Road2CPS

Strategic action for future CPS through roadmaps, impact multiplication and constituency building

Road2CPS

Results from a Strategic Roadmap in Cyber-Physical Systems

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01/02/2017

ARTEMIS-Brokerage Event

Brussels, Belgium

Road2CPS in a nutshell

- **Road2CPS**:
  Strategic action for future CPS through **roadmaps**, **impact** multiplication and **constituency building**
- Support Action, co-financed by the EC - H2020 - ICT 1-2014:
  Smart Cyber-Physical Systems
- 7 Partners from 4 European countries
- Coordinator: Steinbeis-Europa-Zentrum, Germany, Dr. Meike Reimann
  EC Project Officer: Dr. Werner Steinhögl
- Project duration:
  February 2015 - January 2017, 24 months
- Total EC contribution: EUR 832.894
- GA No.: 644164
- Web: www.road2cps.eu

Steinbeis-Europa-Zentrum Germany (Coordinator)	STEINBEIS-EUROPA-ZENTRUM
Loughborough University United Kingdom	Loughborough University
Newcastle University United Kingdom	Newcastle University
Commissariat à l'énergie atomique et aux énergies alternatives France	cea tech list
Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Germany	Fraunhofer IPA
AnySolution S.L. Spain	ANYSOLUTION GLOBAL SERVICE
ATOS Spain SA Spain	Atos

Cyber-Physical Systems

- The term Cyber-Physical System (CPS) describes **hardware-software systems** which tightly **couple the physical world and the virtual world**
- CPS are '**Embedded Intelligent ICT Systems**' that make products smarter, more interconnected, interdependent, collaborative and autonomous (ARTEMIS – SRA 2016)
- In the future world of CPS, a huge number of **devices connected to the physical world** will be able to **exchange data** with each other, access web services, and **interact with people** (EC)
- In future information systems will **sense, monitor and even control** the physical world via Cyber-Physical Systems and the Internet of Things (HiPEAC Vision 2015)

Road2CPS - Aims and Objectives

Road2CPS - Objectives

Impact Analysis & Dissemination

- Impact analysis
- Gap analysis
- Identify exploitation & business opportunities
- Disseminate programme achievements
- Raise awareness of CPS

Roadmapping & Recommendations

- CPS roadmap
- Case studies
- Recommendations for future research priorities and innovation strategies

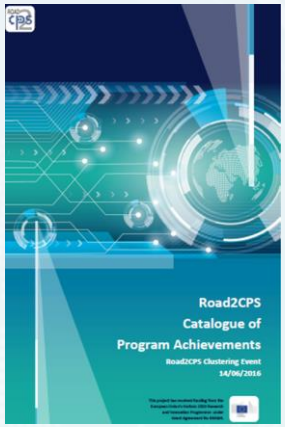
Community Building & Task forces

- Build CPS community
- Bring key players together: across domains, along the value chain, industry and academia
- Task forces
- Clustering events

To collect expert opinions of a broad community to give recommendations to the EC

Road2CPS – Key Outputs

- **Impact assessment** & **gap analysis**
- Custom made **project analysis tool**
- Catalogue of **programme achievements** (ICT-1)
- CPS **case studies** e-book targeted at SMEs
- CPS **technology, application** and **strategy roadmap**
- Recommendations for **research priorities, innovation strategies** and **business opportunities**
- **Workshops, clustering events** & associated reports
- **Final publication**

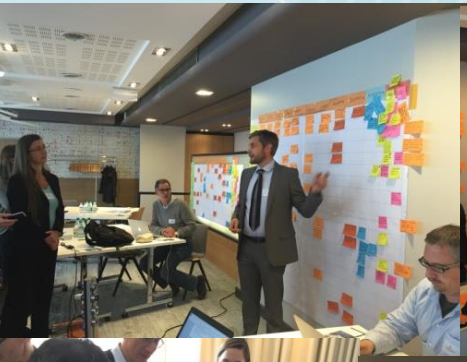


Road2CPS - Approach

- Road2CPS is designed to gather **opinions and perspectives** from a wide **experts community**, to analyse them and give **recommendations** to the **European Commission** and overall community.

- Road2CPS specifically provides **recommendations** in the field of **Cyber-Physical Systems** and for **'Digitizing Europe‘.**

The Road2CPS Way….












TRENDS, NEEDS, BARRIERS

Trends

Megatrends

- Demographic change
- Climate change
- Urbanisation
- Globalisation
- Crisis…

(Mega) trends related to CPS, IoT & FoF

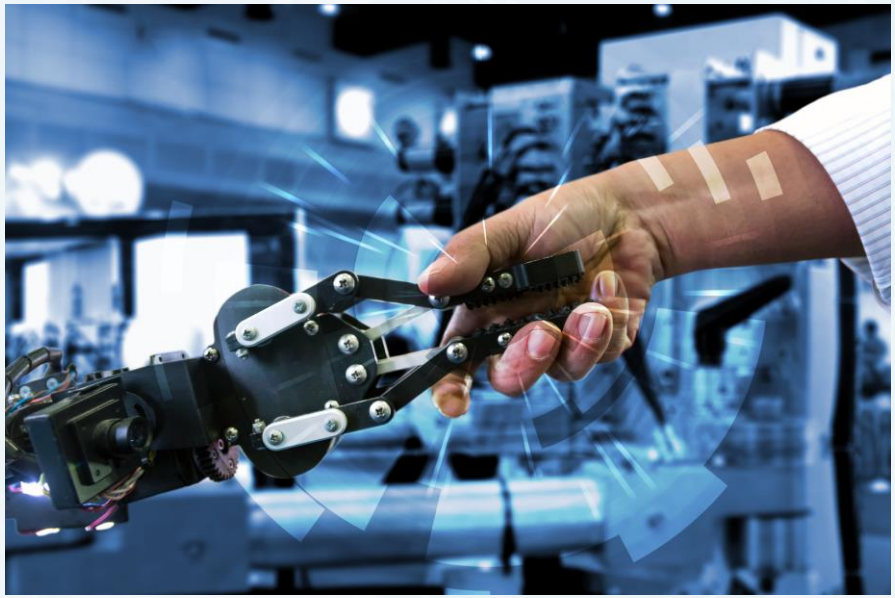
- Digitisation of economy & increasing connectivity
- Rise of the individual, personalisation, customisation
- Sustainability, green thinking, circular economy (sharing global responsibility)
- Knowledge as a key enabler (global knowledge society)
- …towards a smarter, hyper-connected world

Emerging Trends & Vision Statements

- **IT addicts**, dependence of society on IT systems, vulnerability
- **Openness**, open data, open innovation
- **Business models** decoupled from ownership, servitisation, data driven economy, crowd funding, blockchain
- **Political crisis**, international conflicts, migration, destabilisation, change
- T-shape **education**, life-long learning, **digital divide**

Emerging Trends & Vision Statements

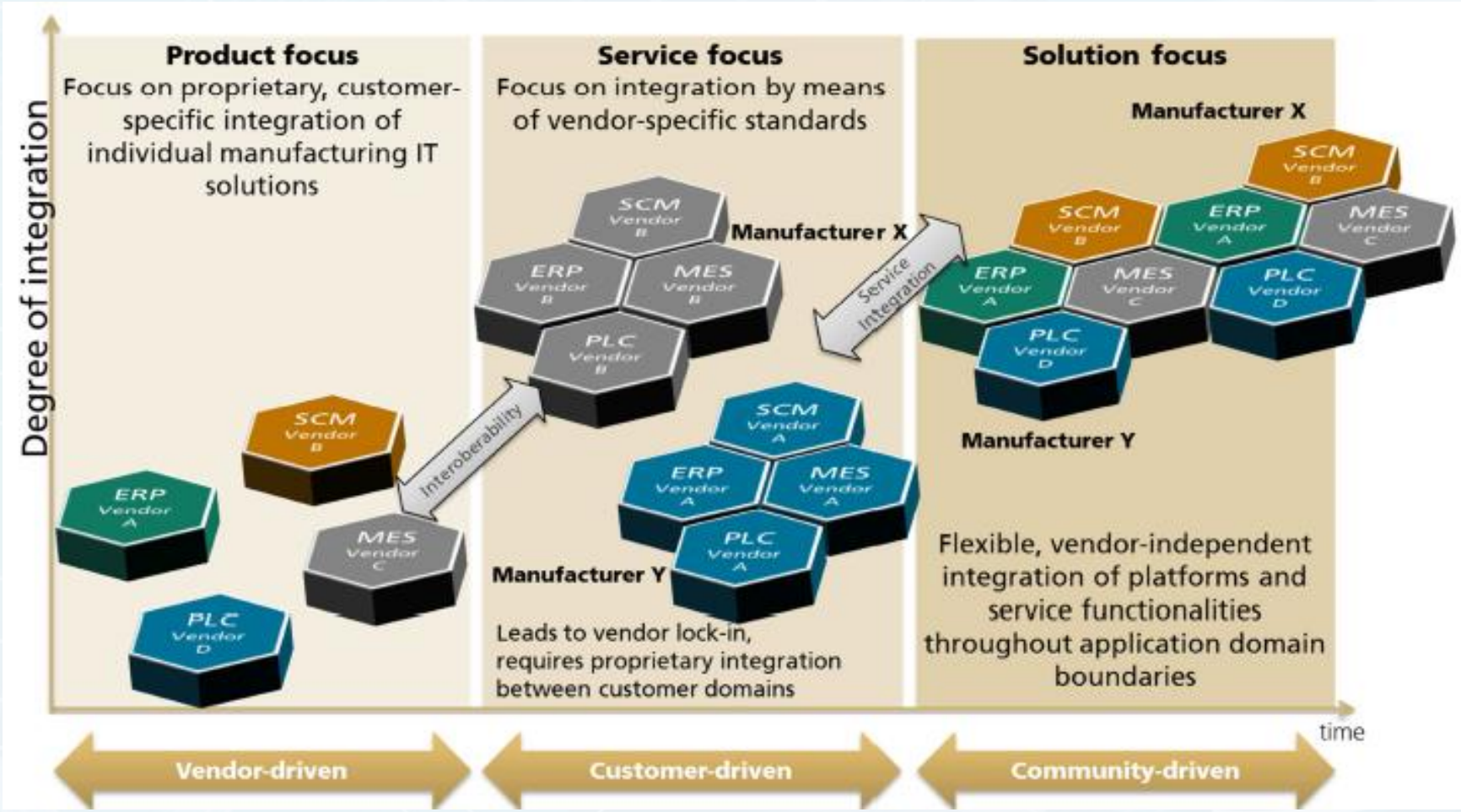
- **Intuitive systems**, human machine collaboration, humanoid robots
- Wearable systems, implantable, **decision support**
- **Neurocognitive systems**, brain inspired computing
- **Secure, legal & ethical** by design CPS



Domain Vision Statements Manufacturing

- **Customers involvement** in collaboratively / co-designed products will increase massively
- Open, modular **platforms** will boost involvement of SMEs
- Ad hoc collaboration in virtual factories will lead to new **business models**, radically new services based on data will emerge
- Innovative entrepreneurs as well as suitable (legal) frameworks are urgently needed

Manufacturing ecosystems: interoperability "from network to community-driven networks"



Picture: Fraunhofer IPA

Needs from Application Domains

Common requirements to be addressed for a better market adoption of CPS technologies:

- **Regulatory frameworks** for the different domains
- **(Re)skill people** and attract talent to the EU
- **Open solutions** and **standards** to enhance interoperability and facilitate the integration of **SMEs** and innovators into the **ecosystem**
- Adress **security and privacy** issues providing technological tools and legal frameworks
- Fostering new **business models** and a culture of innovation and entrepreneurship
- **Demonstrations**, **test beds** and **success stories**

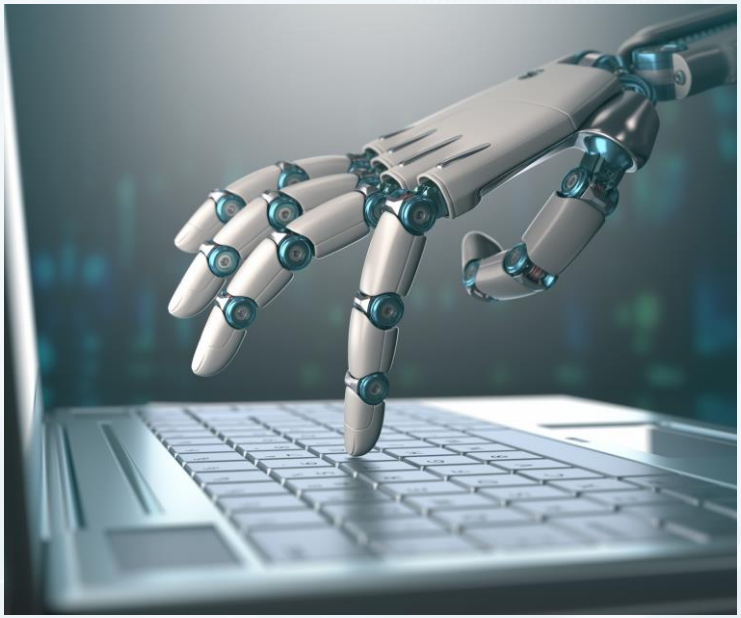
Barriers

- Concerns regarding **security, safety and privacy**
- Lack of **interoperability**, standards and reference architectures
- High **implementation costs**: Cost is too high to be adapted broadly by SMEs
- Unclear economic benefits, concerns regarding multiple ownership, missing **business model** development
- **Conservativism** of decision makers, resistance to change, risk aversion
- **Social acceptance** of pervasive IT systems


RECOMMENDATIONS FOR
RESEARCH PRIORTIES AND
INNOVATION STRATEGIES

Technological Priority Themes

- Seamless **integration** of systems and components
- **Interoperability**, standardisation, **reference architectures** and tools
- Open (vertical and horizontal technology) **platforms**
- Acquisition and use of (**big) data in real time** & handling of **complexity**
- Visualisation, virtualisation, situational awareness, **decision support**
- **Modelling** and **simulation**
- Ubiquitous **autonomy**, AI, cognitive CPS
- **HMI,** Human and machine **awareness**
- **Safety**, reliability, resilience
- **Security**, **privacy**, trust
- **SoS,** distributed MGT and emergence
- CPS **Engineering** (requirements, design)
- CPS **Science**



Non-Technology Priority Themes

- Education, Training, Skills
- Business Models
- Regulation, Legal Issues, DSM
- Open Data, Open Innovation
- Community Building, Networks
- Collaboration (across domains; value chains; regional/national/ EU/ global)
- Demonstrators, Test Beds
- Human in the Loop
- Societal Dialogue, Awareness
- Ethics

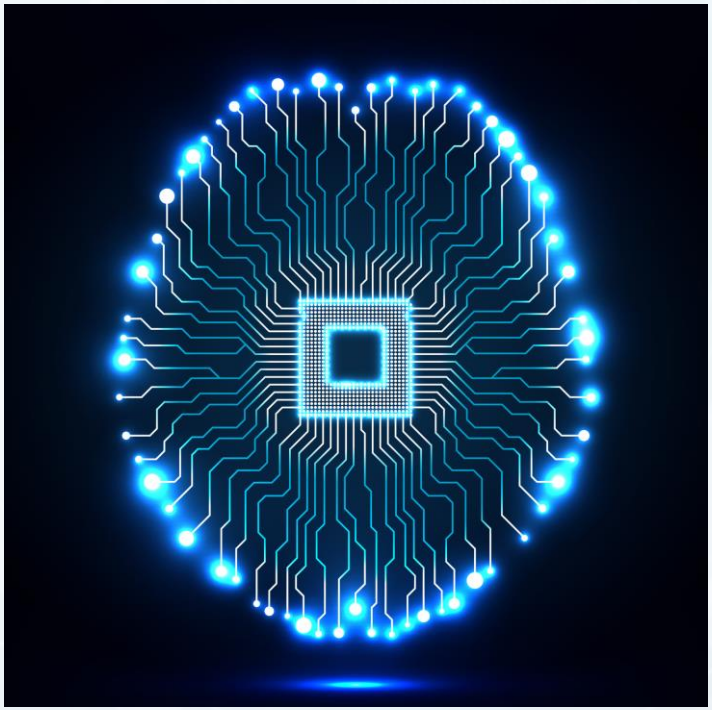
Recommendations for Innovation Strategies

Facilitation of Business and Ecosystems

- Invest not only on the **supply si**de, but on the **demand side**
- **Collaboration between all stakeholders** is needed from the beginning for balanced decision-making
- **Citizen engagement** is needed as a result of the impact of new technologies (ex. wearables) where privacy could be breached
- **Don't over-regulate** and adapt to the evolution of the markets in an agile way
- Promote **"real" DSM** (standard data models, APIs) to allow SMEs to scale
- **Openness** should be promoted not only in theory to new business models, even if they disrupt existing business and require hard work by regulators
- **Harmonise** ICT-related **regulation**, and sector-specific regulatory environments (free flow of data, data ownership and legal frameworks (e.g liability
- Coordinate **skills development efforts** and engage digital innovation hubs

Recommendations for future funding strategies

- Invest in **Research Priorities**
- Fund **platforms** (organisational, technological, operational, customer,..) and reference architectures & tools (interoperability / standardisation)
- Facilitate funding to **SMEs** & inclusion of **start-ups** (Digital Innovation Hubs)
- Support **innovation take-up** action & accelerate **ecosystem** development, **de-fragmentation** & cross-fertilization
- Fund **demonstration**, test beds, show cases, (large scale) pilots, living labs
- Fund **CSAs, NoE, competence centres, DIHs, task forces, working groups**
- Raise **awareness**, promote societal **dialogue**
- Invest in training and **education**



Outlook…

PLATFORMS 4CPS

Creating the CPS Vision, Strategy, Technology Building Blocks and Supporting Ecosystem for Future CPS Platforms

H2020 – ICT1 – 2016

www.Platforms4CPS.eu

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European Commission

Platforms4CPS in a nutshell

Platforms4CPS:
Creating the CPS Vision, Strategy, Technology Building Blocks and Supporting Ecosystem for Future CPS Platforms

Coordination and Support Action, co-financed by the EC - H2020 - ICT 1-2016:
Smart Cyber-Physical Systems

7 Partners from 4 European countries

Coordinator: THALES Research & Technology, France, Dr. Charles Robinson
EC Project Officer: Dr. Werner Steinhögl

Project duration:
November 2016 - October 2018, 24 months

Total EC contribution: EUR 998.900,00

GA No.: 731599

Web: **www.platforms4CPS.eu**

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Contact and Material

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www.road2CPS.eu

Thank you!