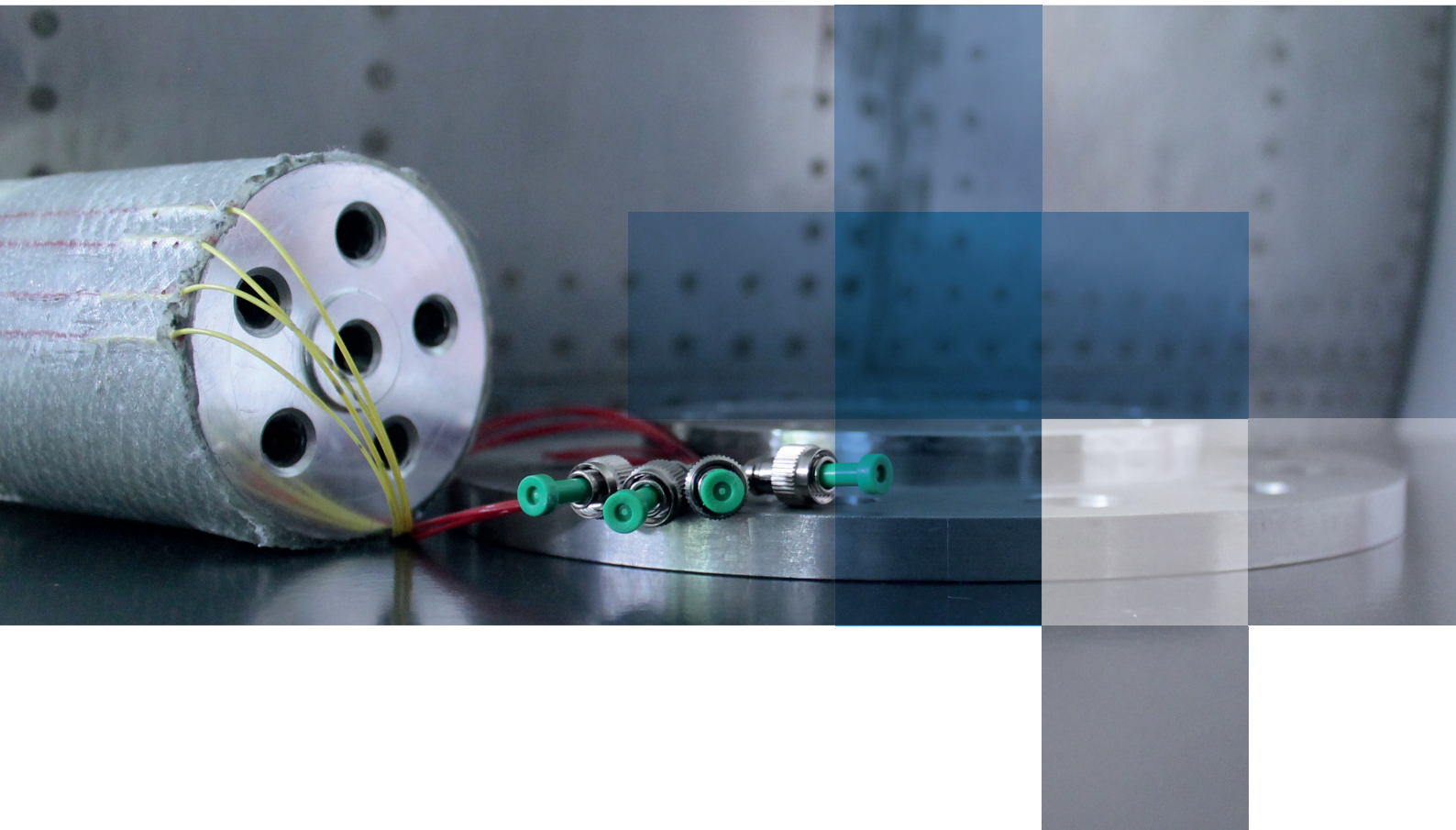




**SMART
SENSING
SYSTEMS**



Consortium Project

Digitalization and Digital Twins for Smart Sensing Systems

Digitalization and Digital Twins for Smart Sensing Systems

Digitalized ecosystems and Digital Twins are two of the major technological trends of the current decade. The numbers are impressive [Gartner, statista]. 13% of organizations implementing IoT projects already use Digital Twins, while 62% are either in the process of establishing Digital Twin use or plan to do so. More than 75 billion IoT connected devices are expected in 2025, hundreds of millions of them will have Digital Twins within 2023. At the same time, companies are transforming themselves from a classical product manufacturer to a solution provider offering innovative product-service systems.

Smart Sensing Systems are the basis for the Digitalisation of technical systems. Their implementation is based on the Digital Twin, the IT counterpart of its Real Twin. This can be e.g. a machine component, the machine itself, or even an entire plant. The combination of Digital and Real Twin finally makes up the Smart Sensing System: The Real Twin and its sensors and actuators “feel and actuate”, the Digital Twin “thinks and communicates”. This allows Smart Sensing Systems to sense early and act autonomously. The result is an efficient digitalisation of single hardware components as well as of complex value-added networks, which enables new and expanded value creation opportunities.

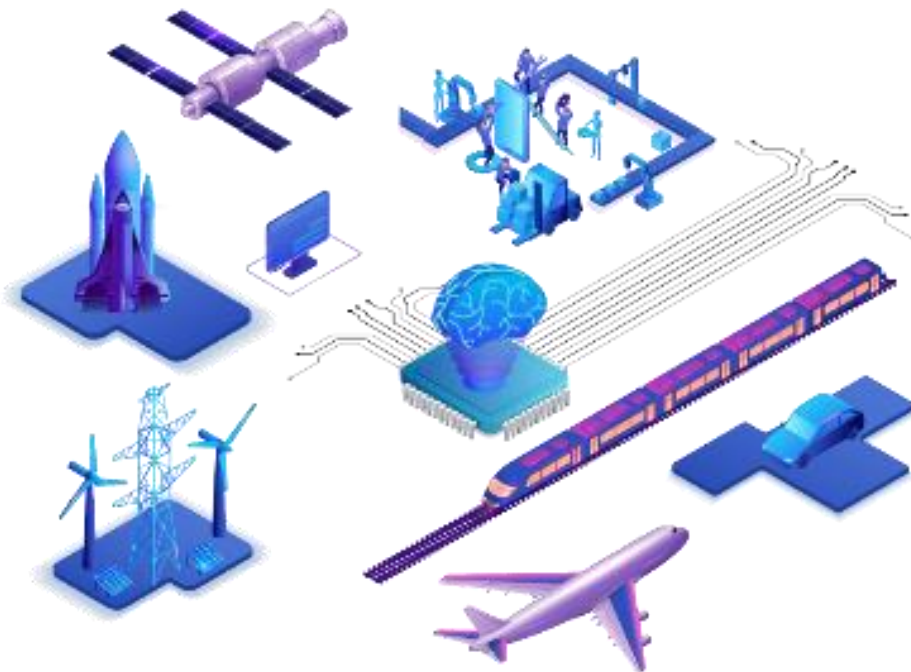
The concrete benefits of Digitalization and Digital Twins for companies in the context of Smart Sensing Systems are manifold but often remain vague. The technical implementation leads to a new view on systems, value-added networks and business models but requires new technological approaches. Therefore, the existing potentials are not or only insufficiently exploited and remain unused for value creation. The goal of this consortium project is to uncover the challenges, identify required technologies and processes and reveal the potentials and benefits associated with Digitalization and Digital Twins for Smart Sensing Systems.

Why Digitalization and Digital Twins?

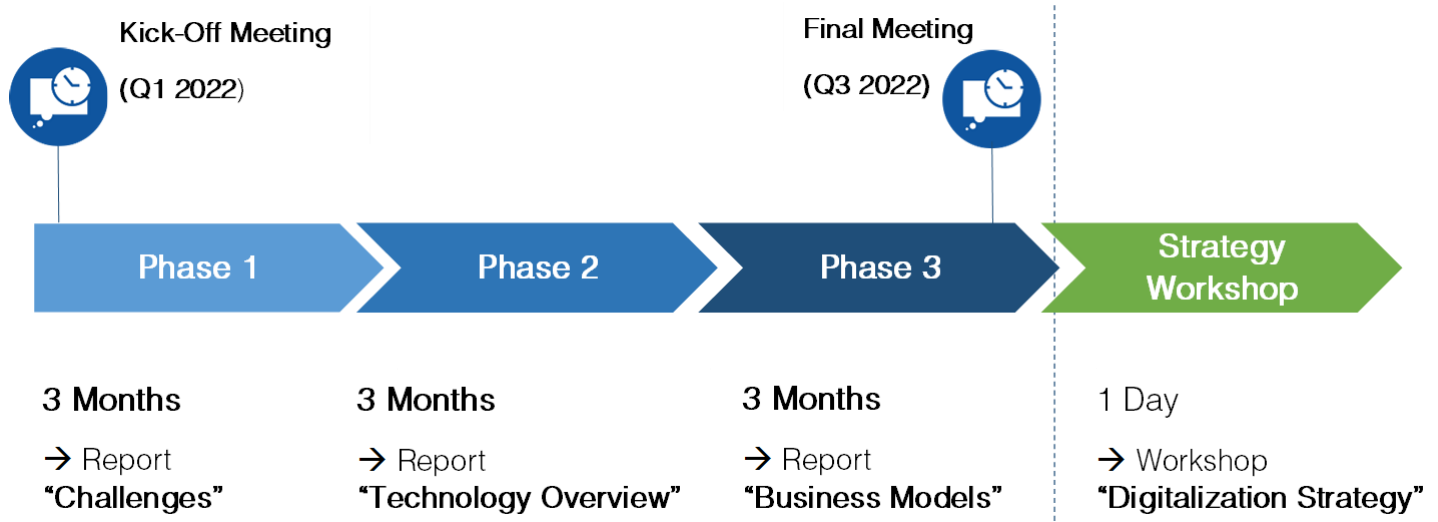
- Digital Twins as core components of intelligent, decentralised and networked systems
- Digital Twins for local information processing and automatic reaction
- Realization of Self-X-Systems (aware, predict, compare, configure, maintain, organize, adaptive, optimize)
- New valued-added networks and business areas
- New digital business models (As-a-Service, Pay-per-X, ...)
- Targeted, cost-effective and rapid development of Smart Sensing Systems based on digital prototypes
- Reduced development costs and time-to-market for flexible products

Why are the potentials of Digitalization and Digital Twins not yet fully exploited?

- Benefits remain vague
- Companies are stuck in old structures and business models
- No common understanding of Digitalization and Digital Twins
- Digital Twin concept too abstract
- Use of required technologies unclear
- Missing guidelines
- Various “chicken-egg-problems” like data availability vs. modelling capabilities, benefits vs. technology, technology push vs. market pull
- New challenges in fields like validation, quality assurance and liability
- Investment costs unclear



Project content and process



Phase 1: Challenges

- Individual interviews regarding
 - Potentials
 - Challenges
 - Boundary conditions
- Networking at the event

Phase 2: Technologies

- Overview of required technologies for Digital Twins
 - in the Internet of Things
 - for Prognosis
 - for human-machine interaction

Phase 3: Benefit

- Business Model options for Digital Twins in the context of Smart Sensing Systems
- Presentation and discussion of the project results in the consortium

Strategy Workshop

- Individual one-day workshop in context of the product ecosystem and company strategy
- Definition of next steps and foundation for a detailed roadmap

Results and benefits for the partners

- Result of the study:
 - Report summarizing the challenges of Digitalization and Digital Twins
 - Report outlining required technologies to put Digital Twins into practice
 - Report introducing different Business Models and Business Cases in the field of Digitalization and Digital Twins
- Network with partners from research and industry in various fields
- Discuss the challenges, opportunities and benefits of Digitalization and Digital Twins for Smart Sensing Systems

Project Summary



Kick-Off Meeting: Q1 2022 in Aachen
Duration: 9 Months



Challenges:

- Concrete benefits and practical implementation of Digitalization and Digital Twins for companies in the context of Smart Sensing Systems are manifold but often not concrete enough
- The existing potential is not or only insufficiently exploited and remains unused for value creation



Project Goals:

- Uncovering the potential of Digitalization and Digital Twins for Smart Sensing Systems
- Identification of enablers at system and process level
- Identification of benefits in hybrid products, overarching value creation networks, innovative business models



Benefit for the partners:

- Reports on challenges, technologies and benefits of Digitalization and Digital Twins
- Networking and opportunity to discover new potentials in a creative process and environment



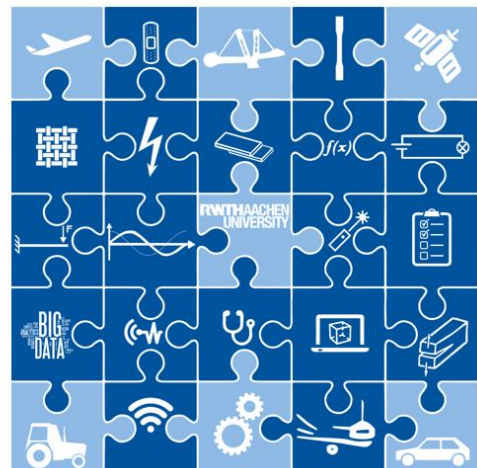
Participation fee per partner:
10.000* €

Center members receive discount

* (excluding the travel costs)

Why to be a partner by Consortium projects of Center Smart Sensing Systems?

Our action	Your benefit
<ul style="list-style-type: none"> ▪ Providing innovative and short-term projects in the field of Smart Sensing Systems 	<ul style="list-style-type: none"> ▪ Cooperation in the formation of the consortium projects based on the need of your company
<ul style="list-style-type: none"> ▪ Considering the focal points of the joint partners in the projects 	<ul style="list-style-type: none"> ▪ The multifaceted impact on partners occurring during a collaborative effort
<ul style="list-style-type: none"> ▪ Organising and implementing the projects by the Center Smart Sensing Systems experts 	<ul style="list-style-type: none"> ▪ Cost sharing of the projects
<ul style="list-style-type: none"> ▪ Providing review process at different phases of the project 	



About us



**SMART
SENSING
SYSTEMS**

Center Smart Sensing Systems

The Center Smart Sensing Systems is a central platform for the establishment and development of smart sensing systems. The development of intelligent structures and systems is a highly interdisciplinary challenge, requiring outstanding depth of expertise in the various disciplines like sensor integration, data and signal processing, quality assurance, fracture mechanics and simulation and the center bundles this professional expertise. The following areas of competence are represented by the Center Smart Sensing Systems: Simulation of damaged components and their superordinate systems, Sensor technology and measurement methods, Sensor integration and production, Digitization and value creation and System integration in the application.

<https://www.rwth-campus.com/cs3/>



**CENTER
SMART SERVICES**

Center Smart Services

In cooperation with its members, the Center Smart Services develops market-ready data-based services. Our portfolio is targeted at companies in the machinery and plant engineering sector as well as the production industry that seek to open up new business segments with smart services or generate value from available company data with the help of modern data analysis methods (such as machine learning). Services provided by the center include the development and application of methods for the creation of digital business models as well as education and training programs, and industrial services assisting companies with the introduction of digital business models.

<https://center-smart-services.com/>



FIR e. V. at the RWTH Aachen

The FIR e. V. at the RWTH Aachen was founded in 1953 and has 130 employees, including 55 scientists /PhD scholars. The goal is to create a bridge between science and business in industrial management. Annually 40 publicly funded projects and 60 projects with industrial customers are carried out at the FIR. The areas of expertise are Service Management, Information Management, Business Transformation and Production Management.

www.fir.rwth-aachen.de



**RWTHAACHEN
UNIVERSITY**

Institute for Man-Machine Interaction (MMI)

The expertise of MMI is the interaction, simulation and analysis of complex systems in their operational environment. MMI makes innovative concepts available for diverse areas of application processes in the context of eRobotics with simulation-based engineering and embodied simulation. Development of virtual test beds form the basis both in the first concept studies, as well as for comprehensive tests and the goal-orientated optimisation of individual components or overall systems are only selective activities that MMI is engaged with.

<https://www.mmi.rwth-aachen.de/>

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