Consortium Project

Digitalization and Digital Twins for Smart Sensing Systems
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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?

<table>
<thead>
<tr>
<th>Our action</th>
<th>Your benefit</th>
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<tbody>
<tr>
<td>PROVIDING innovative and short-term projects in the field of Smart Sensing Systems</td>
<td>Cooperation in the formation of the consortium projects based on the need of your company</td>
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<td>Considering the focal points of the joint partners in the projects</td>
<td>The multifaceted impact on partners occurring during a collaborative effort</td>
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<td>Organising and implementing the projects by the Center Smart Sensing Systems experts</td>
<td>Cost sharing of the projects</td>
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<td>Providing review process at different phases of the project</td>
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