
ROAD2CPS STRATEGY WORKSHOP

Industry 4.0 - point of view and recommendations

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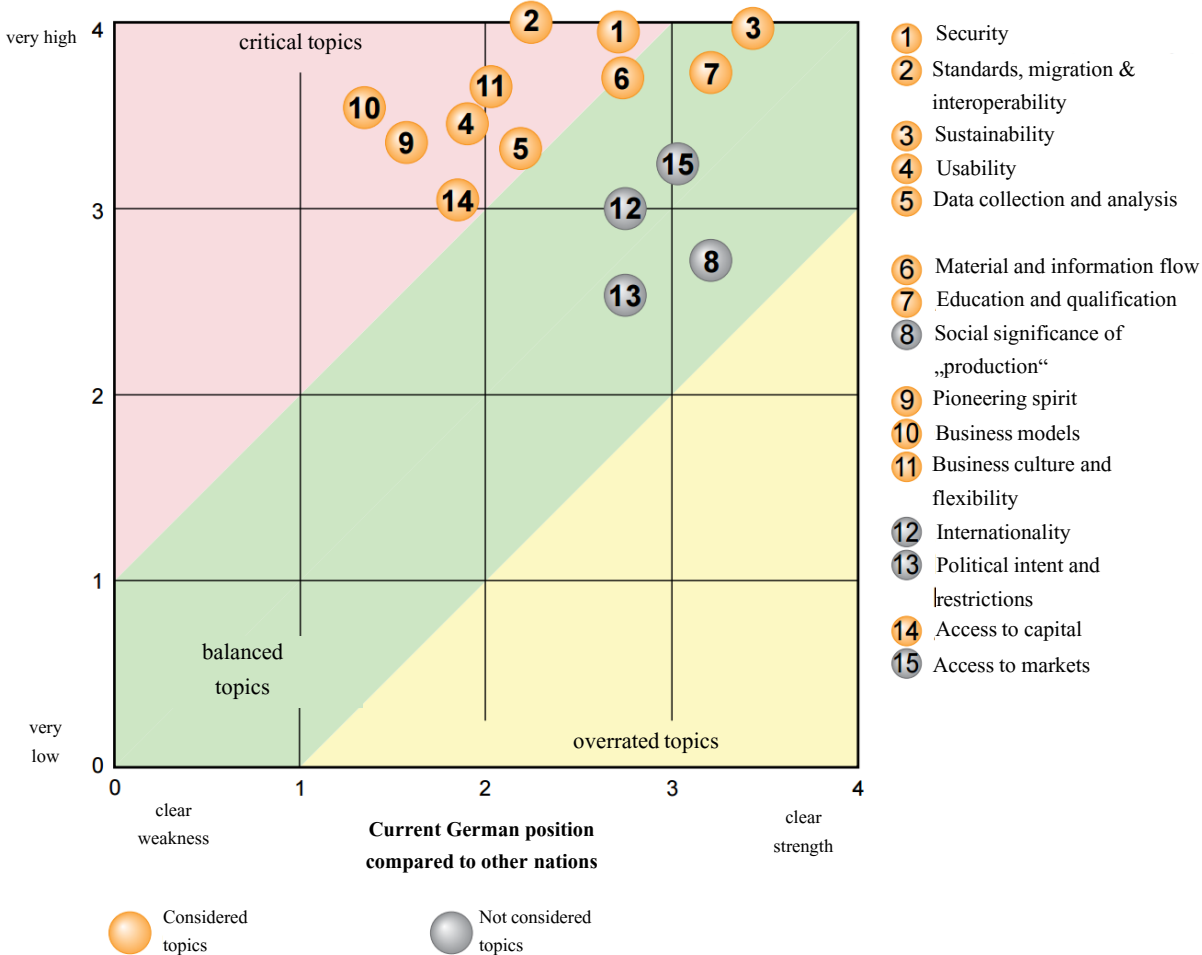
Industry 4.0 – Vision or Mission Statement related to CPS / Digitization

- **Digitization** in the production sector, respectively the **networking in production**, is referred to as Industry 4.0 and is understood as the fourth industrial revolution. In this context, the Industry 4.0 platform defined the term as a new stage of the **organization and management** of the entire value chain over the **life cycle of products**.
- This change in companies means that **production processes** and processes can be made more **flexible** as well as **optimized** through increased **transparency**.
- Machine utilization or **customer-specific product** combinations can be improved and implemented using **cyber-physical systems (CPS)**.
- The increase in industrial added value through the use of the Internet also includes the provision of **complementary services** to the delivered products (smart services)
- The basis for the additional services described above is the **integration** of **physical** and **virtual** objects into a global network.

<https://www.bitkom.org/noindex/Publikationen/2016/Leitfaden/Industrie-40-Status-und-Perspektiven/160421-LF-Industrie-40-Status-und-Perspektiven.pdf>

Research areas and relevant topics

Expected importance of the topic in the future



Source: Internationaler Benchmark, Zukunftsoptionen und Handlungsempfehlungen für die Produktionsforschung (2016)

http://www.acatech.de/fileadmin/user_upload/Baumstruktur_nach_Website/Acatech/root/de/Publikationen/Sonderpublikationen/INBENZHAP_dt_web.pdf

CPS (related) Research Priorities

- **Real-time** capability of communication and services
- Ensuring of **functional security** by services provided by third parties
- **Information security** with regard to sensitive company and employee data
- **Interoperability** of components and services, adaptive interfaces for semantically correct interaction
- **Plug and Produce** capabilities, **reconfiguration** at runtime
- Consistent **CPS engineering** toolchain from design to operation
- CPS capability **self description** (formalized and semantically distinct) of functional and non-functional properties (accuracy, reaction time, safety, security, environmental conditions), to enable automated evaluation
- Description of communication requirements for automated communication connection configuration, to ensure the correct information exchange between the participants while meeting real time requirements

<https://www.bitkom.org/noindex/Publikationen/2016/Leitfaden/Industrie-40-Die-neue-Rolle-der-IT/160421-LF-Industrie-40-Die-neue-Rolle-der-IT.pdf>

https://m.vdi.de/fileadmin/vdi_de/redakteur_dateien/gma_dateien/Statusreport_07-2014_Industrie_4.0_CPS-basierte_Automation_Forschungsbedarf_anhand_Fallbespiele.pdf

CPS (related) Research Priorities

– ecosystems and platforms for CPS

- Mapping of relevant **standards and protocols** for domain specific open platforms and reference architectures
- Building of **open platforms** to support engineering and services for the complete lifecycle of a product (CP(P)S also as products)
- Elaboration of **reference architecture building blocks** by applying current industrial standards and protocols
- Analysis and consideration of **cybersecurity** and trust issues stemming from cross domain and interdisciplinary standards
- Creation of **Meta-Platforms** to connect existing platforms, including abstraction layers for interface, protocol and data mapping to provide interoperability as a service
- Holistic **interoperability** solutions spanning all communication channels and interfaces (M2M, HMI, machine to service) in the factory
- Definition and application of open interfaces, data formats and protocols

Funding strategies for SMEs

- Examples of German types of funding strategies/programmes for SMEs (besides regular research programmes which also fund large companies)
 - ZIM (BMWi)
Market-oriented technology support for individual, cooperation and network projects
 - KMU innovativ (BMBF)
High risk industrial research and pre-competitive development projects
 - I4KMU (BMBF)
Test beds for innovative SME technologies, short runtime (1 year, up to 100k€, subcontracting)
 - Smart Service Welt – Stage 2 (BMWi)

The main barriers encountered by businesses

- Lack of **coordination**: Many companies still think in silos regarding their production, development, IT and finance departments. This makes the coordination of industrial 4.0 projects across the organization more difficult.
- Lack of **courage for change**: Many companies lack the courage to make necessary radical changes.
- **Lack of (qualified) staff**: Many companies have difficulties in gaining employees with new qualification profiles, such as Data Scientists.
 - Knowledge transfer programs
 - Development of new training and study course (e.g. CPS-Engineering)

Source: https://www.mckinsey.de/files/mckinsey_industry_40_2016.pdf

The main barriers encountered by businesses

- **Cybersecurity** considerations: The implementation of industry 4.0 applications often requires collaboration with partners, e.g. Software providers. Many companies are concerned about IT security on their partner's network or in transit. Therefore, they hesitate to share their data.
 - “Industrial Security” concepts, Data Ownership
 - Attitude to Industrial Security and Cyber Security
 - Safety concepts for cyber-physical systems
- Apparently missing **business foundation**: Many organizations find it difficult to justify the need for major investments in the IT architecture if the possible revenues from industry 4.0 are not yet quantifiable.
 - Business model innovations in the production area
 - Competencies in service innovation
 - Examples of local market disruptors
 - Research/innovation vouchers

Source: https://www.mckinsey.de/files/mckinsey_industry_40_2016.pdf

The main barriers encountered by businesses

- Concerns about **data ownership** when working with third-party providers.
 - Initiatives like the Industrial Data Space
 - Legal Frameworks
- Uncertainty about which Industry 4.0 applications to source internally and which to source from third-party providers as well as a lack of knowledge about suitable providers.
 - Competency & Technology maps to increase visibility
 - Innovation contests (e.g. http://www.i40-bw.de/100_places)
 - PPP project spaces like Arena2036
- Challenges with **integrating data** from disparate sources to enable Industry 4.0 applications.
 - Platforms and platform interoperability

Source: https://www.mckinsey.de/files/mckinsey_industry_40_2016.pdf