Achatz (CTO of thyssenkrupp AG and chairman of the International Data Spaces Association).

Following the speeches, three vivid presentations were given by the heads of our three business units, outlining the basic activities of their respective unit as well as shedding some insight on one of the projects the unit is currently involved in, or has been involved in in the past. Each of the three presenters was joined by a representative from a partner or client involved in one of the projects. Co-presenters were Lars Ganzhorn Knudsen of Aarhus Universitetshospital, Hans-Jürgen Berndt of AUDI AG, and Jasmin Saric of Boehringer Ingelheim Pharma GmbH & Co. KG.

The third and last part of the official program was a very interesting panel discussion on the expected impact of digitization on business and the society. Participants were Gerhard Rinkenauer (Leibniz-Institut für Arbeitsforschung at TU Dortmund University, IfADo), Peter Sorowka (Cybus GmbH), Simone Hessel (GE Digital), and Jakob Rehof (Fraunhofer ISST).

Fraunhofer ISST would like to say thank you to all guests attending the event, and to everybody contributing to its organization and the program! We are looking forward to the next 25 years, bringing us new challenges to address and requiring from us to keep coming up with innovative solutions that make digitization a great success story for North Rhine-Westphalia and Germany.

For viewing the videos of the business unit presentations, or the Fraunhofer ISST image film (which had its premiere at the ceremony), we refer you to our YouTube channel:

 <http://s.fhg.de/Bcb>

For more information on the ceremony and for downloading slide shows, please go to: www.ist.fraunhofer.de/25Jahre



SEPTEMBER 20, 2017



HIGHLIGHTS FROM THE 25th ANNIVERSARY CEREMONY

MOBILE COMPUTING

SOFTWARE-BAUHAUS

KNOWLEDGE M...

NETWORK COMPUTING

FRAUNHOFER ISST ESTABLISHED

E-COMMERCE

LOC B SER

1992

Fraunhofer ISST established as a preliminary institute of Fraunhofer-Gesellschaft (with branches in Dortmund and Berlin)



1994

Innovative base concepts for ICT-based applications

Process management: business process modeling and analysis



1996

Computer vision: full-fledged programs in the form of »software from the web for a few cents per use«



1997

Kiosk systems

Y2K problem

Software engineering

Computer-based integration

1993

Founding ceremony

Tool-based software engineering

Integrated software infrastructures

Process engineering

1995

Software-Bauhaus

End of preliminary phase – Fraunhofer ISST becomes a regular institute of Fraunhofer-Gesellschaft

MANAGEMENT

MILLENNIUM-CRASH

INTERNET 3.0

INFORMATIONSLOGISTICS

CONTINUOUS SOFTWARE ENGINEERING

EDUCATION-BASED SERVICES

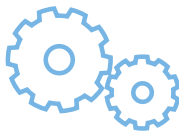
E-LEARNING

AUTOSAR

1998
Virtual exhibition for a museum (unprecedented in Germany at that time)



2000
Concepts for continuing education of IT professionals



2002
»Smart Wear« (first wearable solution)



2004
»International Software Industry Parks«

1999
Competence Center Information Logistics
Software system evolution

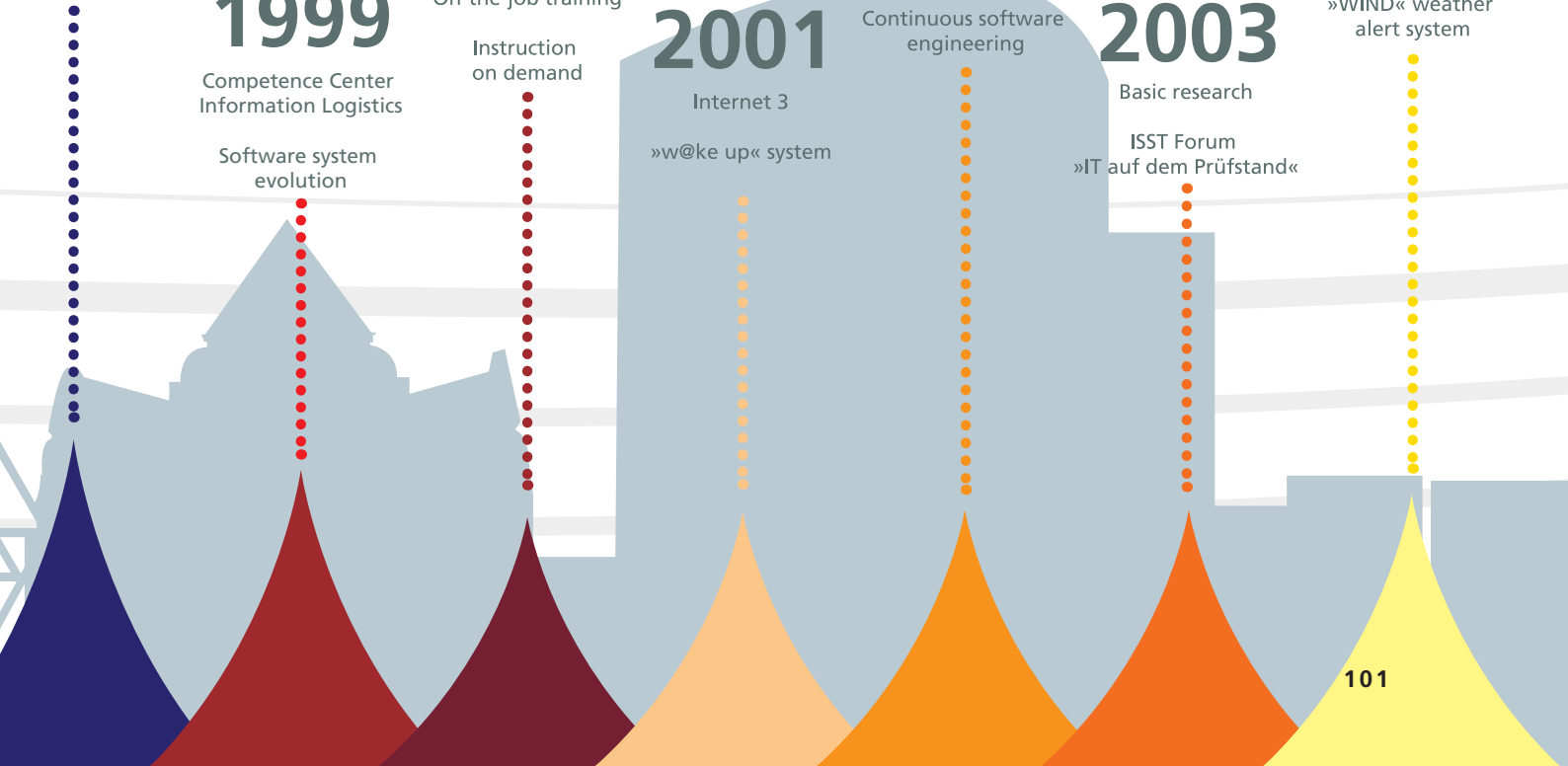
On-the-job training
Instruction on demand

2001
Internet 3
»w@ke up« system

Continuous software engineering

2003
Basic research
ISST Forum
»IT auf dem Prüfstand«

»WIND« weather alert system



HIGHLIGHTS FROM THE 25th ANNIVERSARY CEREMONY

E-HEALTHCARE

CLOUD COMPUTING

AMBIENT ASSISTED LIVING

LOGISTICS-IT

INTER OF TH



2007

Competence Center for Processes and Architectures (COMPARC)



2010

Cloud computing architecture



»Logistics Mall« online

2006

»Year of informatics«

Radio frequency identification

Jakob Rehof new Director of Fraunhofer ISST

New business units: E-Healthcare, Ambient Assisted Living, E-Government, and Automotive

2009

»EffizienzCluster LogistikRuhr«

»Logistics Mall« (cloud computing for logistics)

2011

Secure business IT infrastructure

Targeted alerting

2008

»Elektronische FallAkte (EFA)« for efficient information exchange in the German healthcare sector

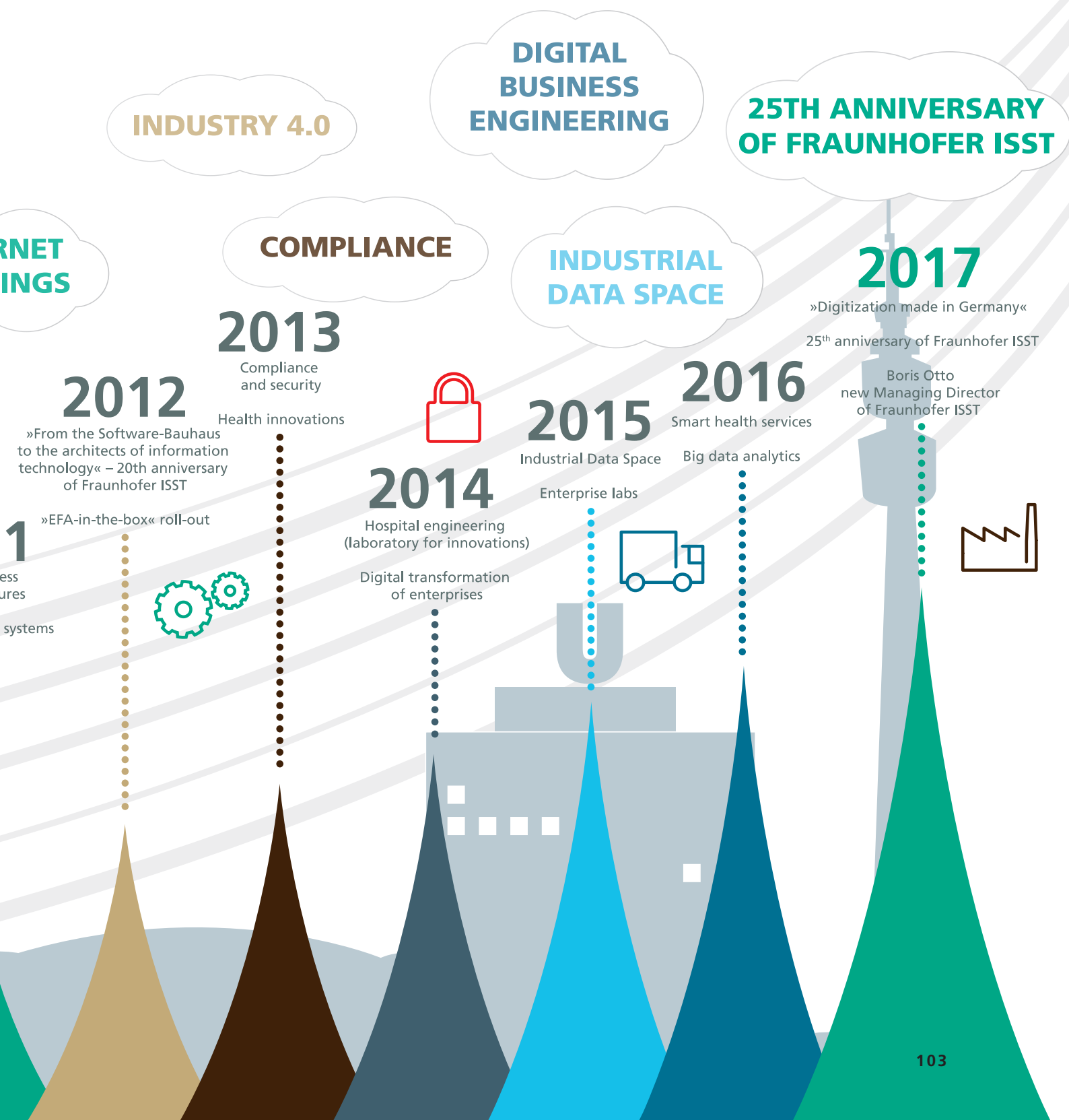
»KATWARN« mobile weather alert system

2005

Specification for electronic health insurance card

»SmarterWohnenNRW« smart living project





INDUSTRY 4.0

DIGITAL BUSINESS ENGINEERING

25TH ANNIVERSARY OF FRAUNHOFER ISST

INTERNET OF THINGS

COMPLIANCE

INDUSTRIAL DATA SPACE

2017

»Digitization made in Germany«
25th anniversary of Fraunhofer ISST

Boris Otto
new Managing Director
of Fraunhofer ISST

2012

»From the Software-Bauhaus to the architects of information technology« – 20th anniversary of Fraunhofer ISST

»EFA-in-the-box« roll-out



2013

Compliance and security

Health innovations



2015

Industrial Data Space

2016

Smart health services

Big data analytics

2014

Hospital engineering (laboratory for innovations)

Digital transformation of enterprises

Enterprise labs



SELECTED PUBLISHED WORKS AND PUBLIC RELATIONS ACTIVITIES

SCIENTIFIC PUBLICATIONS

- A.S. Ahmadian, D. Strüber, V. Riediger, J. Jürjens: **Model-based privacy analysis in industrial ecosystems.** In: Anjorin, A.: *Modelling foundations and applications. 13th European Conference, ECMFA 2017 : Held as part of STAF 2017; Marburg, Germany, July 19-20, 2017; Proceedings Cham: Springer International Publishing, 2017, S.215-231 (Lecture Notes in Computer Science 10376) (DOI: http://dx.doi.org/10.1007/978-3-319-61482-3_13)*
- M. Bartsch, T. Ernst, T. Fedkenhauer, M. Ipekcioglu, J. Jürjens, S. Kistler, N. Menz, A. Resetko, R.-P. Simon, G. Stöhr, S. Wessel: **Strategy Paper Certification: Framework for the Industrial Data Space Certification Scheme.** White Paper, IDS e.V. Technischer Bericht, 2017.
- T. Bredehorn, W. Deiters (Hrsg.), D. Dragon, M. Hintze (Hrsg.), V. Kaffka-Cevani, S. Meister, B. Moll, A. Raida, S. Wibbeling (Hrsg.): **Das Krankenhaus der Zukunft : Von der Gegenwart in die Zukunft.** Dortmund, Verlag Praxiswissen, 2017, 132 S. (ISBN 978-3-86975-121-4)
- V. Diamantopoulou, K. Angelopoulos, J. Flake, A. Praitano, J. F. Ruiz, J. Jürjens, M. Pavlidis, D. Bonutto, A. C. Sanz, H. Mouratidis, J. G. Robles, A. E. Tozzi: **Privacy data management and awareness for public administrations: A case study from the healthcare domain.** In: Schweighofer, E.: *Privacy technologies and policy. 5th Annual Privacy Forum, APF 2017 : Vienna, Austria, June 7-8, 2017; Revised selected papers. Cham: Springer International Publishing, 2017, S.192-209 (Lecture Notes in Computer Science 10518) (DOI: http://dx.doi.org/10.1007/978-3-319-67280-9_11)*
- M. Jahn, J. Kopecki, A. Statti, S. Meister, A. Kribben, S. Becker: **Telemedizin - quo vadis?** In: *Der Nephrologe* 12 (2017), Nr.5, S.363-366 (DOI: <http://dx.doi.org/10.1007/s11560-017-0186-2>)
- J. Jürjens, K. Schneider (Eds.). **Software Engineering (SE 2017).** LNI P-267, GI 2017, 157 S.
- S. Meister, M. Hintze, S. Wibbeling, Sebastian: **Digital Health Business Engineering. Digitale Wege im Krankenhaus 4.0.** In: Bröckerhoff, H.-P.: *TrendGuide Gesundheits-IT 2017 : E-Health-Compendium Offenbach: HEALTH-CARE-COM, 2017, S.18- 23*
- S. Meister, S. Becker, F. Leppert, L. Drop, Linus: **Digital Health, Mobile Health und Co. - Wertschöpfung durch Digitalisierung und Datenverarbeitung.** In: Pfannstiel, Mario: *Digitale Transformation von Dienstleistungen im Gesundheitswesen In : Impulse für die Versorgung. Wiesbaden: Springer Fachmedien, 2017, S.185-212 (DOI: http://dx.doi.org/10.1007/978-3-658-12258-4_13)*
- B. Otto, S. Lohmann, S. Auer, G. Brost, J. Jürjens, C. Lange, C. Quix, J. Cirullies, J. Schon, A. Eitel, C. Mader, D. Schulz, T. Ernst, N. Menz, J. Schütte, C. Haas, R. Nagel, M. Spiekermann, M. Huber, H. Pettenpohl, S. Wenzel, C. Jung, J. Pullmann: **Reference Architecture Model for the Industrial Data Space.** White Paper, Fraunhofer 2017.
- B. Otto: **Industrial Data Space: Architekturentwurf zur Wahrung der digitalen Souveränität für die Wirtschaft** (Keynote). In: Jürjens, J. / Schneider, K.: *Software Engineering 2017, Fachtagung des GI-Fachbereichs Softwaretechnik, Feb. 21-24, 2017, Hannover, Deutschland. LNI P-267, GI 2017, ISBN 978-3-88579-661-9, S. 21*
- S. Ruf, J. Jürjens, N. Herda: **Versicherungswirtschaft digital: Quo Vadis?** *Versicherungswirtschaft, 2017.*
- J. Schütte, G. Fridgen, W. Prinz, T. Rose, N. Urbach, T. Hoeren, N. Guggenberger, C. Welzel, S. Holly, A. Schulte, P. Sprenger, C. Schwede, B. Weimert, B. Otto, M. Dalheimer, M. Wenzel, M. Kreutzer, M. Fritz, U. Leiner, A. Nouak, W. Prinz (ed.), A. T. Schulte (ed.): **Blockchain und Smart Contracts : Technologien, Forschungsfragen und Anwendungen.** München : Fraunhofer-Gesellschaft, 2017, 50 S. (URL: <http://publica.fraunhofer.de/documents/N-480276.html>)
- S. Steinbuß, B. Holtkamp, S. Oprel: **HANDELkompetent - Situation Aware Learning in Retail.** In: *Procedia manufacturing* 9 (2017), S.245-253 (DOI: <http://dx.doi.org/10.1016/j.promfg.2017.04.048>)

PRESENTATIONS

- S. Peldszus, J. Cirullies, J. Jürjens: **Sicherheitszertifizierung für die Digitale Transformation: Anwendung auf den Industrial**



Data Space. In Software-QS-Tag 2017, 2017. Best Paper Award.

J. Jürjens. Datensouveränität in der Industrieautomatisierung. In Hannover Messe 2017, Hannover, Apr. 24 – 28, 2017.

J. Jürjens, A. Resetko. Industrial Data Space: Plattform für unternehmensübergreifende Daten-Marktplätze und Big-Data-Analysen. In: Big Data Summit 2017, BITKOM. Hanau, Feb. 16, 2017.

J. Jürjens. Industrial Data Space: Plattform für die digitale Transformation von Unternehmen. In OOP 2017, München, Jan. 30 – Feb. 3, 2017.

S. Peldszus, J. Jürjens. Werkzeuggestützte Sicherheitszertifizierung: Anwendung auf den Industrial Data Space. In: Software Quality Days 2017, Wien, Jan. 17 – 20, 2017.

J. Jürjens. Industrial Data Space: enabling B2B data access. In: EC workshop on Industrial Data Spaces as an enabler of B2B data access, Brussels, June 8, 2017.

J. Jürjens. Industrial Data Space: Digital Industrial Platform across Value Chains in all Sectors of the Economy. In: Third workshop of the EC Working Group

on Digital Industrial Platforms (WG2), Brussels, 4 May 2017.

J. Jürjens. The Industrial Data Space initiative (Invited Talk). In: Digital Challenges in Europe. EC, Brussels, 29 June 2017.

EVENTS

Jan. 30 – Feb. 3, 2017: presentation of the Industrial Data Space at OOP 2017

Jan. 31, 2017: presentation of the Industrial Data Space at the first »Digitising European Industry Stakeholder Forum« of the European Commission

Feb. 9, 2017: »4. Wissensgipfel Ruhr – Digitalisiertes Ruhrgebiet«: Presentation on »Strukturwandel durch Digitalisierung: Gut aufgestellt im Ruhrgebiet« by Prof. Boris Otto

Feb. 24, 2017: BOB 2017 Conference: presentation on »Synergy of IoT and BPM - IoT Analytics Platform on Top of SMACK« by Yevgen Pikus

Mar. 16/17, 2017: »Digitising Manufacturing Conference in the G20 - Initiatives, Best Practices and Policy Approaches«: presentation by Prof. Boris Otto on »Data Sovereignty – Call

for international Effort« und Workshop

Mar. 20 – 24, 2017: Industrial Data Space at CeBIT 2017

Apr. 3, 2017: Dr. Sven Meister is member of the jury at »Innovation Day« in Essen

Apr. 24 – 28, 2017: Industrial Data Space at »Hannover Messe Industrie« 2017

Apr. 25 – 27, 2017: conhIT 2017: Fraunhofer ISST presents e-Health-Solutions

May 17/18, 2017: »med.Logistica«: Fraunhofer ISST presents e-Health-Solutions (Hololens in hospitals and new digitizing strategies for hospitals)

June 1, 2017: European Digital Health Day in Berlin

June 20 – 22, 2017: EPItect at the »Hauptstadtkongress Medizin und Gesundheit« 2017

June 29, 2017: opening ceremony of the »Leistungszentrum Logistik«

July 5/6, 2017: Health Business Connect 2017 with a guided tour at the Fraunhofer ISST

Sept. 12/13, 2017: »Zukunftskongress Logistik – 35. Dortmunder Gespräche«

Sept. 20, 2017: Ceremony on the 25th anniversary of the Fraunhofer ISST

Sept. 26, 2017: eHealth.NRW 2017

Oct. 3 – 5, 2017: IOT Solutions World Congress: presentation of the Industrial Data Space

Oct. 25 – 27, 2017: »Deutscher Logistik-Kongress« in Berlin

Nov. 13 – 16, 2017: MEDICA World Forum for Medicine

Nov. 23, 2017: presentation of the study »Industry 4.0 – the Future of Indo-German Collaboration« by Dr. Bernhard Holtkamp in New Delhi

Nov. 29, 2017: Fraunhofer Day on Artificial Intelligence: presentation of »Sherlockbot«

Dec. 4, 2017: Conference »Riding the Digital Wave« with a presentation by Dr.-Ing. Jan Cirullies in Washington

NETWORKS AND COLLABORATIONS OF FRAUNHOFER ISST

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V. (Fraunhofer-Gesellschaft)

Research of practical utility lies at the heart of all activities pursued by Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V., the umbrella organization of Fraunhofer ISST and all other Fraunhofer Institutes. Founded in 1949, Fraunhofer-Gesellschaft is a recognized non-profit organization conducting applied research that drives economic development and serves the wider benefit of society. Its services are solicited by customers and contractual partners in industry, the service sector, and public administration.

At present, Fraunhofer-Gesellschaft comprises 72 institutes and research units. The majority of the more than 25,000 staff are qualified scientists and engineers, who work with an annual research budget of roughly 2.3 billion euros. Of this sum, roughly 2 billion euros is generated through contract research. Around 70 percent of Fraunhofer-Gesellschaft's contract research revenue is derived from contracts with industry and from publicly funded research projects. Around 30 percent is contributed by the German federal government and the state governments, respectively, in the form of base funding, enabling the institutes to work on solutions to problems that will not become acutely relevant to industry and society until five or ten years from now.

International collaborations with excellent research partners and innovative companies around the world

ensure direct access to regions of the greatest importance to present and future scientific progress and economic development.

With its clearly defined mission of application-oriented research and its focus on key technologies of relevance to the future, Fraunhofer-Gesellschaft plays a prominent role in the German and European innovation process. Applied research has a knock-on effect that extends beyond the direct benefits perceived by the customer. Through their research and development work, the Fraunhofer Institutes help reinforce the competitive strength of the economy in their geographical region, and throughout Germany and Europe. They do so by promoting innovation, strengthening the technological base, improving the acceptance of new technologies, and helping train the urgently needed future generation of scientists and engineers.

To its staff, Fraunhofer-Gesellschaft offers the opportunity to develop the professional and personal skills that allow them to assume positions of responsibility at their institute, at universities, in industry, or in society. Students who choose to work on projects at one of the Fraunhofer Institutes have excellent prospects of starting and developing a career in industry by virtue of the practical training and experience they have acquired.

Fraunhofer-Gesellschaft is named after Joseph von Fraunhofer (1787–1826), the illustrious Munich researcher, inventor, and entrepreneur.

Fraunhofer-Verbund IUK-Technologie (Fraunhofer ICT Group)

Fraunhofer ISST is a member of Fraunhofer-Verbund IUK-Technologie, which is an initiative comprising all Fraunhofer Institutes operating in the field of information and communication technology (ICT; in German: IUK-Technologie). Fraunhofer ICT Group is Europe's largest organization conducting applied research on ICT and developing solutions for being used in practically all areas of life and work – from smart phones to intelligent power grids, from digitized operating rooms to digital driver assistance systems, and much more.

ICT is characterized by rapid change and short innovation cycles. More than in any other field, being able to respond quickly and operate efficiently is critical to stay competitive. In addition, software systems are becoming more and more complex – from systems embedded in everyday objects to solutions for process optimization for public authorities, from ICT integration in healthcare processes to solutions for process optimization in the finance sector, etc.

With its extensive knowledge about markets and technology, the Fraunhofer ICT Group offers organizations comprehensive support in their effort of meeting the challenges posed by the megatrend of digitization.

Fraunhofer-Allianz Ambient Assisted Living, AAL (Fraunhofer Ambient Assisted Living Alliance, AAL)

The AAL Alliance is a group of 11 Fraunhofer Institutes, among them Fraunhofer ISST, that work jointly on the conceptualization and development of system solutions for ambient assisted living and personal health. In the center of activities are technologies for Ambient Intelligence (Aml) as well as innovative concepts of user-friendly human-technology interaction, assistance, and healthcare.



Photo: © MEV-Verlag

Fraunhofer-Allianz Cloud Computing (Fraunhofer CloudComputing Alliance)

The Fraunhofer Cloud Computing Alliance unites eight Fraunhofer Institutes dedicated to cloud computing and other, thematically related topics, such as grid computing, utility computing, service-oriented architectures, or software as a service. In industry projects and in publicly funded R&D projects, Fraunhofer ISST and its partner institutes work together to develop solutions for optimal networking and use of distributed IT resources.



Photo: © Okeja - iStockphoto

NETWORKS AND COLLABORATIONS OF FRAUNHOFER ISST

Fraunhofer-Innovationszentrum für Logistik und IT, FILIT (Fraunhofer Innovation Center for Logistics and IT, FILIT)

To further intensify their long-time established, successful collaboration, Fraunhofer ISST and Fraunhofer IML (Fraunhofer Institute for Material Flow and Logistics) four years ago established FILIT, the Fraunhofer Innovation Center for Logistics and IT. The primary goal of FILIT is to promote the development of IT systems and infrastructures tailored to the requirements and goals of today's logistics. In »Enterprise Labs«, expert staff from both institutes offer clients strategic innovation process consulting and management.

Fraunhofer-inHaus-Zentrum (Fraunhofer inHouse Center)

The Fraunhofer inHouse Center bundles the skills and expertise of three Fraunhofer Institutes (among them Fraunhofer ISST) and multiple partners from business in order to jointly develop, test, demonstrate and market novel room concepts, innovative construction materials, and intelligent building technology. Topics range from energy efficiency of buildings or optimized office infrastructures to safety and assistance in healthcare or »hospital engineering«. For demonstration of the concepts and solutions developed, the partners jointly run use labs.



AFFILIATIONS OF FRAUNHOFER ISST

- Bundesverband Informationswirtschaft, Telekommunikation und neue Medien e. V., BITKOM (German association for IT, telecommunications, and new media)
- HL7 Benutzergruppe in Deutschland e. V. (HL7 user group for Germany)
- MedEcon Ruhr e. V. (network of healthcare providers located in the Ruhr region),
- ruhr networker e. V. (network of SMEs located in the Ruhr region)
- WINDO e. V. (network of research institutes located in the city of Dortmund)
- Wissenschaftsforum Ruhr e. V. (network of research institutes located in the Ruhr region)

Outlook at 2018: STARS, Fraunhofer ISST's newly established research group funded under the ATTRACT program, conducts simulations for evaluating software bugs in autonomous systems

Autonomous systems will proliferate significantly into all areas of life in the upcoming years. One major area in which autonomous systems will play a crucial role is road traffic, where self-driving cars will soon coexist next to pedestrians and cars still being steered by humans. In view of this futuristic scenario, the question arises as to how it can be ensured that autonomous systems work safely and reliably. Assessing the safety and reliability of autonomous systems is in the focus of STARS (»Scenario-based Testing of Autonomous Robotic Systems«), Fraunhofer ISST's newly established research group headed by Prof. Dr. Falk Howar.

Autonomous systems are already well-established in manufacturing facilities and warehouses. In such environments, robots and autonomously working machines have become indispensable elements of everyday processes and routines. However, autonomous systems usually operate in selected and restricted areas in these environments, where operations typically take place in a much more controlled fashion than this is possible in road traffic. For scenarios in which humans and autonomous systems operate very closely to each other, it is imperative to clearly and reliably assess these systems in terms of safety and predictability of behavior. As autonomous systems rely heavily on software, software bugs can have severe consequences in terms of endangering humans and the environment.

»This is exactly what we are investigating with STARS«, Falk Howar explains. »As it will never be technically possible to conduct one-hundred percent evaluation and testing of the software used in an autonomous system, we use risk-based methods that allow us to assess the safety of these systems quickly and cost-efficiently.« To do so, the researchers conduct simulations for identifying certain scenarios and determining the probability of the occurrence of errors.

Apart from his role as head of the STARS group, Falk Howar has been a professor under the Chair of Software Engineering at TU Dortmund University since the winter semester 2017/2018. Prior to his engagement in Dortmund, he worked at the Institute for Applied Software Systems Engineering at TU Clausthal University. Before that, he had an engagement at Carnegie Mellon University (Silicon Valley Campus) in California, USA, where he headed a NASA-funded research project on the evaluation of safety relevant software used in aerospace applications.

STARS receives funding under Fraunhofer-Gesellschaft's ATTRACT program, granting Falk Howar and his research group a budget of roughly 2.5 million euros over the next five years. The goal is to sustainably establish the STARS group for building up Fraunhofer ISST's business unit no. 4, »Digitization in Automotive Industries«. »We are glad that we could establish the STARS research group to extend our vision of 'Digitization made in Germany' to the automotive sector«, says Boris Otto, Managing Director of Fraunhofer ISST. »The auto industry is extremely data-driven. We now can use our Digital Business Engineering approach to support automakers and suppliers in their effort of digital transformation.«



CHAIRS AT TU DORTMUND UNIVERSITY

Chair of Supply Net Order Management

Associated with the Faculty of Mechanical Engineering of TU Dortmund University, the Chair of Supply Net Order Management held by Prof. Dr.-Ing. Boris Otto investigates on innovative concepts, methods, architectures, and solutions for business and logistics networks. The Chair pursues an interdisciplinary approach to logistics at the interface between engineering sciences, business management, and computer sciences.

The Chair is part of the LogistikCampus of TU Dortmund University. Together with other study programs offered by the Faculty of Mechanical Engineering, it provides scientific education of logistics experts, mechanical engineers, and industrial engineers. The Chair's activities in research and education take place in connection with multiple collaborations with partners from research and business from both Germany and abroad. The Chair is endowed by Audi AG and Stifterverband für die Deutsche Wissenschaft (association of sponsors promoting humanities and sciences in Germany).

Chair of Software Engineering

Headed by Prof. Dr. Jakob Rehof, the Chair of Software Engineering at TU Dortmund University, which is associated with the Department of Computer Science, aims at linking basic research as conducted by a university with applied research as done by Fraunhofer ISST in its contract research projects. The Chair's main topics of research are software architectures, business processes, and software engineering.

As for software architectures, the focus of the research activities is on the specification of state-of-the-art, abstract (industry specific) architectures, including aspects such as communication and synthesis. In terms of business processes, the Chair deals both with the modeling of new processes and the redesign of existing processes, including analysis of process patterns and ad-hoc changes. Regarding software engineering, the Chair investigates the dynamic properties of distributed systems, among other things.



Prof. Dr.-Ing. Boris Otto



Prof. Dr. Jakob Rehof



Chair of Materials Handling and Warehousing

Founded in 1972, the Chair of Materials Handling and Warehousing does research in the field of intralogistics design, engineering, and controlling. Headed by Prof. Dr. Dr. h.c. Michael ten Hompel and associated with the Faculty of Mechanical Engineering of TU Dortmund University, the Chair investigates on the planning and control of material flow systems.

Interdisciplinary teams conduct basic research and – in close collaboration with Fraunhofer ISST and Fraunhofer IML – contract research for clients from all industries.



Prof. Dr. Dr. h. c. Michael ten Hompel

Deutsches Forschungszentrum für Informationslogistik, DFZI (German Research Center for Information Logistics) at TU Dortmund University

Last year saw the foundation of Deutsches Forschungszentrum für Informationslogistik (DFZI) by Prof. Dr. Dr. h.c. Michael ten Hompel, Prof. Dr.-Ing. Boris Otto, Prof. Dr.-Ing. Markus Rabe, and Prof. Dr. Jakob Rehof at TU Dortmund University. The goal of DFZI is to put together findings from computer science, information technology, and logistics in order to create and promote a new scientific discipline, named »information logistics«.

DFZI can be seen as the basic-research counter piece to FILIT (Fraunhofer Innovation Center for Logistics and IT), in which Fraunhofer ISST and Fraunhofer IML have been conducting applied interdisciplinary research on the development of IT systems and infrastructures tailored to the requirements of logistics for a couple of years. The research center will be operating in a bidirectional fashion: it will investigate on the development and use of methods and technology known from computer science to be applied to the field of logistics, and it will work on transferring principles known from logistics to be applied to data and information management (in terms of getting the right data/information to the right place at the right time).

DFZI comes as a virtual research center that is open to researchers from other faculties as well as to partners from business. It wants to provide a platform for exchanging views and opinions, promote young researchers, and drive forward interdisciplinary research and development.

COLLABORATIONS WITH UNIVERSITY CHAIRS



Prof. Dr. Wolfgang Deiters

Prof. Dr. Wolfgang Deiters, Chair of Healthcare Technology at the Department of Community Health, Hochschule für Gesundheit (hsg), Bochum

Wolfgang Deiters holds the Chair of Healthcare Technology at the Department of Community Health at hsg. The Chair focuses on process and workflow management and information logistics in the fields of Ambient Assisted Living and eHealthcare. Main areas of research are strategies of digitization in the healthcare sector; user-centered digital healthcare services for prevention, therapy, and care; mobile healthcare services; socio-technical and resource-oriented assistance systems, digitally supported healthcare structures; and hospital engineering.

Before Wolfgang Deiters joined hsg in 2017, he worked for Fraunhofer ISST in various positions. Today he is a consultant and senior scientist primarily for Fraunhofer ISST's »Digitization in HealthCare« business unit. From this collaboration, numerous joint project activities have resulted (see pages 26-31).



Prof. Dr. Jan Jürjens

Prof. Dr. Jan Jürjens, Chair of Software Engineering at the Faculty of Computer Science, University of Koblenz-Landau

Jan Jürjens holds the Chair of Software Engineering at the Department of Computer Science at the University of Koblenz-Landau. In 2017, Fraunhofer ISST and Jan Jürjens' Chair launched a strategic collaboration.

The Chair focuses on secure systems used in connection with distributed architectures for intelligent data analysis (such as the Industrial Data Space, for example). At Fraunhofer ISST, Jan Jürjens is Director Research Projects, coordinating the publicly funded projects and scientific publications. In the Industrial Data Space initiative, he is a member of the program management committee.

Fraunhofer ISST and the Chair of Software Engineering at the University of Koblenz-Landau collaborate in a number of research projects. One example is VisiOn (Visual Privacy Management in User Centric Open Environments), a project funded by the EU that was successfully completed last year.

THE BOARD OF TRUSTEES OF FRAUNHOFER ISST

The board of trustees offers consulting to Fraunhofer ISST's board of directors. It comprises representatives from science, business, and the public sector.

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WORK AT FRAUNHOFER ISST



JOIN US!

Fraunhofer ISST is a research institute that operates at the interface with business. We assist our clients and partners in everything that has to do with the megatrend of digitization.

In each of our three business units, our employees are working on the development of innovative, application-oriented digital solutions shaping the future of business.

To our staff, we offer a great working atmosphere, exciting opportunities to collaborate with partners from industry and science, and a professional environment helping them develop as a professional and as a person.

Instagram post of the »Digitization in HealthCare« business unit on the occasion of #mitarbeitermittwoch of @fraunhofer.karriere



Fraunhofer Karriere (
@fraunhofer.karriere)

#mitarbeitermittwoch Auch bei Fraunhofer gibt es Superhelden 🦸 Darf ich vorstellen: Die HealthLeague »Digitization in HealthCare« des #FraunhoferISST 😊 Mit vereinten Kräften stellt sich das Team furchtlos und visionär den Herausforderungen der #Digitalisierung für ein neues, digitales #Gesundheitswesen . In den Bereichen Virtual und Augmented Reality, Biofeedback, Machine Learning, Robotik, Ambient Assisted Living und Krankenhaus 4.0, setzt die HealthLeague auf starke Digitalisierungsstrategien. Die Bedürfnisse der NutzerInnen stehen dabei im Vordergrund. Du hast Interesse am Team und besitzt einen Medizininformatik-Hintergrund? 🤖 Dann schicke uns gerne deine Initiativbewerbung an: bewerbung@isst.fraunhofer.de 😊

📍 Dortmund

🕒 9:01am 08/09/2017 🗨️ 4 ❤️ 278

If you

- are seeking the challenge of working in the field of applied research,
- are interested in contributing to the success of highly ambitious R&D projects, are enthusiastic about working on the conceptualization, development, and implementation of highly innovative digital business solutions, and
- are keen on working in a highly motivated team,
- are a graduate from a university or a university of applied sciences, having studied computer science, information management, engineering, mathematics, physics, business administration, economics, or a related discipline,

we are looking forward to your application.

To check our current job openings, please go to:

www.isst.fraunhofer.de/de/jobs.html

Please e-mail your application to :

bewerbung@isst.fraunhofer.de

#mitarbeitermittwoch Even at Fraunhofer, you can find superheroes in action.

May I introduce to you: The »Digitization in HealthCare« HealthLeague of #Fraunhofer ISST!

With forces joined, the team is fearlessly facing the challenges of digitization in order to create a vision of a new, digital healthcare sector.

The HealthLeague promotes strong digitization strategies in areas such as virtual and augmented reality, bio feedback, machine learning, robotics, ambient assisted living, and hospital 4.0 – with a clear focus on user needs.

If you are interested in joining our team, and if you have a background in medical information systems, we are looking forward to your unsolicited application (bewerbung@isst.fraunhofer.de).



CREATIVE HEADS WITH SCIENTIFIC SPIRIT – GET TO KNOW OUR TEAM!

Who are the people at Fraunhofer ISST being responsible for conceptualizing, developing and implementing the digital strategies and solutions shaping the future of logistics, the healthcare sector, and the service industry?

We would like you to get to know our team! Check out our social media channels for our »Meet us!« series, in which we introduce the creative heads contributing to the success of Fraunhofer ISST to our followers. Here are two of them: Dominik Lis and Salima Houta.

What were the main reasons for you to join Fraunhofer ISST?

#WhyApplied #DigitizationinServiceIndustries #Zukunftsforscher #ISSTdreamjob

Dominik Lis: I was particularly enthusiastic about the institute's activities regarding digitization – especially its expertise in developing digital business solutions and its approach of viewing data as a strategic resource of companies. I knew that joining

Fraunhofer ISST would allow me to work at the very forefront of digital transformation, and that I could work in very innovative projects tackling the true challenges of business.

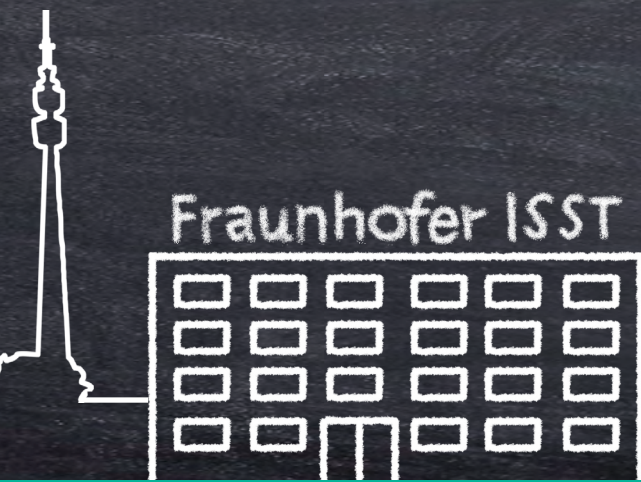
What is so special working with Fraunhofer ISST?

#dayinthelifeof #DigitizationinServiceIndustries #Zukunftsforscher #ISSTdreamjob

Dominik Lis: Dominik Lis: Here at Fraunhofer ISST I am experiencing a new level of responsibility, and also a new quality of challenges. The institute is heavily collaborating with business, especially with high-profile enterprises, which opens up lots of opportunities for me to work in my main area of research, which is data engineering. The close collaboration with partners from industry as well as with other Fraunhofer-Institutes is my daily business here at Fraunhofer ISST. And as an assistant to Prof. Otto, I am involved in the process of developing the institute's strategy, which also allows me to engage in very exciting and meaningful tasks.



**Dominik Lis M. Sc., research assistant in the
»Digitization in Service Industries« business unit**



Meet Us!

What do you appreciate most working with Fraunhofer ISST?
#thatswhatlike #DigitizationinServiceIndustries #Zukunftsforscher #ISSTdreamjob #EPItect

Salima Houta: What I probably appreciate most about working here is that I have the chance to work in such an innovative and creative environment, and that I can really bring innovation into practice. Here at Fraunhofer ISST, I have the opportunity to develop and follow up on my own ideas, and to transform these ideas into practical applications and put these to a reality check involving potential users. Take EPItect, for example, which is a project I manage and in which we develop and test solutions for sensor-based recognition of epileptic seizures and for improving treatment of epileptics with the help of digital technology. In this project we collaborate very closely with hospitals and physicians, but also with patients and their families. This helps us identify problems where they actually originate, and come up with solutions addressing these problems most effectively. I feel so satisfied to see that our research and the solutions we develop help to better the lives of people.








Salima Houta M. Sc., research assistant in the »Digitization in HealthCare« business unit

Can you tell us about your work? What does your daily routine look like?
#dayinthelifeof #DigitizationinServiceIndustries #Zukunftsforscher #ISSTdreamjob

Salima Houta: I deal with the conceptualization, development, and implementation of digital business solutions for the health-care sector. I do this together with my team and in close collaboration with staff from our partners from business and research. This interdisciplinary teamwork is very exciting. It is important for us to keep track of innovations and to take an active part in coming up with innovative solutions ourselves. To do so, we constantly work on the development of new ideas, we look for partners to build up research collaborations with, and we prepare project proposals for applying for public funding.

If you want to stay informed about what's going on at Fraunhofer ISST, follow us on

-  Twitter: @FraunhoferISST
-  Facebook: @FraunhoferISST
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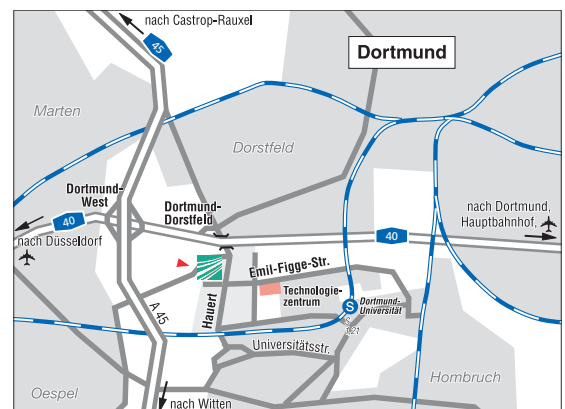
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By Car

Exit the B1 at Dortmund-Dorsfeld, at the end of the sliproad turn left (coming from Bochum) or right (coming from Dortmund) onto Hauert towards the Technologie Zentrum, then right onto Emil-Figge-Straße.

From the north or south: Exit the A45 at Dortmund-Eichlinghofen, at the end of the sliproad turn left onto Universitätsstraße towards the university, roughly 300m after the first traffic lights turn left onto Hauert, then turn left after the second traffic lights into Emil-Figge-Straße.

Parking

There is a parking available for our guests. You can find it at the end of the Emil-Figge-Straße (dead-end street) on the right side of the cul-de-sac. Please ring the bell at the fence in order to enter.

Please notice

The premises of our institute are situated at the cul-de-sac of the Emil-Figge-Straße. Coming from the highway (B1/ A 40) this part of the Emil-Figge-Straße lies on the right side. If you use a navigation system this might guide you at the junction Hauert/ Emil-Figge-Straße (to the left) into the larger part of

the Emil-Figge-Straße. Please notice that you should not follow the directions of your navigation system at this instance but turn to the right. There is a parking available at the end of the cul-de-sac.

By Rail

From Dortmund Hauptbahnhof: Take the S-Bahn S1 or 21 to Düsseldorf up to the station Dortmund-Universität. Then follow the signs to the H-Bahn in direction »Technologiezentrum« and alight at the first station »Technologiezentrum«. From there it is only a 5 min. walk to the Fraunhofer ISST. Alternatively, you can take the bus 462 under the Mensa-bridge (in direction Siepmannstr./Kirchlinde). Alight at the station »Technologiepark « (not »Technologiezentrum«). From there it is a 5 min. walk to the Fraunhofer ISST.

By Plane

From Dortmund-Wickede take the bus to Dortmund Hauptbahnhof. Then proceed as above. A taxi drive from Dortmund-Wickede airport will take ca. 25 min.

From Düsseldorf airport take the S-Bahn S1 or 21 to Dortmund as far as the station Dortmund-Universität. A taxi drive from Düsseldorf airport will take ca. 60 min.

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