Inside International Spare Part Management 2015

Fraunhofer IML

Challenges in Spare Part Management for the Industry 4.0

Speaker:
Bjoern Schweiger

Welcome!

- **Bjoern Schweiger M. Sc.**
- Deputy Head of Department “Plant and Service Management”
- Active for Fraunhofer IML since 2008
- Lecturer for spare part management at DHBW Mannheim

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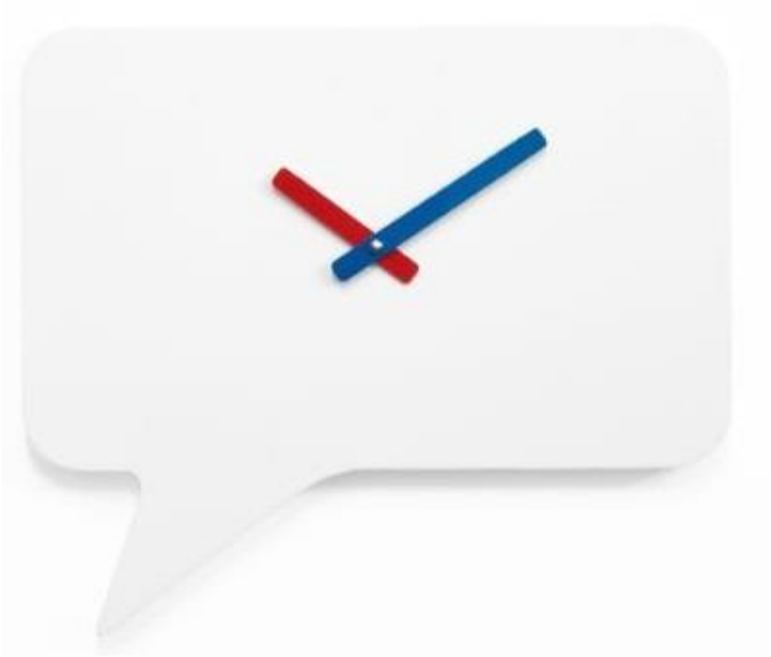
Agenda



- The Fraunhofer Institute for Material Flow and Logistics (IML) Dortmund
- Industry 4.0 - A small introduction
- New services and added values for the Industry 4.0
- Pooling of spare parts in vertical and horizontal networks
- Master-Data-Management as added-value for customers
- 3D-Printing - Challenges for Service, Logistic and Customer Maintenance
- Summary

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The Fraunhofer IML -
facts

- Founded in 1981
- More than 200 scientists and 250 student assistants
- Turnover of 24.3 million €
- There of 40% from industry, trade and services
- Branches and project centers in Frankfurt am Main, Prien am Chiemsee, Hamburg
- Cooperation with HSG St. Gallen (Switzerland), Georgia Tech (USA), Lisbon (Portugal), Shanghai (China), Rio de Janeiro (Brazil)




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The Fraunhofer IML -
Developments towards Industry 4.0

Intelligent Bin

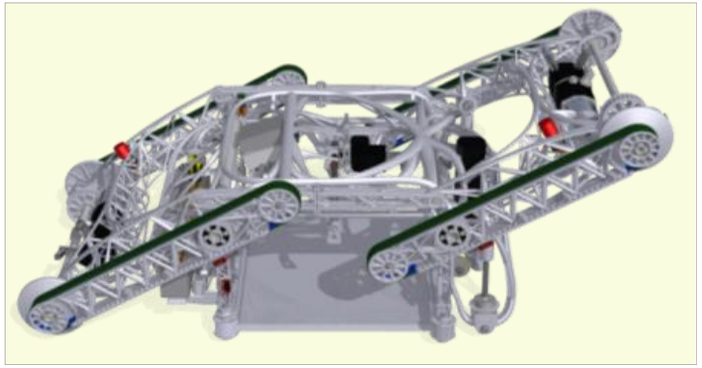
- → Self-provider
- → Communicative
- → Able to store energy

Cellular Transport Systems

- → Autonomous drive
- → Self-control
- → Swarm intelligence

Find the video on our youtube channel

Rack Racer



- → Autonomous climbing
- → Diagonal drive inside the rack
- → Bionic design

Find the video on our youtube channel

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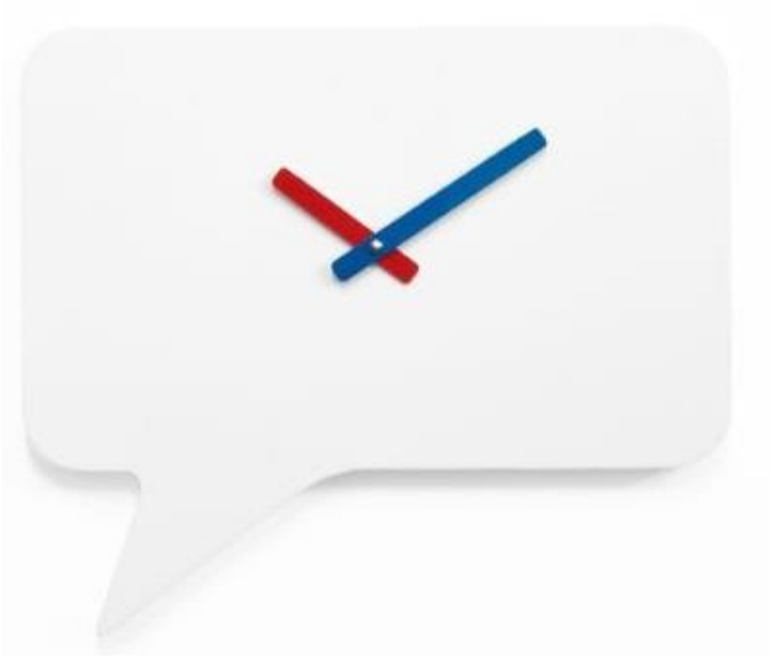

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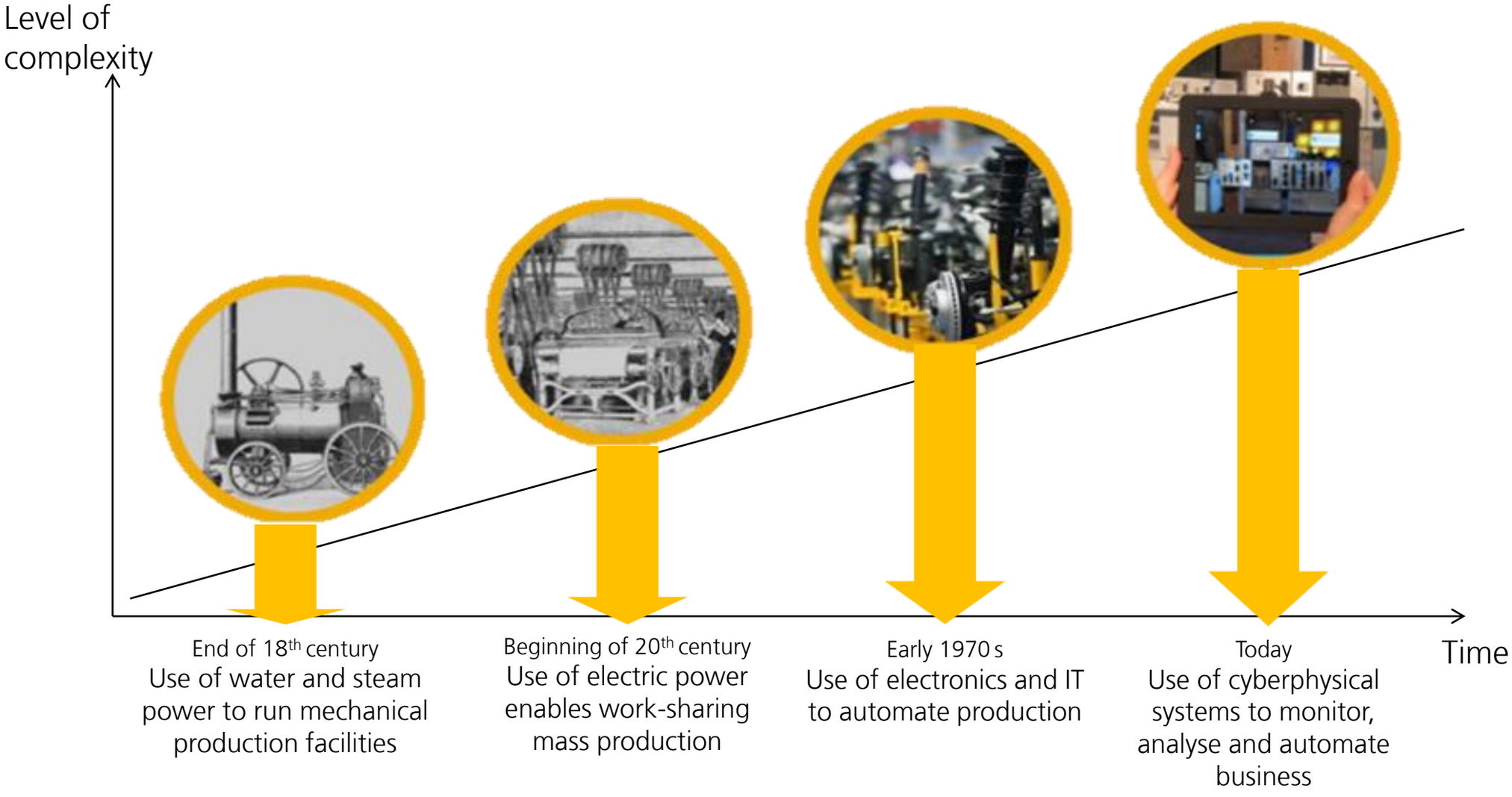
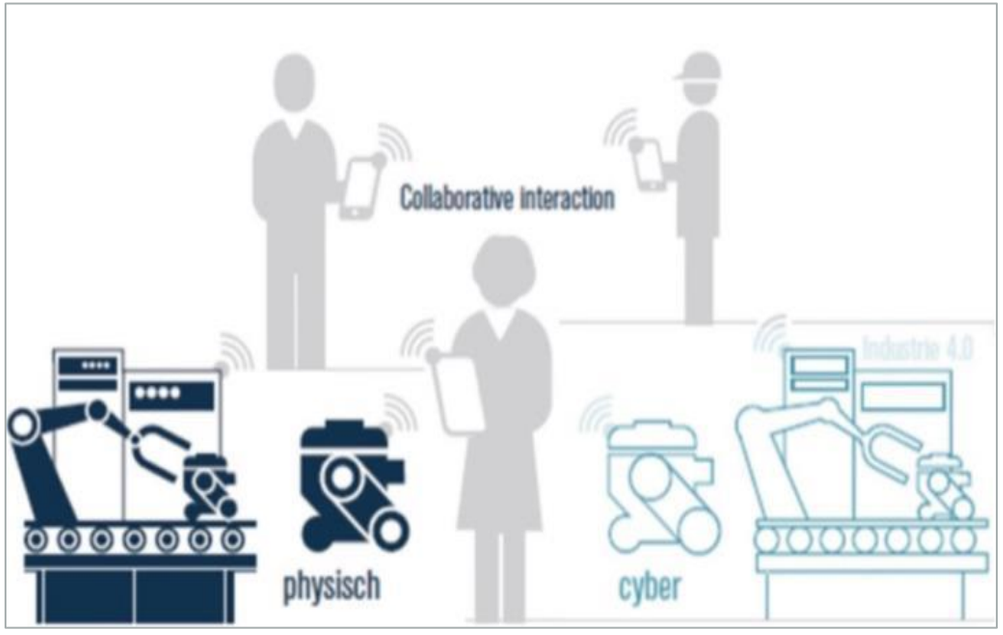
Introduction -
History of industrial revolution



Introduction -
What is Industry 4.0?



- A Vision!

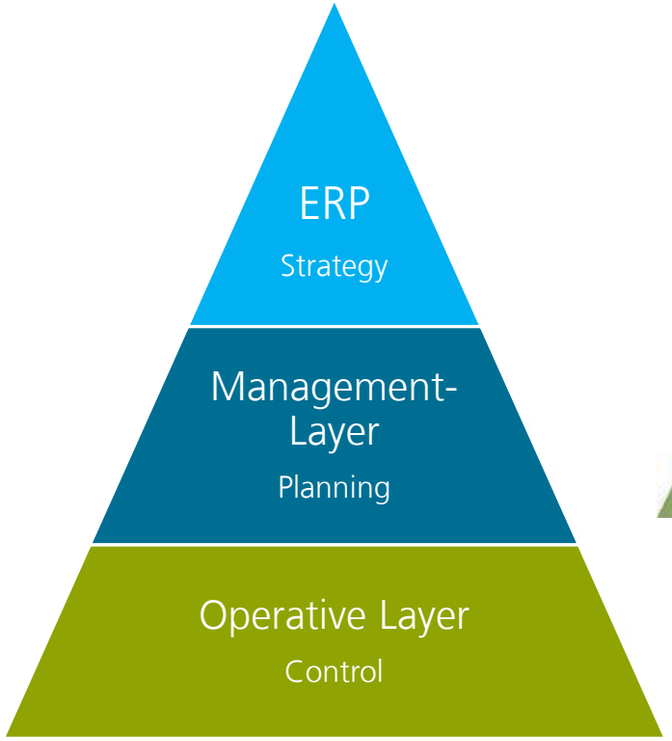
- Real time imaging of reality into virtual space and conversely application of the unlimited virtual solution-space in reality

- Selective application and combination of technologies provide new situations- and enterprise-specific possibilities

- Holistic system-thinking of integrated supply chains overcome physical and economic limits

Introduction -
Industry 4.0 – necessary change

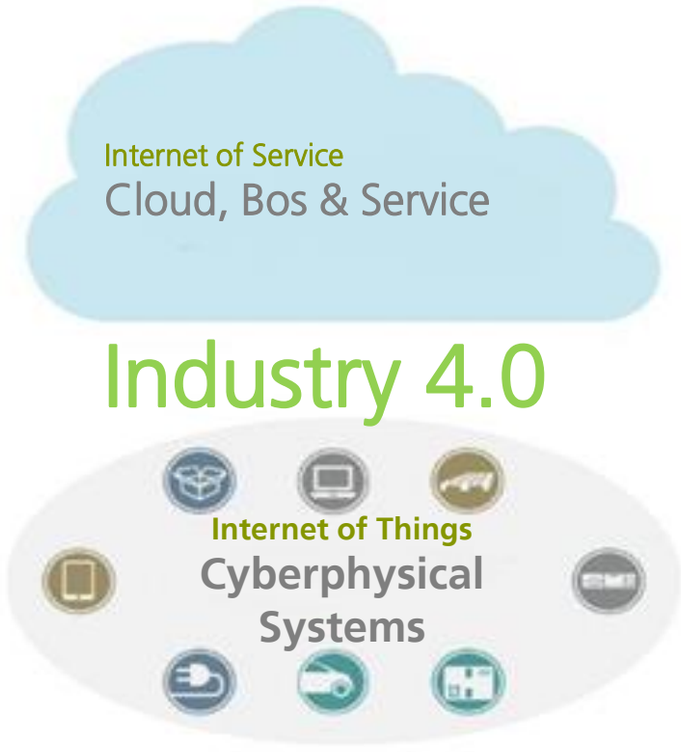
Conventional System



Transformation of organisation

Migration of Cyberphysical Systems

Industry 4.0



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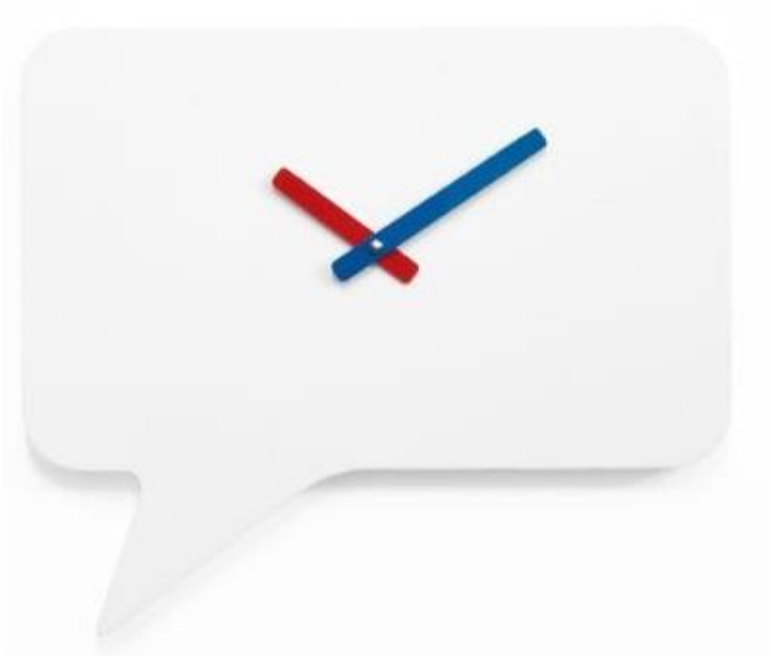

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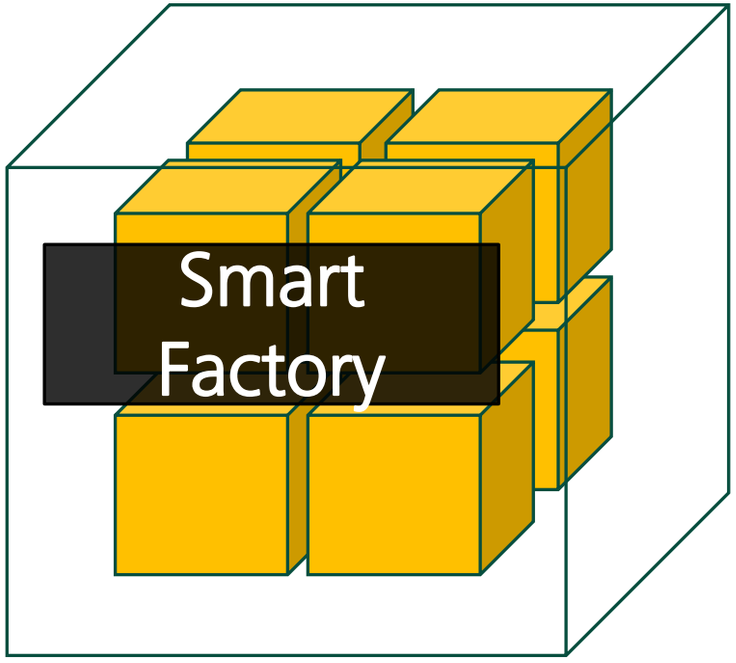
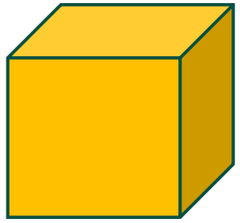
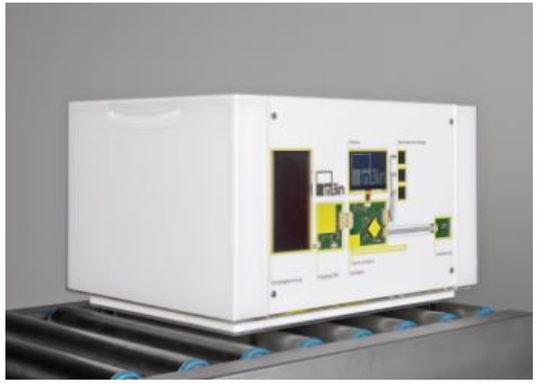
Smart Factory





Smart Products

- Objects become „intelligent“
- They can communicate with their environment
- Organise their way through production
- Store their whole life history



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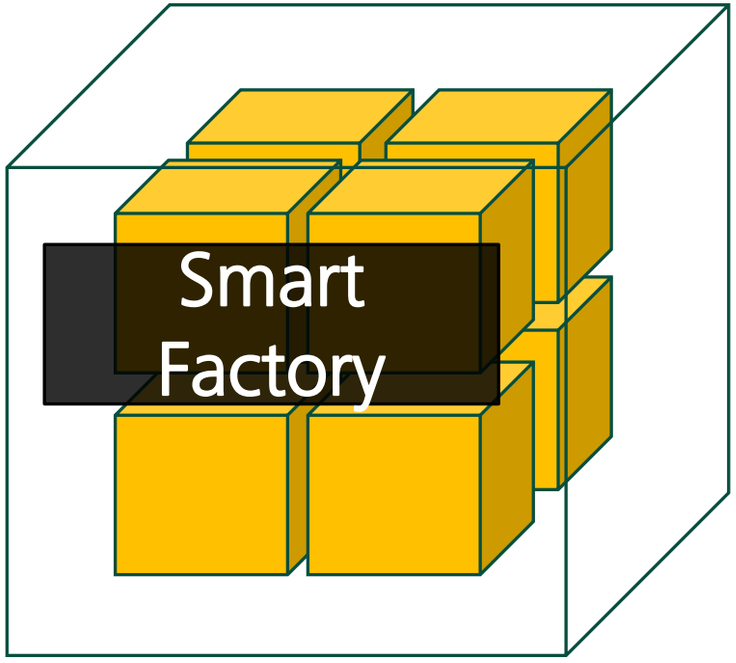
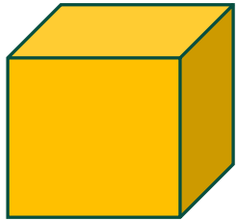
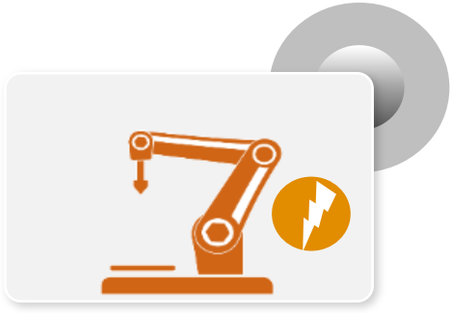
Smart Factory





Smart Service

- Machines get some kind of intelligence
- Machines can communicate with each other and their environment
- Sensors detect atypical conditions of machines
- Machines will be able to order the required service and spare parts



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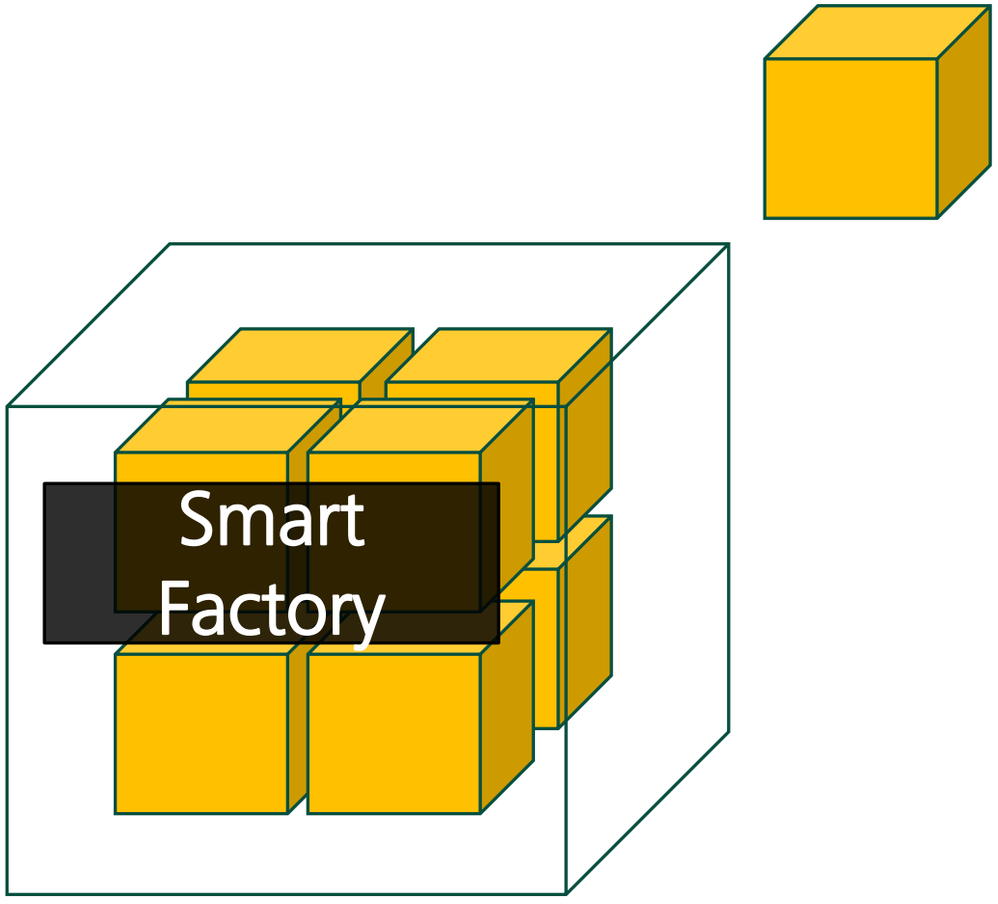
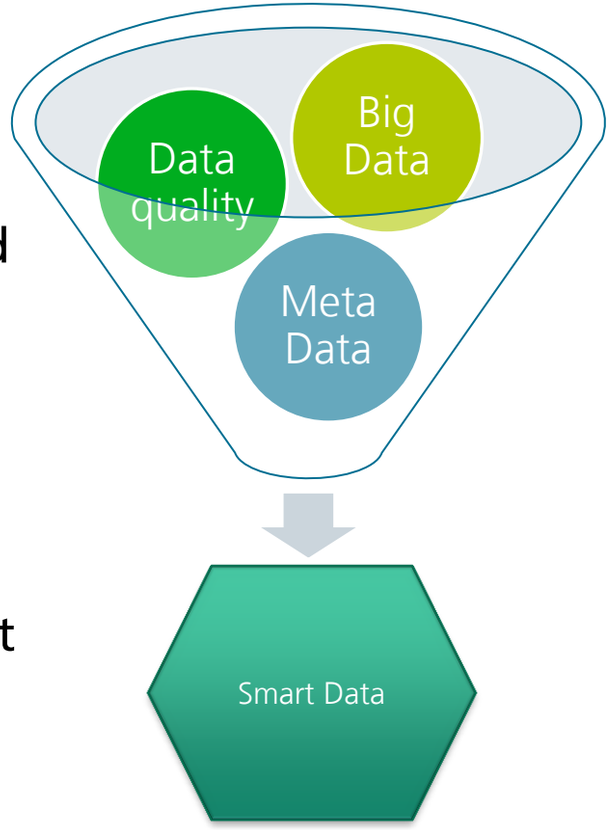


Smart Data

- Collecting / generating data is just the first step and right now not a big problem any more
- Interpretation and getting the right information out of it is the big challenge of tomorrow



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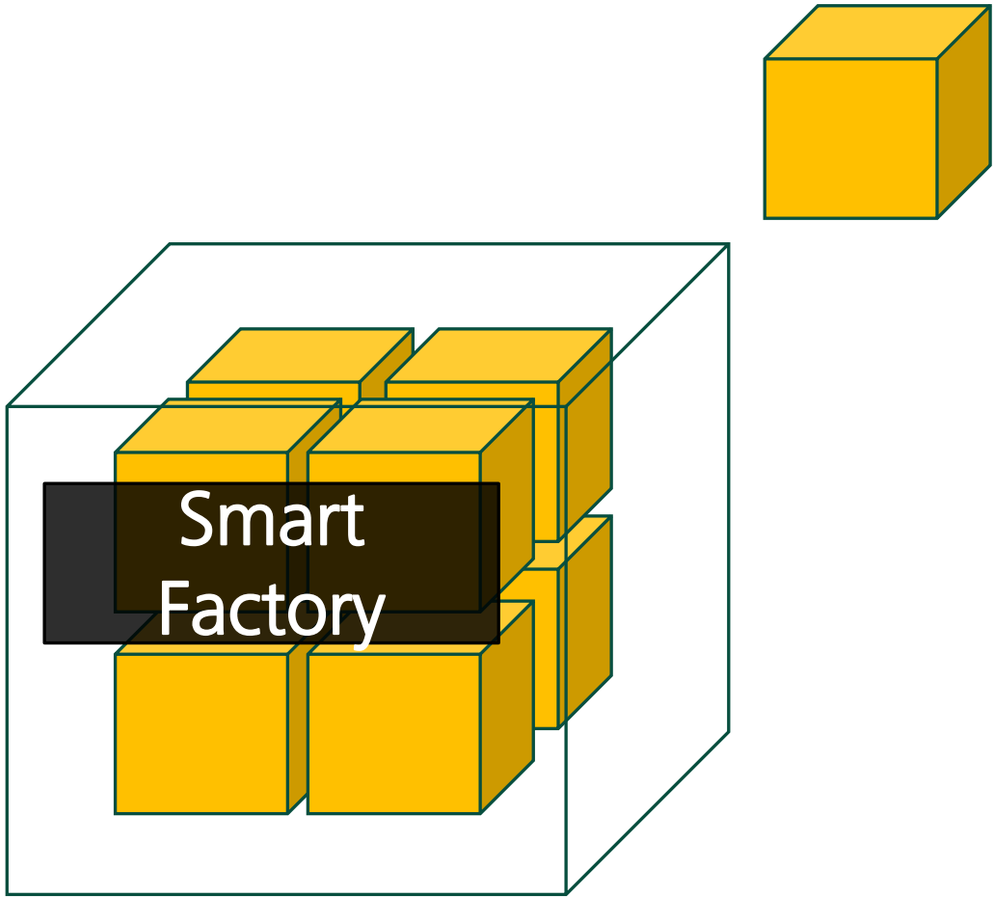
Smart Factory



Smart Maintenance

- Maintenance must adapt to the upcoming changes with the implementation of the Smart Factory

- Using tools (Assistance Systems) and methods to:
  - Get all required information
  - Interpret this collected data and
  - Enable the staff to perform maintenance tasks

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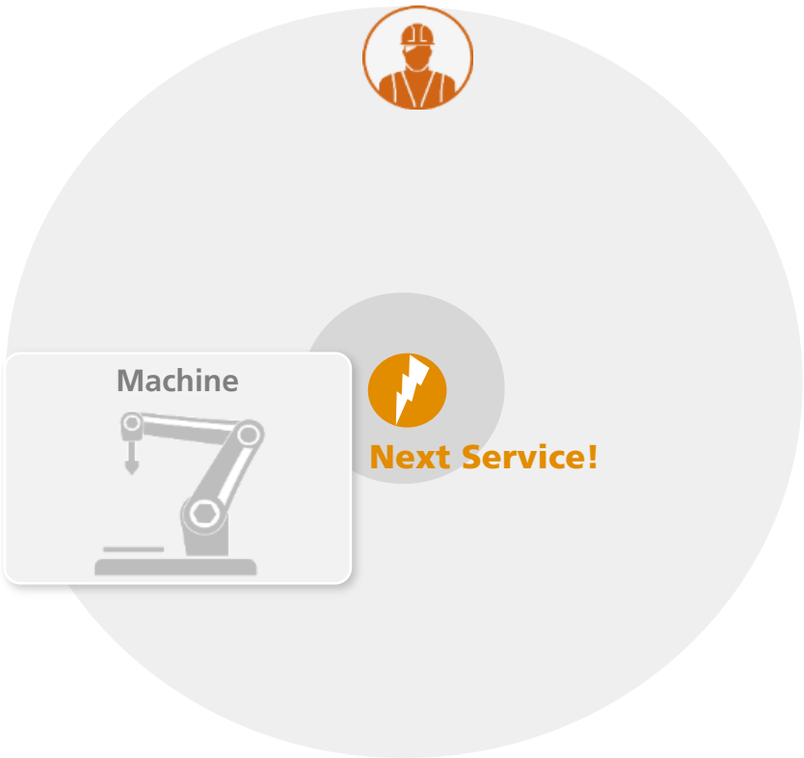
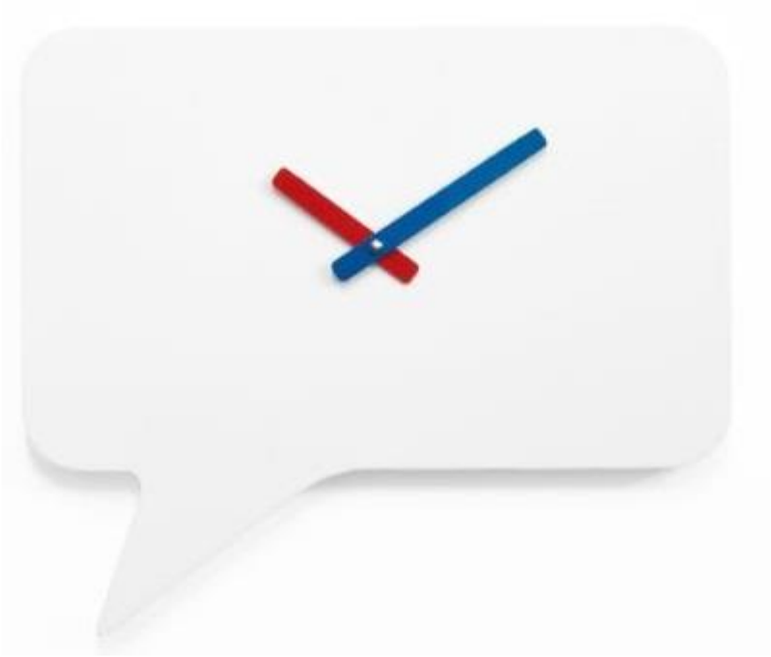
Smart Maintenance -
for Smart Factories



- The Smart Factory will be the core of Industry 4.0 and needs Smart Maintenance and Services to be successful
- Smart Maintenance will enable a pro-active maintenance strategy and integration of external services
- The challenges for spare part and service management will be:
  - Supply-chain cooperation and transparent data
  - 3D-printing of spare parts
  - Skilled and trained service staff
  - New remote services (smart glasses, service robots)
  - The application of new technologies

Agenda



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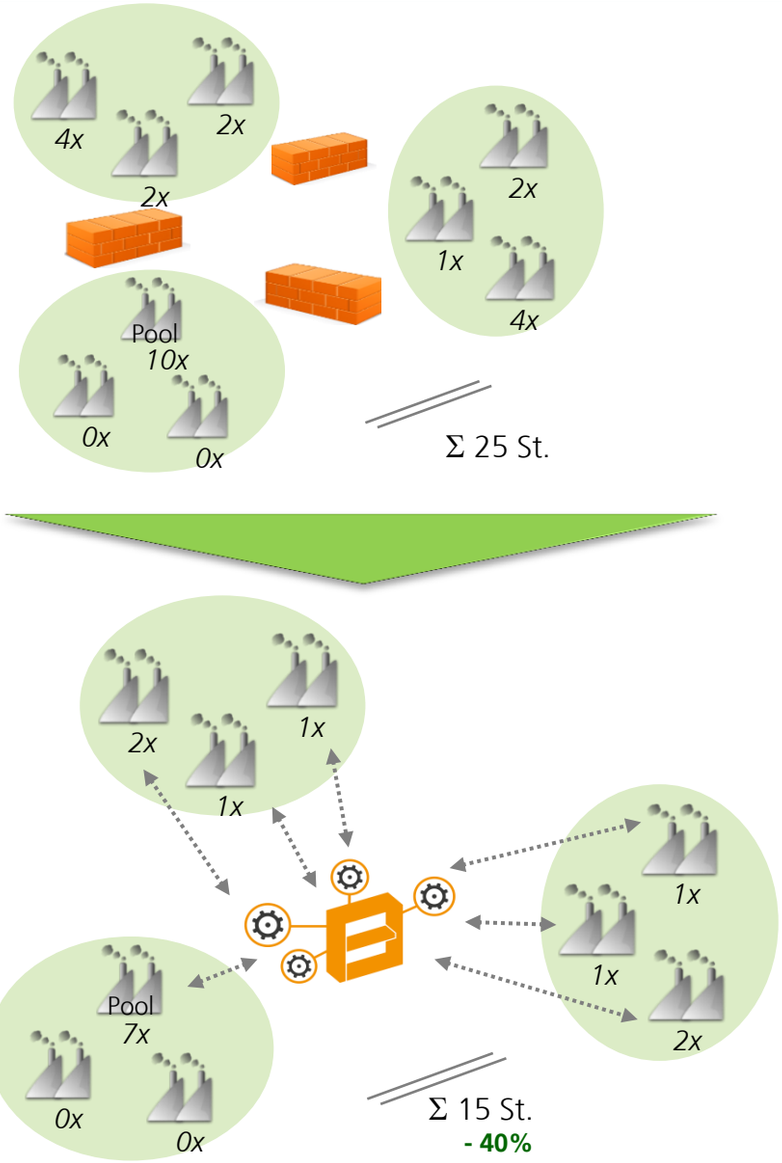
Pooling -
Potential of collective spare part management



- Merging and cooperation in stock-management
- Enterprise-wide or external network cooperation is possible
- Network-wide data infrastructure is necessary
- Cost allocation based on consumption
- Shared risk of stock-outs
- Result is a reduced overall stock for the network

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Pooling -
Process of order via assistance system

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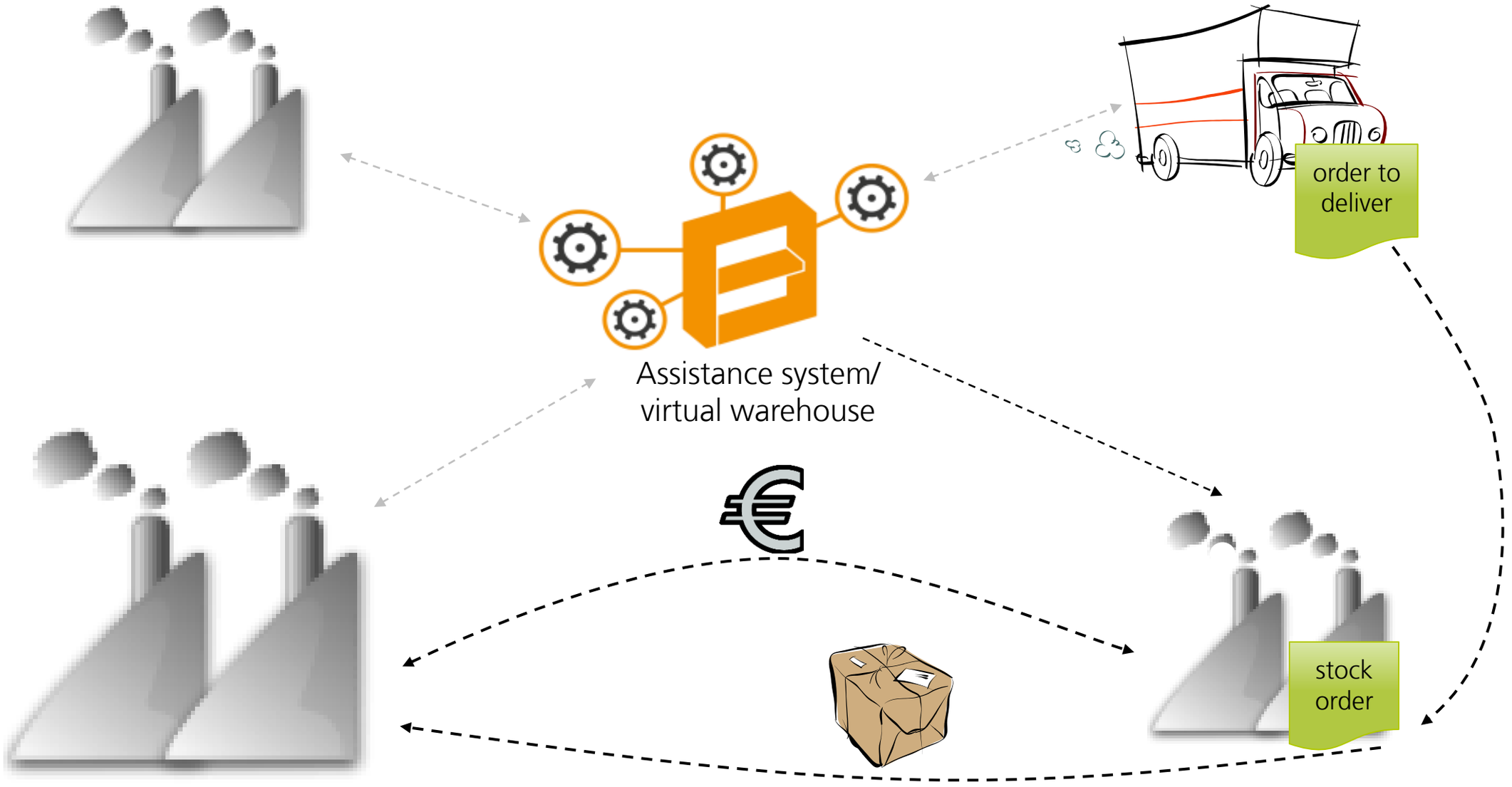
Pooling -
From order to delivery



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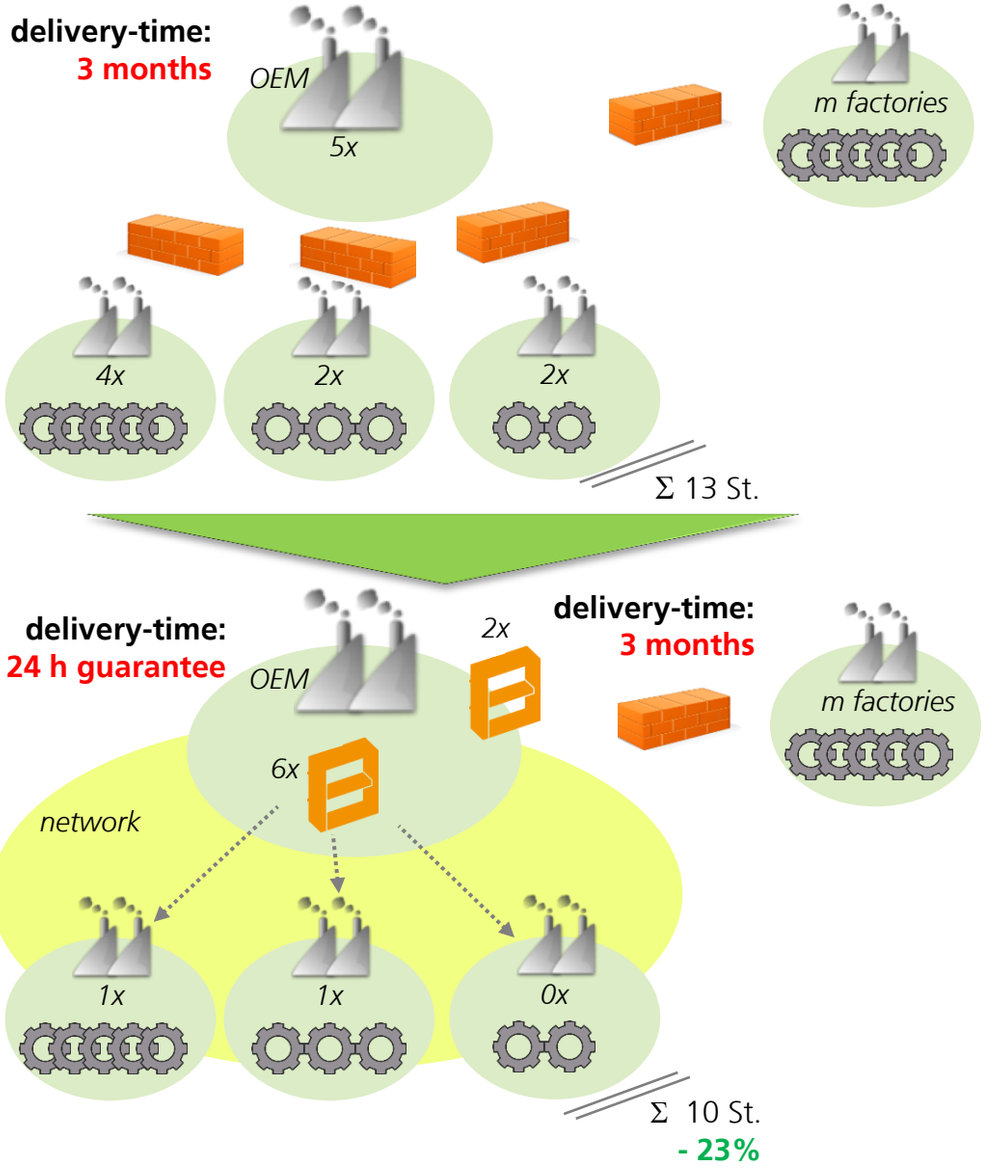
Pooling -
In vertical networks



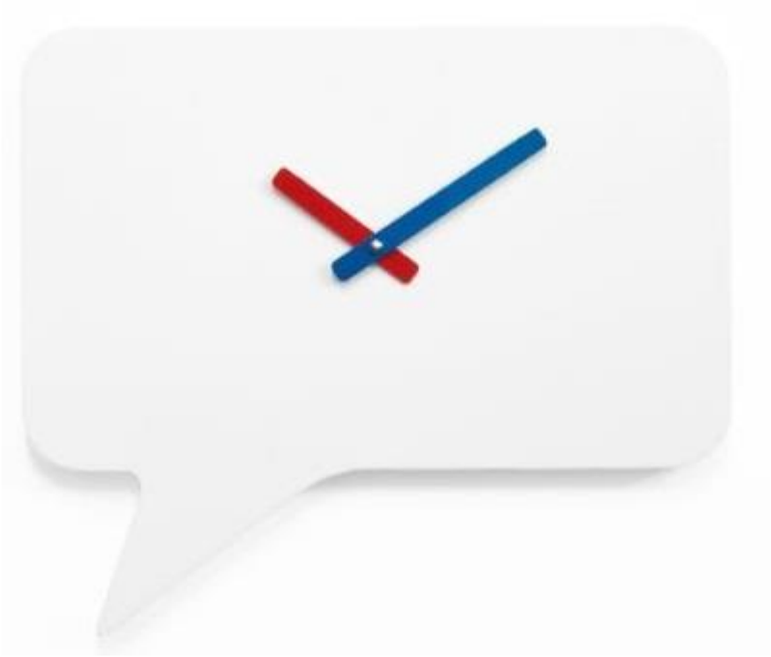
Concept

- High availability of spare parts with a short delivery-time
- Network-wide stock reduction and pooling at the OEM
- For capital intensive parts with a high life-time
- Build-up a knowledge database
- Priority stock for network-participants
- Assistance system to determinate OEM/network stock-level

Added-value OEM

- Strategic partnership and customer satisfaction
- Service charge
- Data and knowledge transfer
- (Network-wide) stock optimization

Agenda



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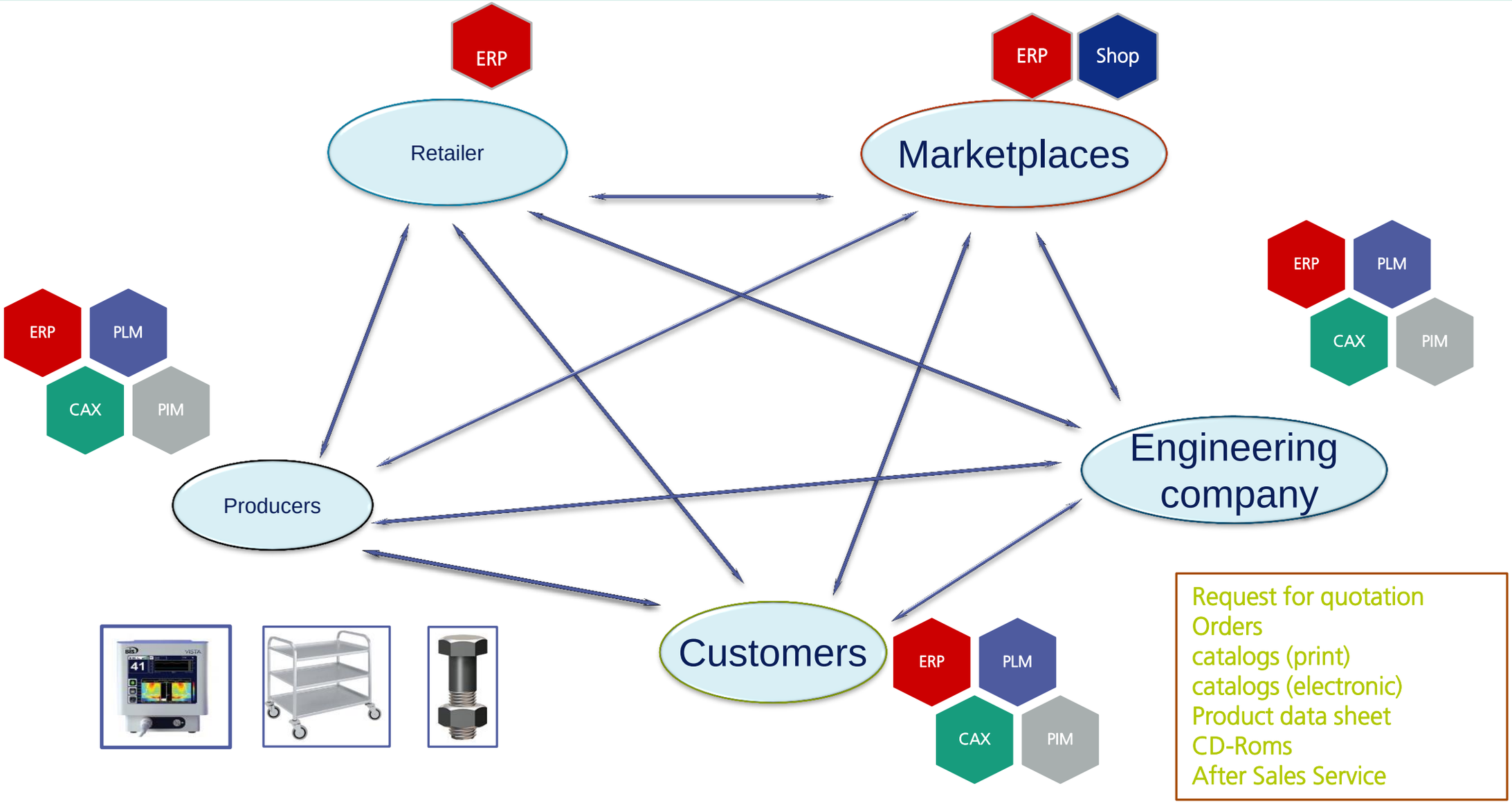
Master-Data-Management -
Use Case: User of MDM



Source: eCl@ss, Henning Uiterwyk

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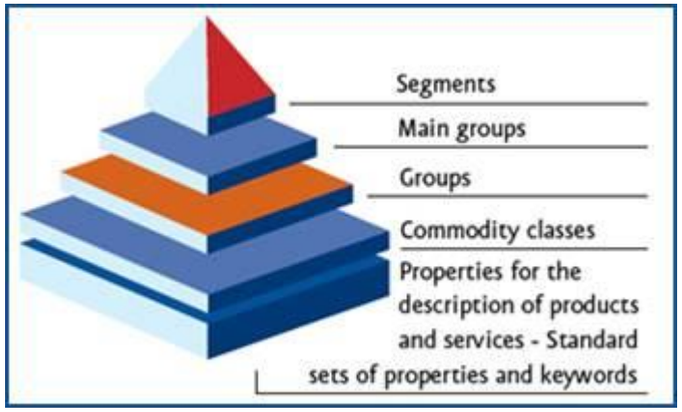
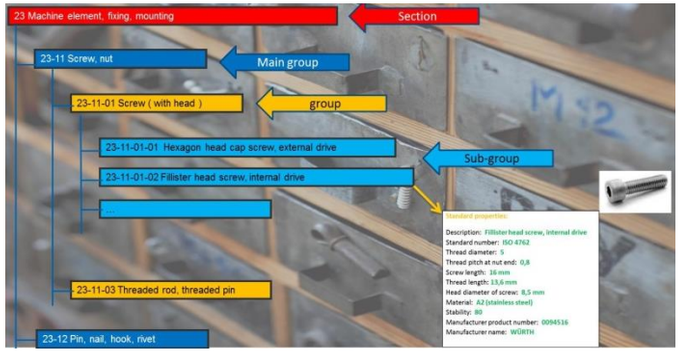
Master-Data-Management -
Important information



Source: eCl@ss



Source: D&TS

Which Master-Data can be shared?

- Material No. and Description
- Classification
- Technical and commercial attributes
- Delivery time and availability
- End of life/delivery
- Changes of values
- Price

Added-value OEM

- Strategic partnership and customer satisfaction
- Process efficiencies in order taking
- Increase in sales of consumable spare parts

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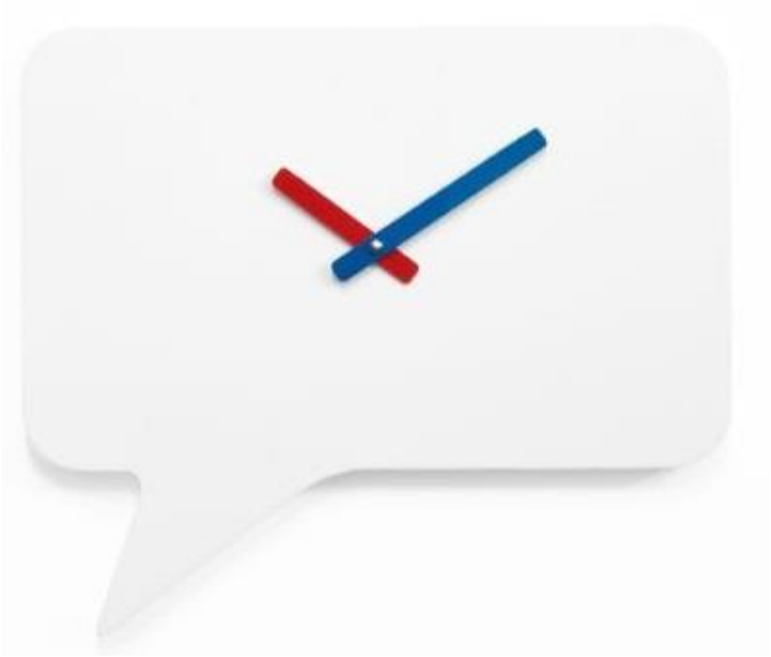

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3D-Printing -
Visions

Source: www.esa.iint; www.tagesschau.de

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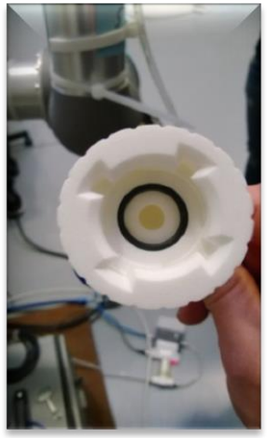
3D-Printing -
Examples from Fraunhofer IML

EOS P395 - laser sintering plant
for plastic material



Cups with bayonet lock

Pneumatic cylinder

Cooling hood for Maker-Bot

Source: http://www.3dsystems.com/3d-printers/production/spro-60-hd

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3D-Printing - Challenges

Potential restrictions:

- Quantity
- Size
- Material
- Weight
- Production duration and consequential costs downtime versus storage costs
- Properties of montage
- Weld pieces
- Legal issues
- Manual post-treatment
- Limited potential for automation

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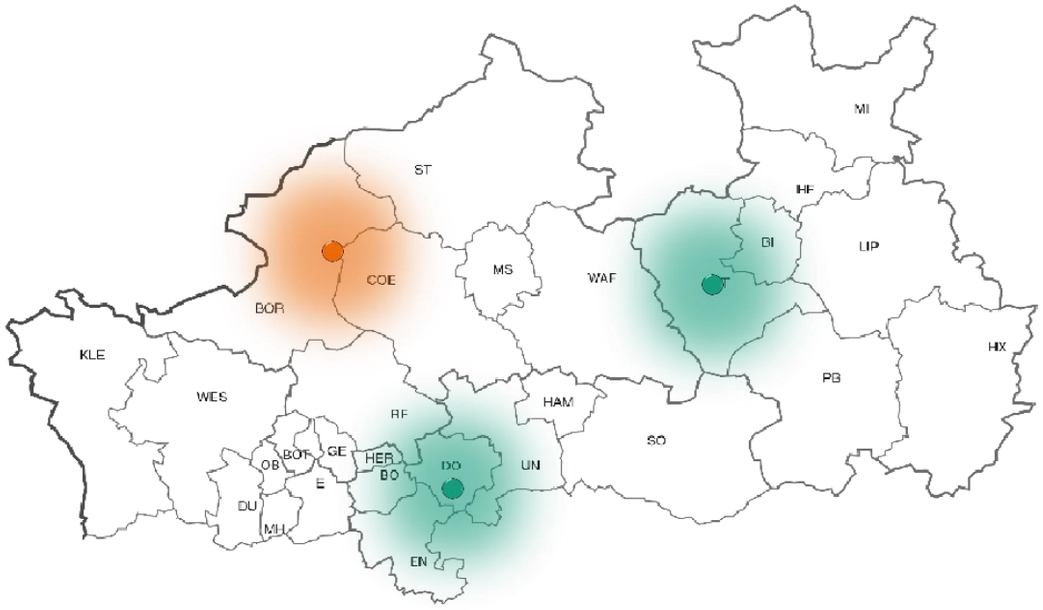
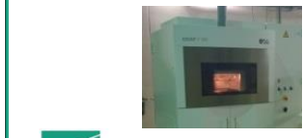
3D-Printing -
Possible widespread use: 3D-Printing on demand





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Important aspects

- Acquisition of necessary construction data
- Capacity planning
- Price negotiation respectively cost allocation
- Transport costs
- Reliability
- Responsability
- Priority of the customers

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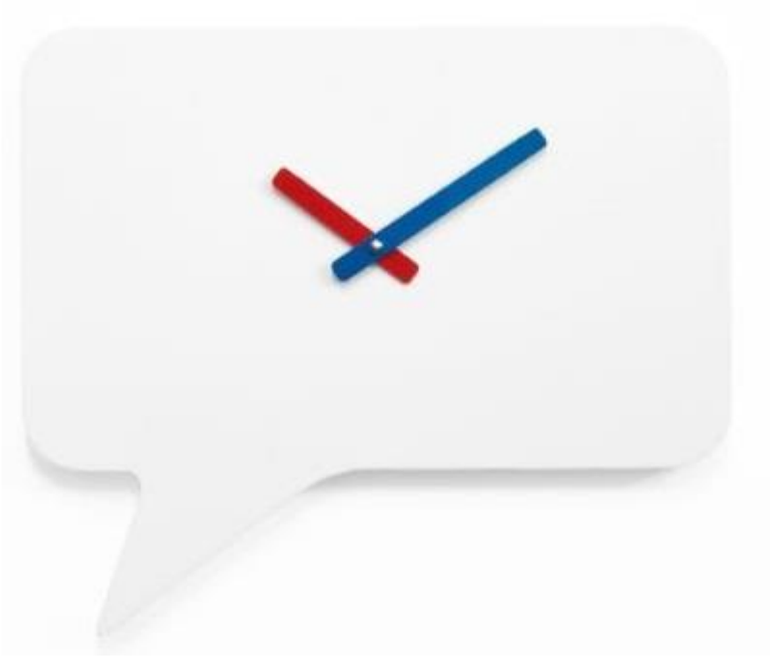

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New services and added values -
Industry 4.0 and group-wide spare part management

Keywords of Industry 4.0

- Control of complex systems
- Cloud Computing
- Real and virtual world in common
- Horizontal integration through added value networks
- Standardisation, architecture of reference
- Internet of Things, intelligent maintenance management
- Efficiency of resources

Focus on spare part management

- Spare part supply chain cooperation
- Sharing of material master data
- Merging of stock in a vertical networks
- Spare part- and knowledge management and communication between companies
- Standardisation and classification of spare parts via "eCl@ss"
- Transparency of stock and inventory planning in common (risk management)
- Reduction of network-wide stock of spare parts without a loss of availability

Summary

>> The way is the goal. <<
(Confucius)

- New technologies of Industry 4.0 will effect a lot of aspects in production, service and spare part management
- Standardised master-data and the cooperation in the networks will become of greater importance
- There are a lot of challenges before 3D-Printing of spare parts can be a part of daily spare part business
- Industry 4.0 is a complex system out of small and bigger elements, that can integrate flexible in to the companies
- Don’t forget the people

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Thank you
for your attention!

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