EPOSS POSITION PAPER

SMART SYSTEMS FOR THE AUTOMATED FACTORY

PRESENTATION OF THE EPOSS WORKSHOP ON SMART SYSTEMS FOR THE AUTOMATED FACTORY TORINO, 5.9.2017

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European Technology Platform
on Smart Systems Integration

INTRODUCTION

CHANGING INDUSTRY

Smart Health

Car-to-X

Smart Home

MtM

Automated Factory

Internet of Things

Wearables

Sensor Networks

Cyber Physical Systems

Smart Cities

Industrie 4.0

Smart Systems

Big Data

CHANGING INDUSTRY

The characteristics of the changing manufacturing industry include:

- horizontal integration across multiple value chains on processes, data and companies;
- vertical integration among corporate levels, from the enterprise resource planning (ERP) level down to the field level (sensor and actuators, shop floor); and
- strong interaction by means of the IoT, where connected enterprises can attain increased efficiency in processes, performance and output.
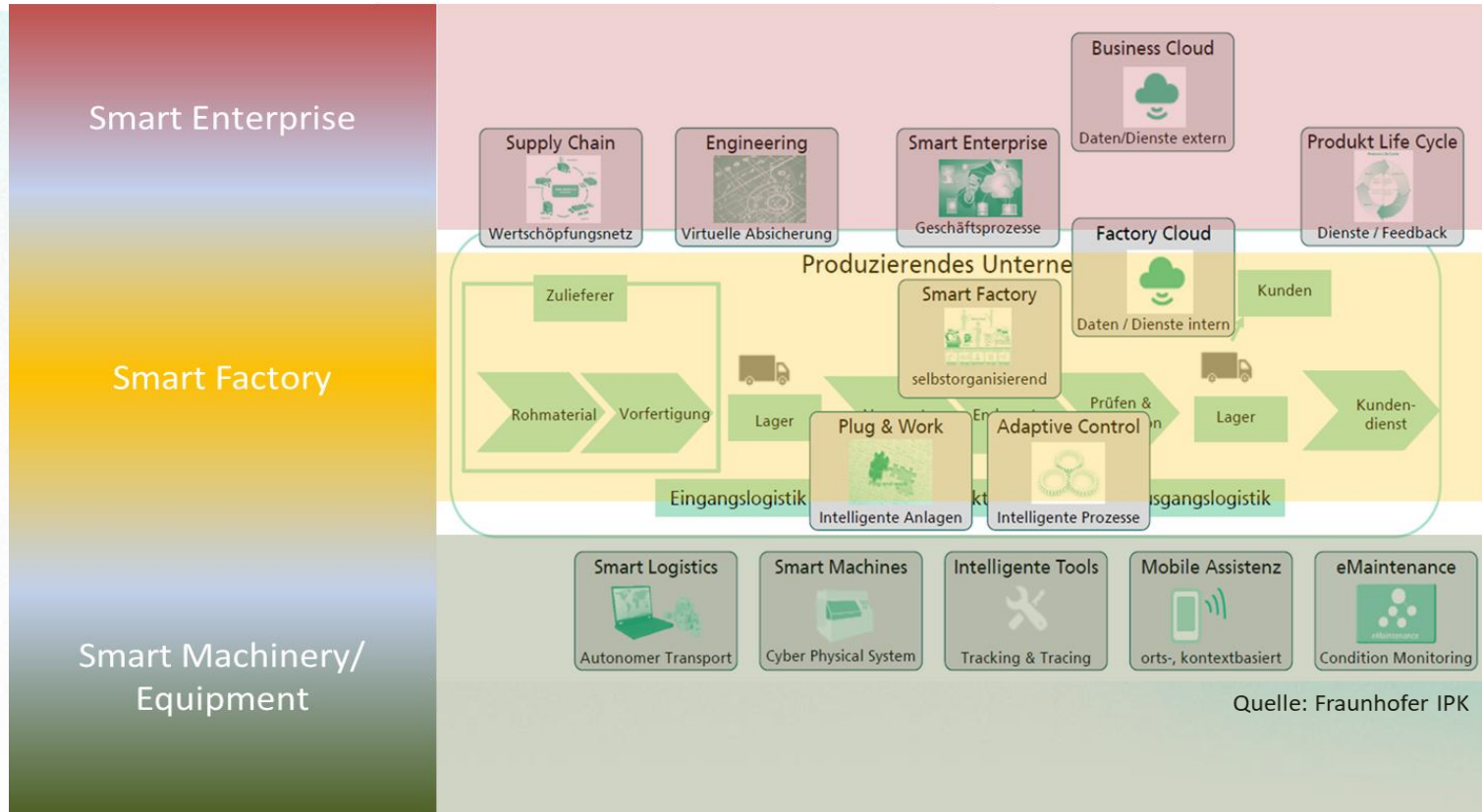
2 THE AUTOMATED FACTORY

CHANGING INDUSTRY
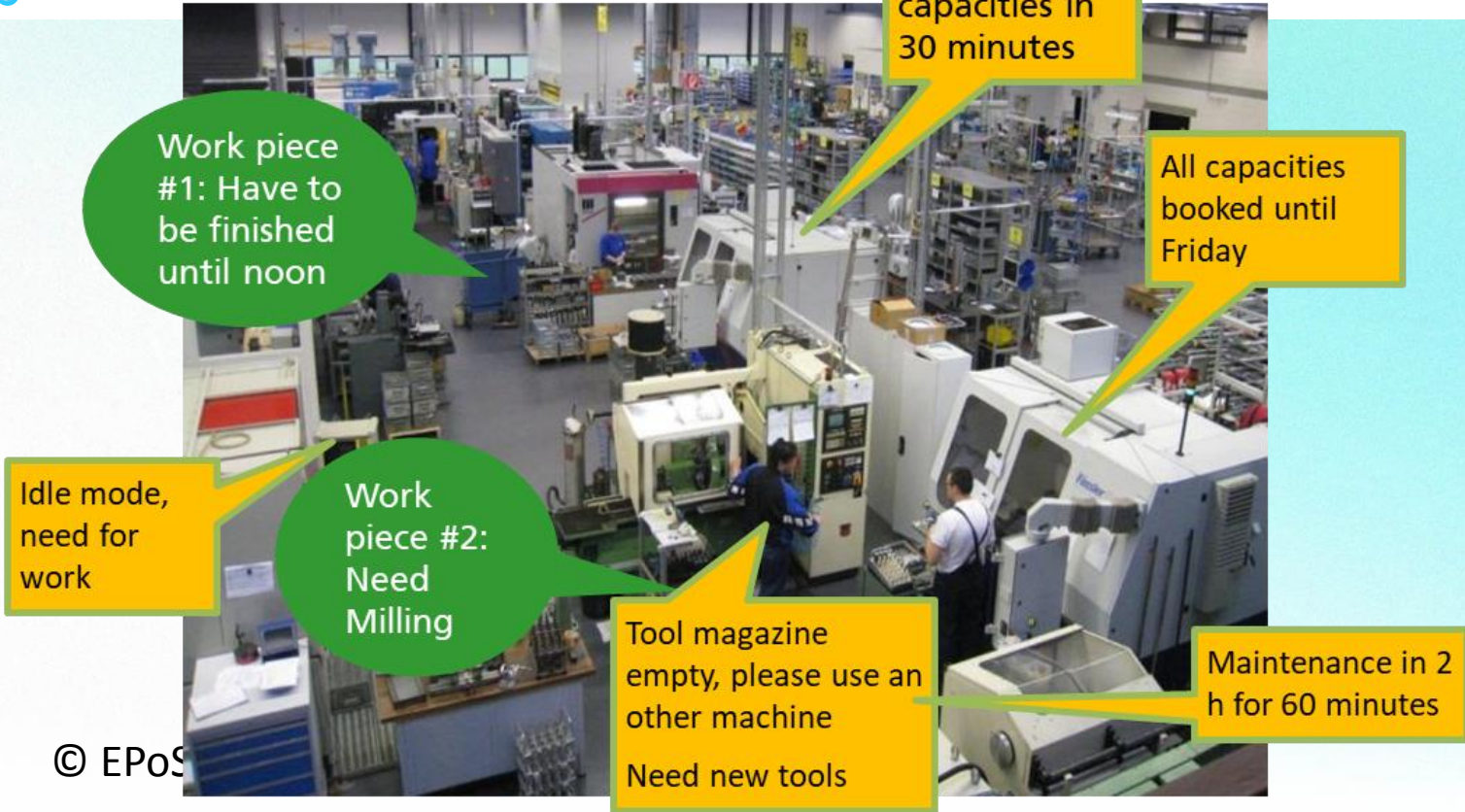
CHANGING INDUSTRY

Quelle: Fraunhofer IPK

- Parallel instead of linear production workflows within one factory and along the entire supply chain due to demand-driven self-orchestration of production.
- Combination of human flexibility and experience with the potential of process and factory automation.
- Effective collaboration between workers and machines
- Only the automated factory with an optimal supported flexible workforce can lead the industry to an efficient mass-customization of goods.

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SSI FOR THE AUTOMATED FACTORY

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1. **Product:** „Customised and personalised."

2. **Processes & Equipment:** "robust, time resilient, zero-downtime/-set-up time, cost-effective, energy and material efficient, safe for workers, cooperative"

3. **Production:** „ Agile, flexible, dynamic, clean, sustainable, secure, robust, worker-friendly/ designed for elder workers, cooperative and compliant to increase human-machine workflows."

4. **Plant:** "Resilient, safe, secure, with a virtual replica. Vertically and horizontally integrated, retrofittable and upgradable."

5. **Worker:** "Fully aware of all processes, products, equipment and situations; and able to act and control."

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Sensing & actuating:
- To enable factory-wide connectivity, sensor fusion becomes increasingly crucial for which energy-autarkic and massively distributed sensor systems are required: Main topics are e.g. robust autononoumos sensors for harshest environments, sensor for man-machine interaction
- Demand for a diverse range of actuators that actuate at a designated time within the production process according to the product requirements.

Software:
Need for Big Data analytics in integrated control loops to initiate production and react in real-time to the environment. Intelligent algorithms allowing for event-based predictions.

Promising technologies to reach goal of effective HMI:
- Practically foldable displays
- Sensor-fitted textiles
- Gesture, eye and natural language command

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Sensing & actuating:
Sensor and actuator networks must be in place at products & equipment allowing remote monitoring and control of the entire equipment. Information must available at any time at any place. Main topics are e.g.: Robust, low latency, energy efficient wireless interfaces, powerful and secure networks, "big data" analysis environment

Software:
Well-defined and powerful hard and software interfaces. This becomes ever more relevant as with all entities being connected, the flexibility to integrate devices, components and sensors in the virtual production environment.

Promising technologies to reach goal of effective HMI:
- Voxel size sensors with nano and molecular functions
- Biometric monitoring of workers
- Wearables and exoskeletons
- Self-repairing manufacturing equipment that continuously analyzes its condition

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R&D REQUIREMENTS
IN-HOUSE LOGISTICS

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Sensing & Actuating:
All items need to be equipped and connected through low-cost sensors to make the whole production site virtually transparent and fully traceable. Identification of serial and IoT ID numbers. Main topics are e.g.: real time stock tracking/ Virtual inventory, indoor tracking & route optimization, scheduling & dispatching, theft reduction

Software:
Across the whole plant, autonomous, distributed devices and equipment have to be equipped with secure communication capabilities.

Promising technologies to reach goal of effective HMI:
Precise and reliable RFID, indoor-GPS, NFC and BAN technology will be implemented in all kinds of goods.

Proposed Further Steps

17.10.2017	**Distribution of first draft of white paper**
3.11.2017	**Internal discussion among workshop members**
17.11.2017	**Distribution among EPoSS community**
15.12.2017	**Feedback by EPoSS community**
31.1.2017	**Final Paper**

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