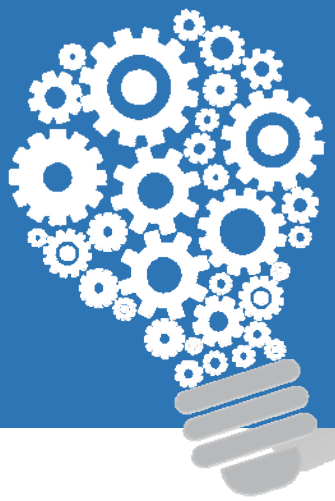
FORSCHUNGSVEREINIGUNG
SMART ENGINEERING

ProSTEP
iViP

Smart solutions for digital product development and production processes



Dr. Marcus Krastel | :em AG

ProSTEP iViP Symposium 2017, 18th May 2017 | Essen

Agenda

1. Introduction and Research Needs
2. Research Association Smart Engineering e.V.
3. Organizational Structure and Procedures
4. Membership
5. Outlook

Massive Change in Product Development

Industrial Internet

Smart Products

Smart Systems

Smart Logistics

Smart Object

Smart Embedded System

Smart Home

Smart Mobility

Web of Services (WoS)

Smart Device

Smart Engineering

Industry 4.0

Smart Technical System

Product-driven Manufacturing

Smart Grid

Internet of Thing (IoT)

Cyber Physical System

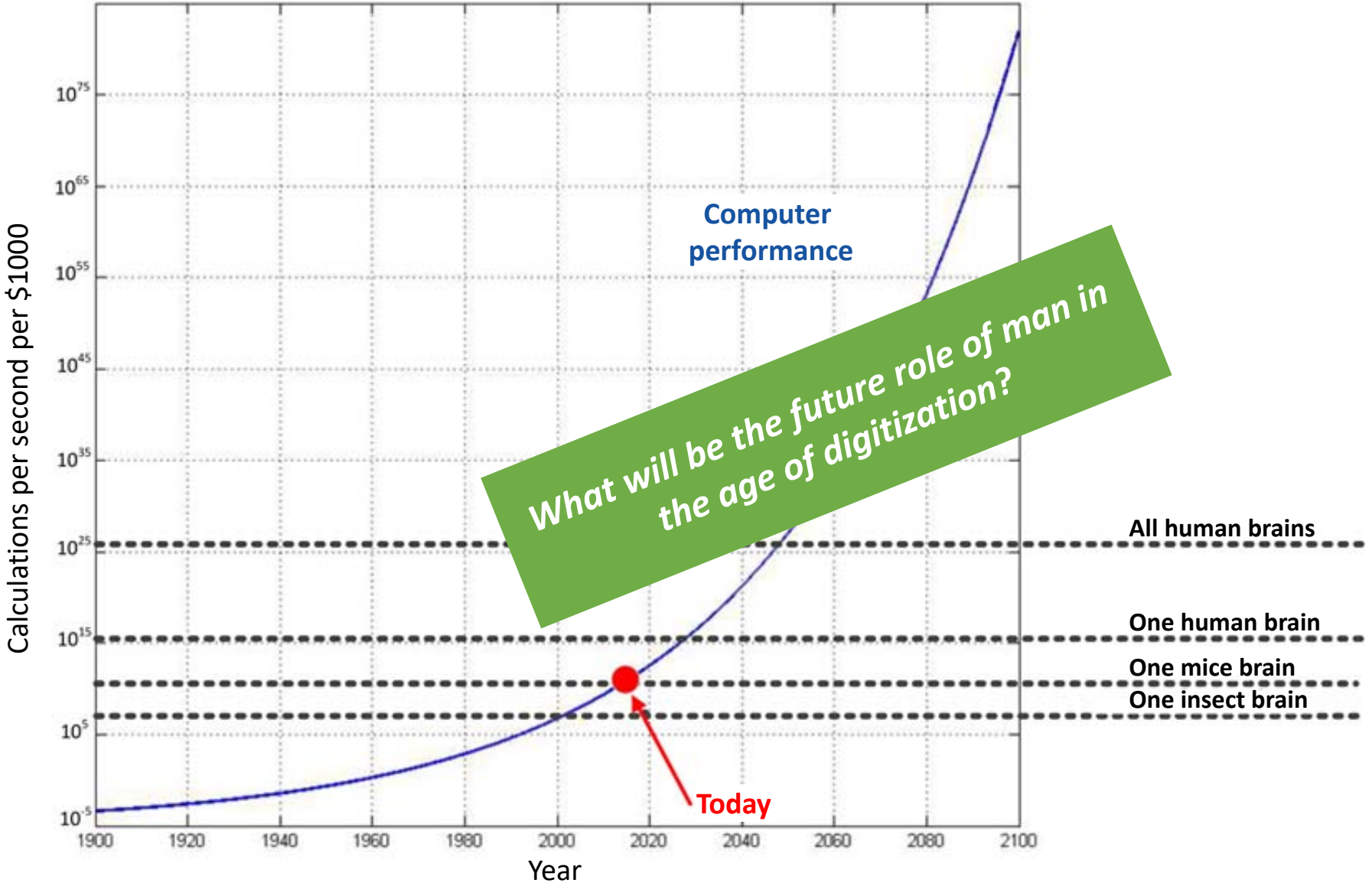
Smart Factory

Intelligent Systems

Embedded Micro Device

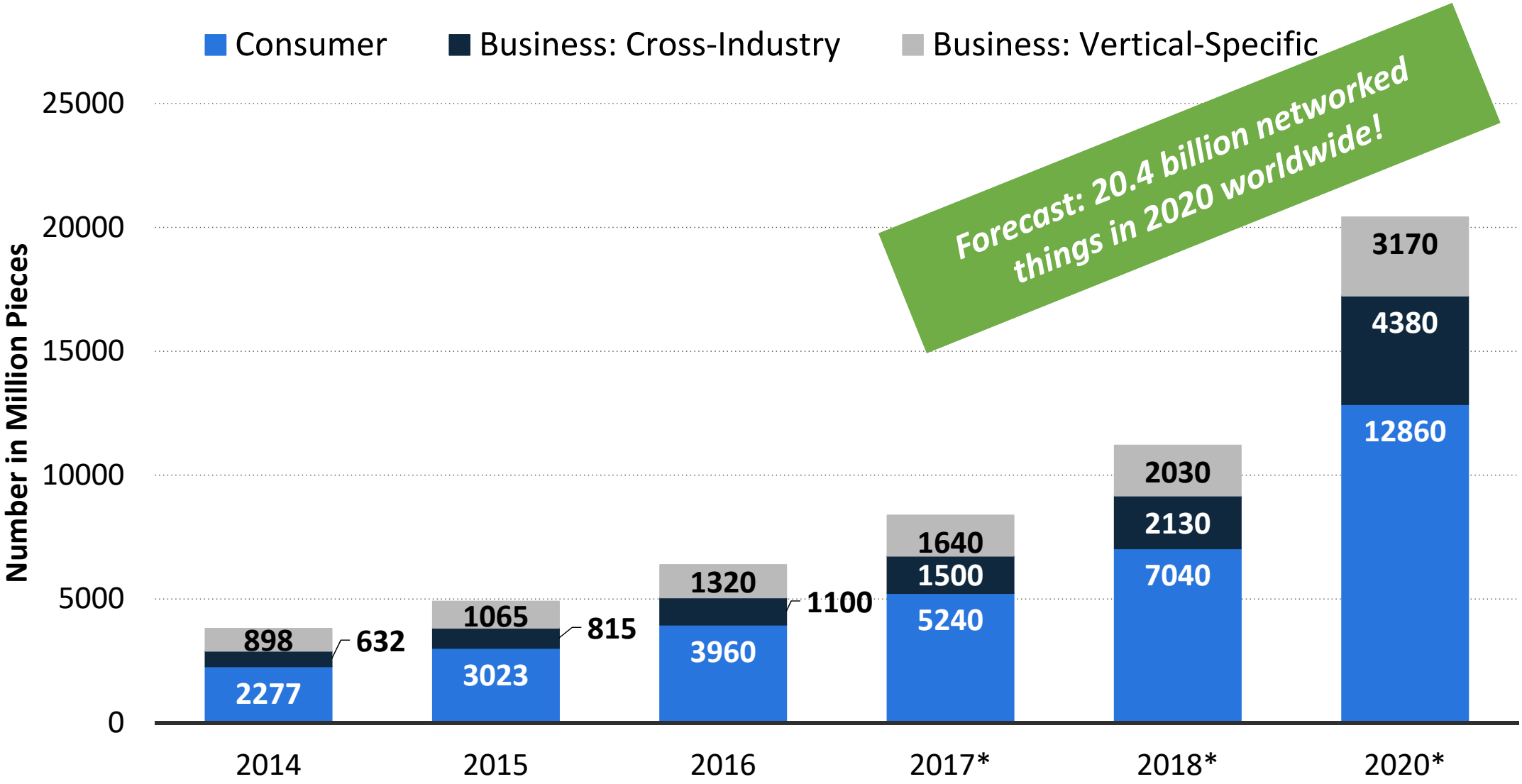
Source: Abramovici, Stark: Welcome to Bochum. CIRP Design 2013

Computing Power vs. Human



See Daniel Batz: Entwicklung eines Statusmodells für das Model-Based Systems Engineering zur Unterstützung des Konfigurationsmanagements, Masterarbeit, betrieblich betreut durch Tim Schulte, 2015

Forecast of the Number of Networked Devices in the IoT

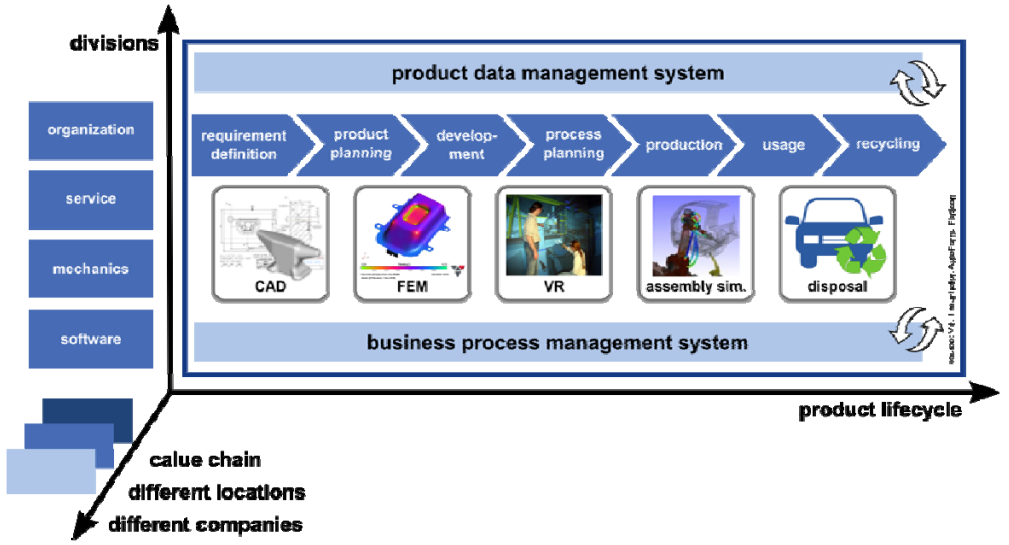


*Forecast

See Gartner. (n.d.). The Internet of Things (IoT)* units installed base by category from 2014 to 2020 (in billions) . In Statista - Das Statistik-Portal. Access at 9th May 2017, https://www.statista.com/statistics/370350/internet-of-things-installed-base-by-category/

Aims of Smart Engineering

- **"Smart engineering"** | **Interdisciplinary, networked, intelligent** approach in product development to enable **attractive innovations** to be successfully implemented in future intelligent, networked and smart products
- Smart engineering includes novel technologies, work methods, and human interactions for
  - A digitally integrated engineering
  - A collaborative and **model-based Systems Engineering**
  - New Industrial **Smart Product Service Systems**
  - An advanced **Smart Digital Factory**
- The **role of human** in the age of neuronal/ hybrid AI-Networks "2030 Computing Power higher than Human Brain!"
- Support of a future "**Green Engineering**"



Source: Anderl, Eigner, Sendler, Stark (Hrsg.): Smart Engineering – Interdisziplinäre Produktentstehung, acatech Diskussion, 2012

Problems in the Field of Smart Engineering

- **Lack of** innovative, intelligent and networked **methods/tools** throughout the entire lifecycle for the required redesign of products, production and production systems
- Lack of holistic, efficient **data management**
- Insufficient **network infrastructure**
- Insufficient **security/safety concepts**
- Lack of adaptation of the **work environment** to the new technologies
- Lack of **interdisciplinary skilled** managers and specialists

→ **High need for adjustment at the companies**

→ **Major challenge especially for small and medium-sized enterprises (SME)**

See: WIGEP Positionspapier "Smart Engineering", in: Konstruktion, Mai 5-2017

Research Association Smart Engineering

- Smart Engineering Processes
- Smart Engineering Methods
- Smart Engineering Tools
- Smart Engineering Organization
- Smart Engineering Competences

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Aims of the Research Association Smart Engineering

To promote science and research in the **field of smart engineering**, with the aim of supporting the **development of smart, networked products and services** as well as the **intelligent, networked production and its production systems** over the entire product life cycle and to promote the **continuous digital value creation**.

Achieving these aims by:

- Supporting the application and implementation of research projects in the field of smart engineering
- Supporting the formation of project groups and establishing contacts
- Formation of interest groups and organization of workshops
- Providing current research results for the members
- Publication of contributions to current research projects at conferences, in journals etc.

Research Needs and Research Areas

- **Designing the smart engineering business models of the future**
  (Recommendation for SMEs to develop a Smart Enterprise, protection of personal data, legal framework and liability)
- **Application of new and smart methods in product development**
  (Incubator Method, Constraint Method, Agile Methods, Design Thinking)
- **Prepare for "individualized" products**
  (Digital Twin, Smart Modularization, Re-Configuration during use, use of data from customer use, Cloud, Integrated Data model (Digital Brain), interdisciplinary PLM-concept)
- **Establish a model-driven product development**
  (Linking between models in the V-Model, automated processes for model transformation, new PLM-support, returing CAE-results into CAD, Smart Req. Management/Engineering)
- **People at the center of a workplace of the future**
  (new foundation in education, new digital rooms, smart adaptive environment - Handicap)
- **Impact of smart engineering on process planning (production systems)**
  (smart production & networking with smart engineering)

World Café results of Kick-Off Workshop Smart Engineering, 2017, Darmstadt.

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Initiation Team of the Research Association

FORSCHUNGSVEREINIGUNG SMART ENGINEERING

Dr. Marcus Krastel
:em engineering methods AG

Prof. Dr. Birgit Awiszus
TU Chemnitz

Prof. Dr. Thomas Mechlinski
Hochschule Osnabrück

Prof. Dr. Rainer Stark
TU Berlin

ProSTEP iViP Verein
ProSTEP iViP
Dr. Steven Vettermann
M.Sc. (Math.) Rachel Bauer
Dipl.-Wi.-Ing. Nora Tazir

Prof. Dr. Martin Eigner
TU Kaiserslautern

Prof. Dr. Michael Abramovici
Ruhr-Universität Bochum

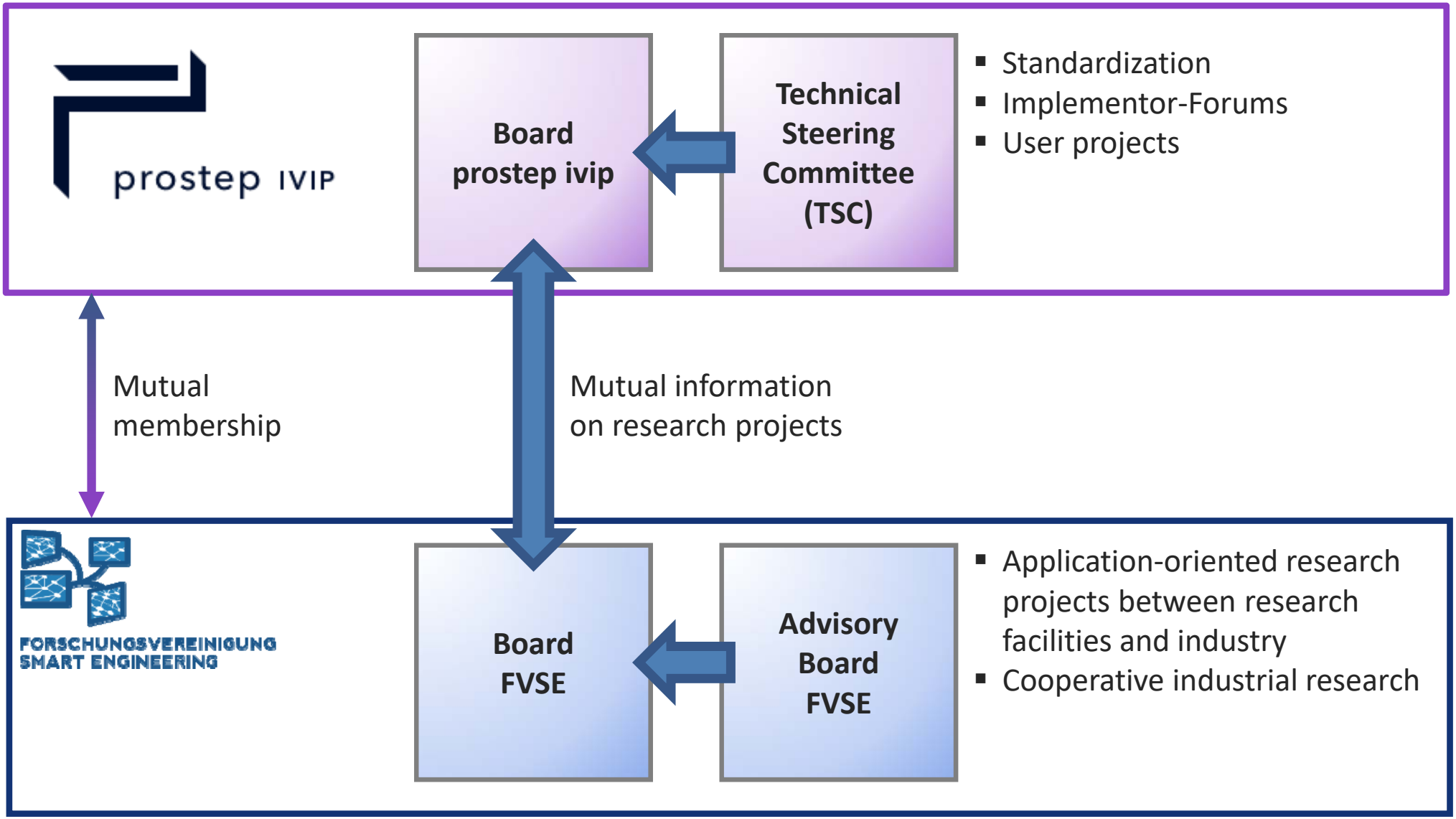
Prof. Dr. Jochen Deuse
TU Dortmund

Prof. Dr. Reiner Anderl
TU Darmstadt

Prof. Dr. Vahid Salehi
Hochschule München

Source: ProduktDaten Journal, Volume 23/2. 2016 S. 16-17 (leicht angepasst)

prostep ivip Cooperation



Structure of the Research association Smart Engineering

General Meeting

Board

Prof. Dr. Birgit Awiszus
Deputy
Technische Universität Chemnitz

Dr. Marcus Krastel
Presidency
:em engineering methods AG

Prof. Dr. Thomas Mechlinski
Hochschule Osnabrück

Management Office

Dr. Thoralf Gerstmann
TU Chemnitz

Jeannette Boll
TU Chemnitz

Advisory Board (Candidates for election)

Dr. Roman Dumitrescu
it`s OWL Clustermanagement GmbH

Prof. Alfred Katzenbach
Katzenbach Executive Consulting

Dr.-Ing. Walter Koch
Leiter Advanced R&D Engineering

Dr. Steven Vettermann
ProSTEP iViP e.V.

Process for Initiation of Research Projects

Members
idea/project outline

Presentation

Advisory Board
Discussion on implementation

Approval

Project Group

Selection of funding program and application

internal

external

Financing by own funds

Financing by public funds

Members

Research association

Source: Freepik.com - Designed by D3images

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Members (Status 08.05.2017)

PROSTEP integrate the future

em engineering methods AG
Know-how für Ihre virtuelle Produktentwicklung.

Technische Universität Berlin
Chair of Industrial Information Technology

HOCHSCHULE OSNABRÜCK
UNIVERSITY OF APPLIED SCIENCES
Laboratory for Product Data Management

VIF VIRTUELLE FERTIGUNGSTECHNIK
Chemnitz University of Technology

ITM IT in Mechanical Engineering
Maschinenbauinformatik
Prof. Dr.-Ing. Michael Abramovici
Ruhr-Universität Bochum

Katzenbach Executive Consulting

CONWEAVER

EDMS
Engineering Design
Mechatronic Systems
Product Lifecycle Management

THM
TECHNISCHE HOCHSCHULE MITTELHESSEN
Department of Mechanical Engineering and Energy Engineering

IPS Institut für Produktionssysteme
TU Dortmund University

ik INSTITUT FÜR KONSTRUKTIONSTECHNIK
Technische Universität Braunschweig

ProSTEP iViP

Benefits of a Membership

- Using the latest findings in the field of smart engineering for the further development of company-specific solutions
- Improving competitiveness
- Compensation for structural disadvantages in research and development
- Codetermination of research topics of the Research Association
- Initiation of own research projects
- Possibility of external (additional) funding (z. B. AiF*-IGF)
- Participation in project-accompanying committees and in the Advisory Board
- Regular exchange of experience in research groups and workshops
- Early knowledge transfer to the companies by access to the latest research results and publications

*AiF Arbeitsgemeinschaft industrieller Forschungsvereinigungen

Contact

Are you interested in learning more about the research foundation or do you have further questions? We are happy to help you!

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c/o Technische Universität Chemnitz
Professur Virtuelle Fertigungstechnik
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09126 Chemnitz

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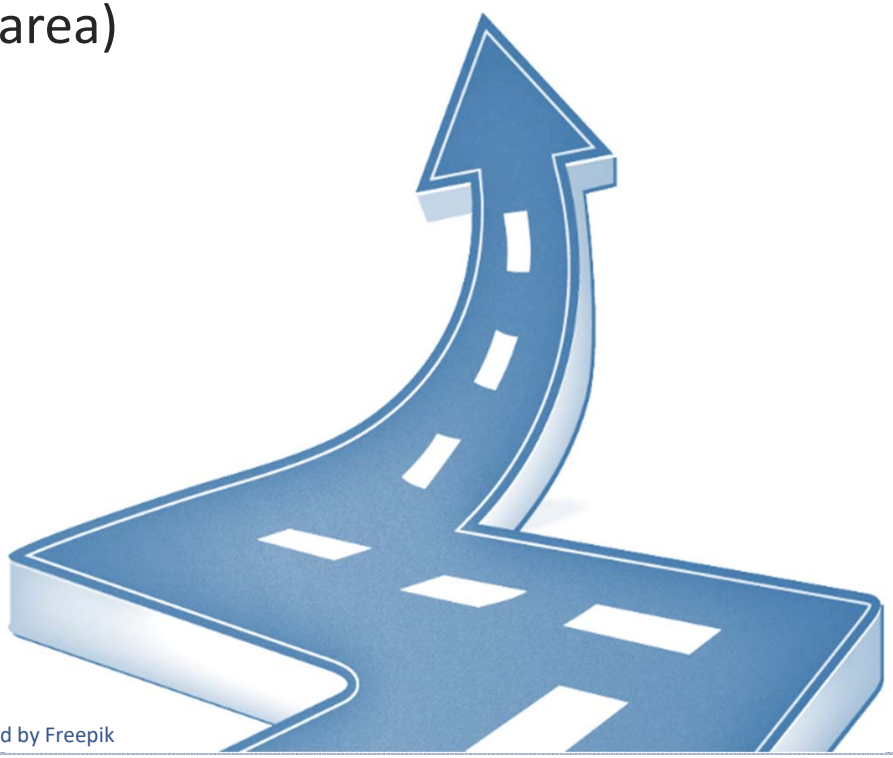
Outlook

- Orientation of the research association on the research interests of the members
  - Formation of research groups
  - Initiation of initial research projects
- Becoming a member of the AiF
- Launch new FVSE homepage (including members' area)
- Onboarding further members

- Next planed Workshop (Q4/2017):

Agile Methods & Design Thinking in Product Development



Source: Designed by Freepik

FORSCHUNGSVEREINIGUNG
SMART ENGINEERING

Questions
Wishes
Suggestions