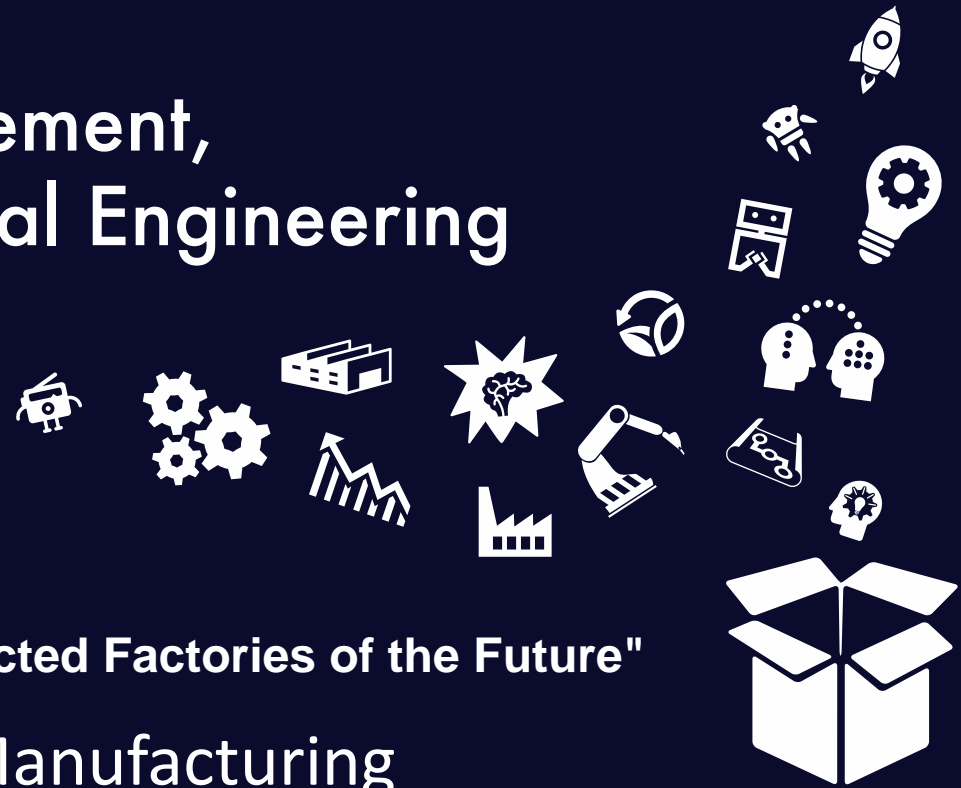




POLITECNICO MILANO 1863

Department of Management, Economics and Industrial Engineering

Manufacturing Group



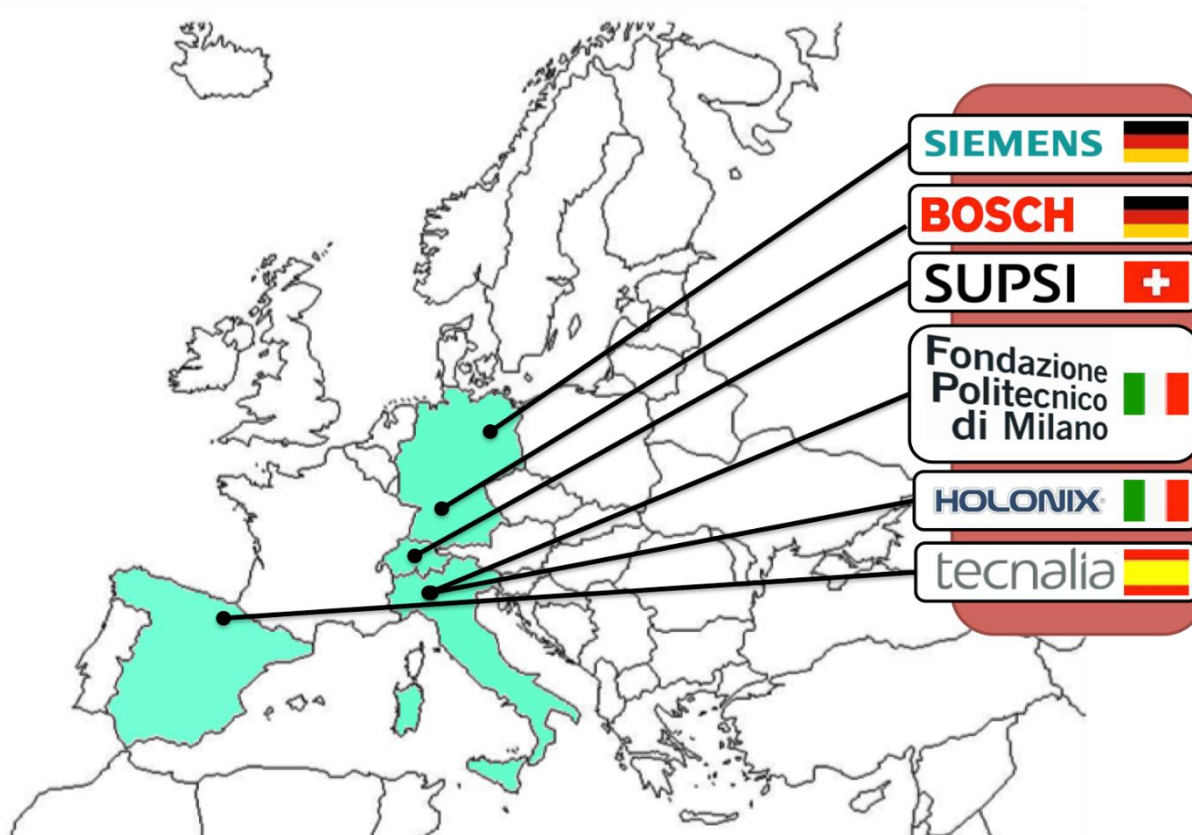
Workshop "Platforms for connected Factories of the Future"

Role of CPS in Manufacturing

Prof. Marco Taisch



Project funded by European Commission to **define the roadmap for CPS4MFG** (CPS for Manufacturing) in Europe





- **17 Guru interviews**

Gurus are both from Academia and Industry world

(i.e, University of Cincinnati, HP, FESTO, IBM, etc.)



- **3 Knowledge Capture Events**

(in Stuttgart, Munich and Milan)



BOSCH

SIEMENS



More than **100 strategic breakthroughs** CPS adoption can bring into Manufacturing Industry have been identified...



Enhance companies cooperation through ecosystems of partners for service execution

Linking data & manufacturing

Inclusion of customers needs & usage directly in product development & production

Efficient production for small batch sizes

New options for service related business along the whole life cycle of digitalized products. "digital twin"

Adaptive Graphical User Interfaces (GUIs) to give the right info to the right person

Responsiveness: late delivery of material, early adoption of product schedule

Ubiquitous sensing, better understanding of the ecosystem

More comprehensive product and production



...and then categorised according to **six main clusters**:

- 1. New data-driven services and business models**
- 2. Data-based improved products**
- 3. Closed-loop manufacturing**
- 4. Cyberized™ plant/ “Plug & Produce**
- 5. Next step production efficiency**
- 6. Digital ergonomics**



About **80 key CPS related enabling technologies** that can bring the bigger impact to Manufacturing Industry have been identified



"visual" analytics:
technology for
grasping complexity

IoT O.S.
opensource

MEMS (Micro Electro-
Mechanical Systems)

Artificial
intelligence

CAD/CAM
seamless digital
world integration

Big Data and HPC (High
Performance
Computation)
infrastructure

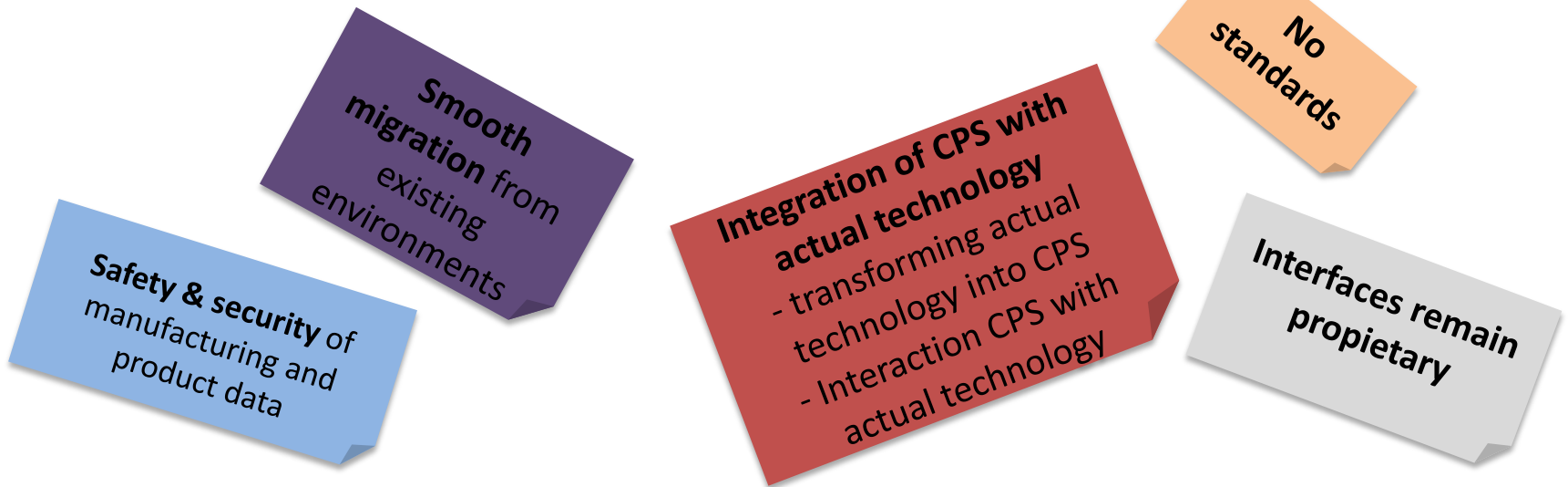
Open frameworks and
standards
(CPSoS, IoT, etc.)

Distributed &
connected sensors



About **90 obstacles** to CPS deployment and integration within existing systems have been identified.

Between them, a **need for standards** and related **platforms** arises





- **ICT 2015, Lisbon 21st
October, 2015**

**Launching the European community for
CPS in manufacturing networking
session**



- **Knowledge Capture Event,
Brussels**



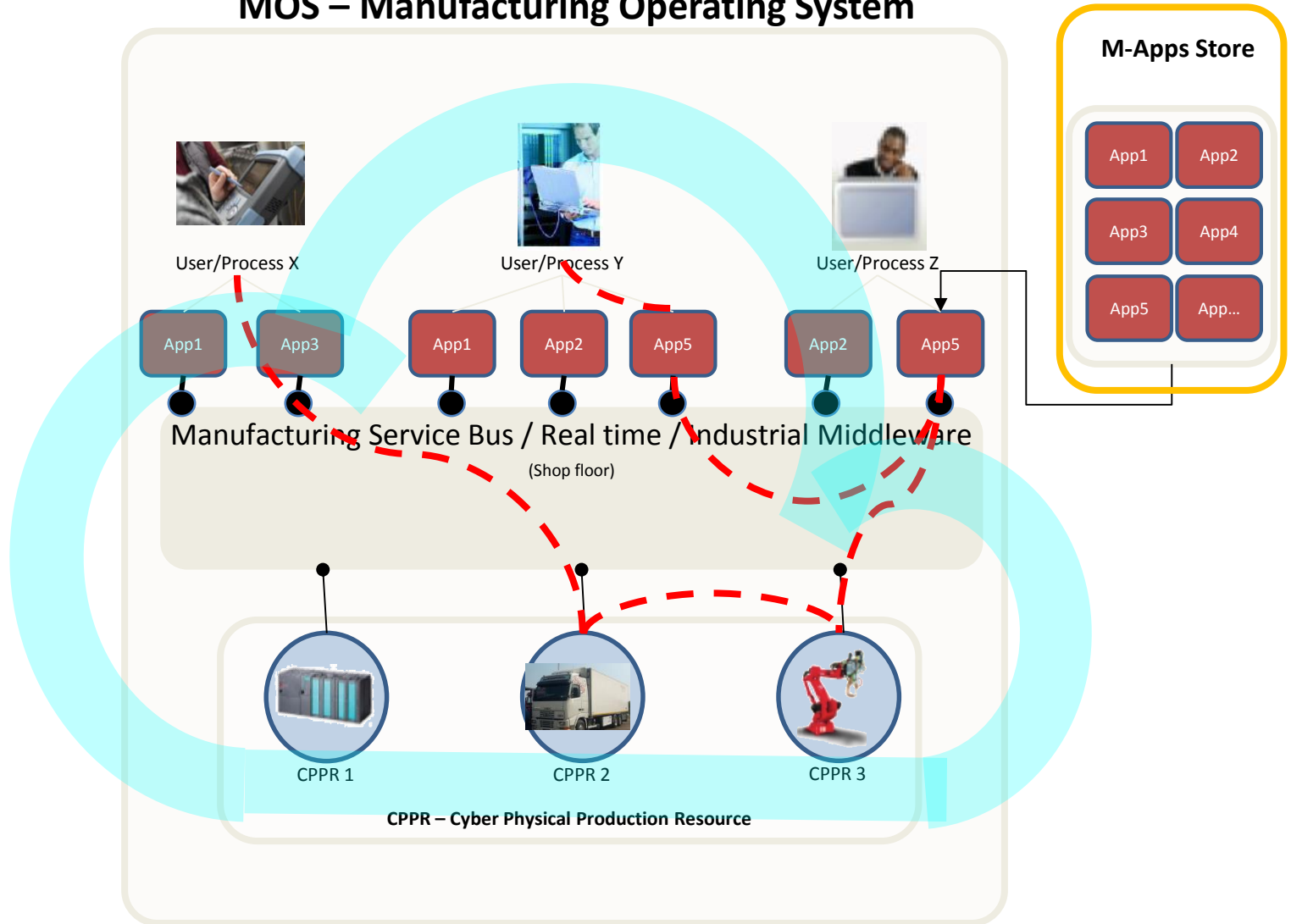


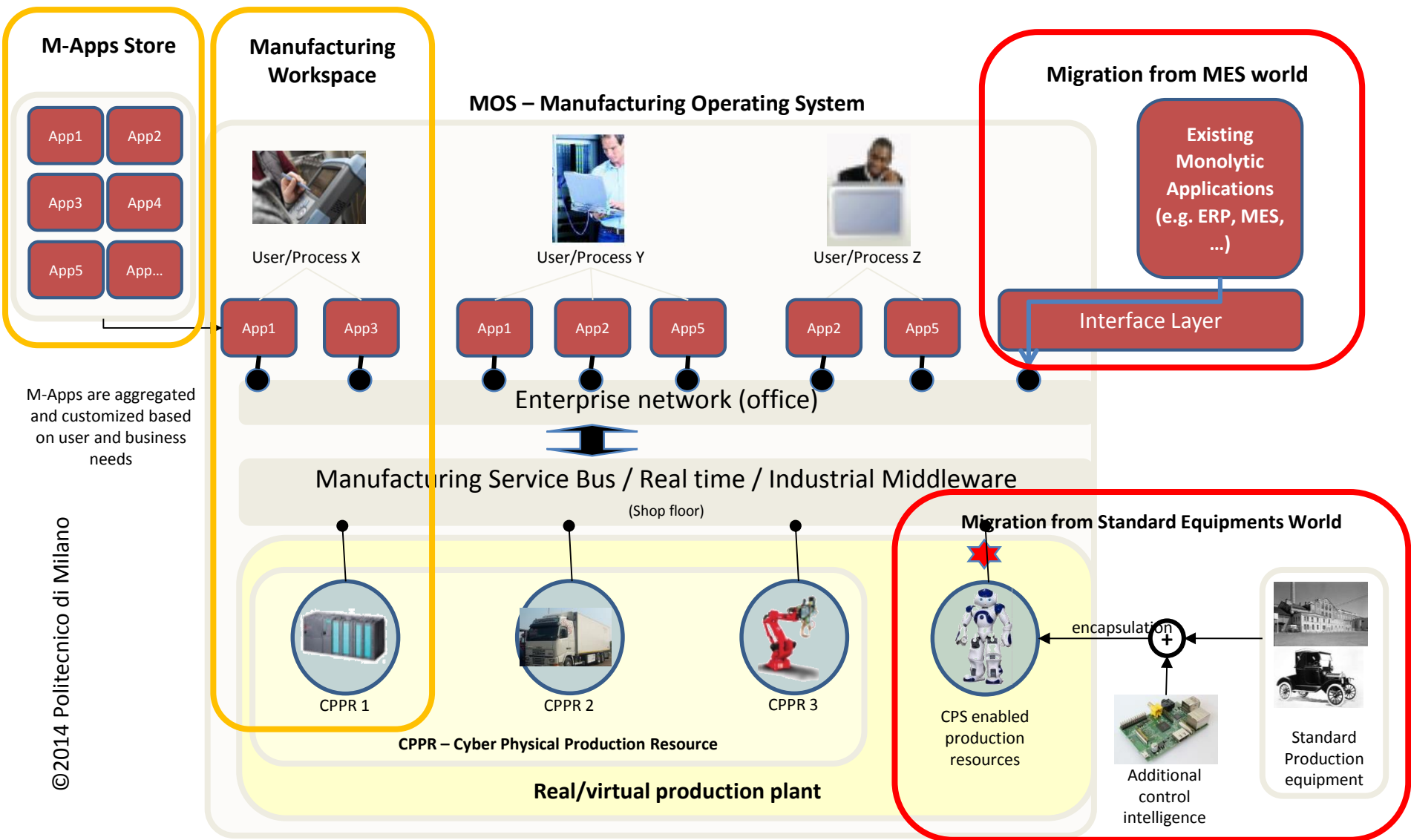
- SMEs and Mid-caps are the backbone of the European Manufacturing renaissance
- SMEs have difficulties to have access to innovative ICT solutions due to the high cost
- Due to lack of awareness and knowledge, SMEs are not able to pull innovation from the market offer
- Strong offer of 'cheap' ICT Services from Europe
- Untrust towards the Cloud technology (security and performance – 26% of cyber attacks is in Manufacturing)





MOS – Manufacturing Operating System





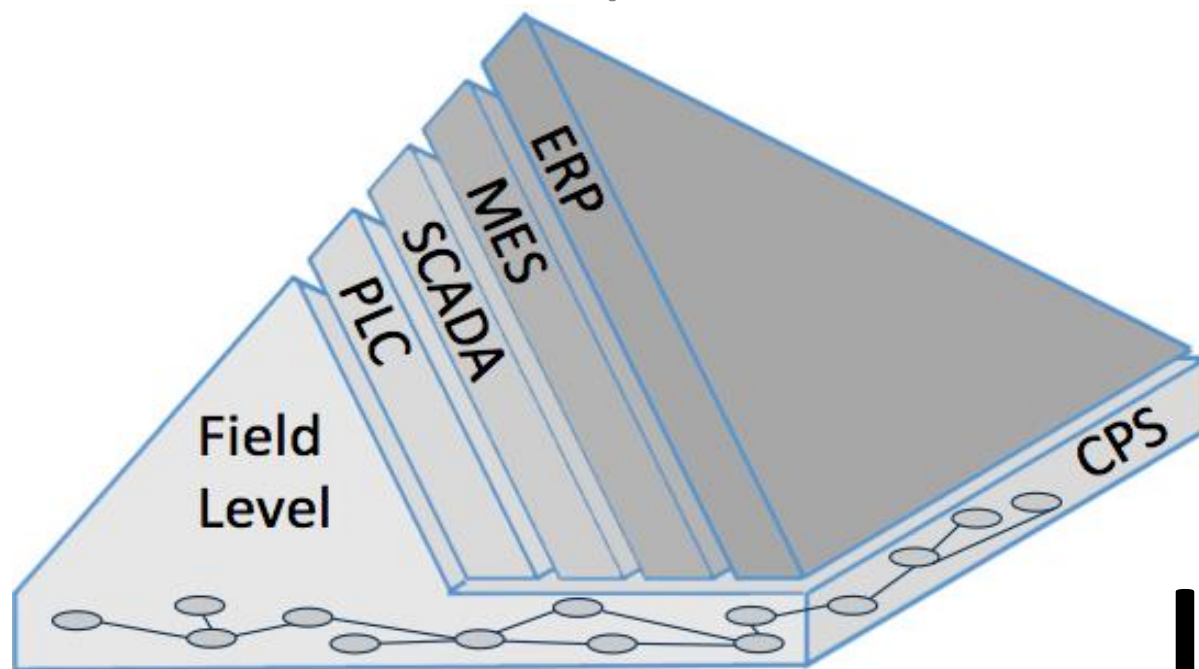
©2014 Politecnico di Milano

Evolution of the Automation Pyramid



Field level features **CPS** capable of articulated functions

Hierarchical structure is preserved

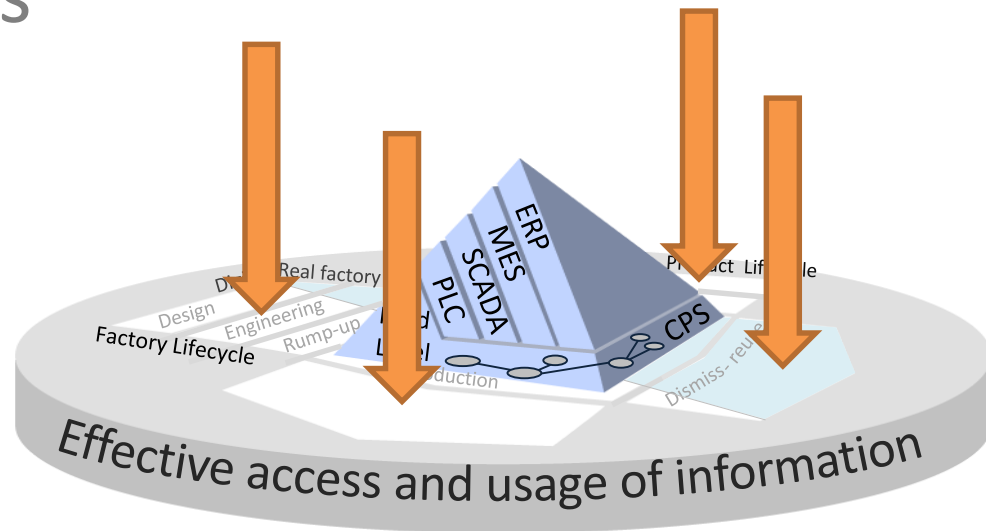


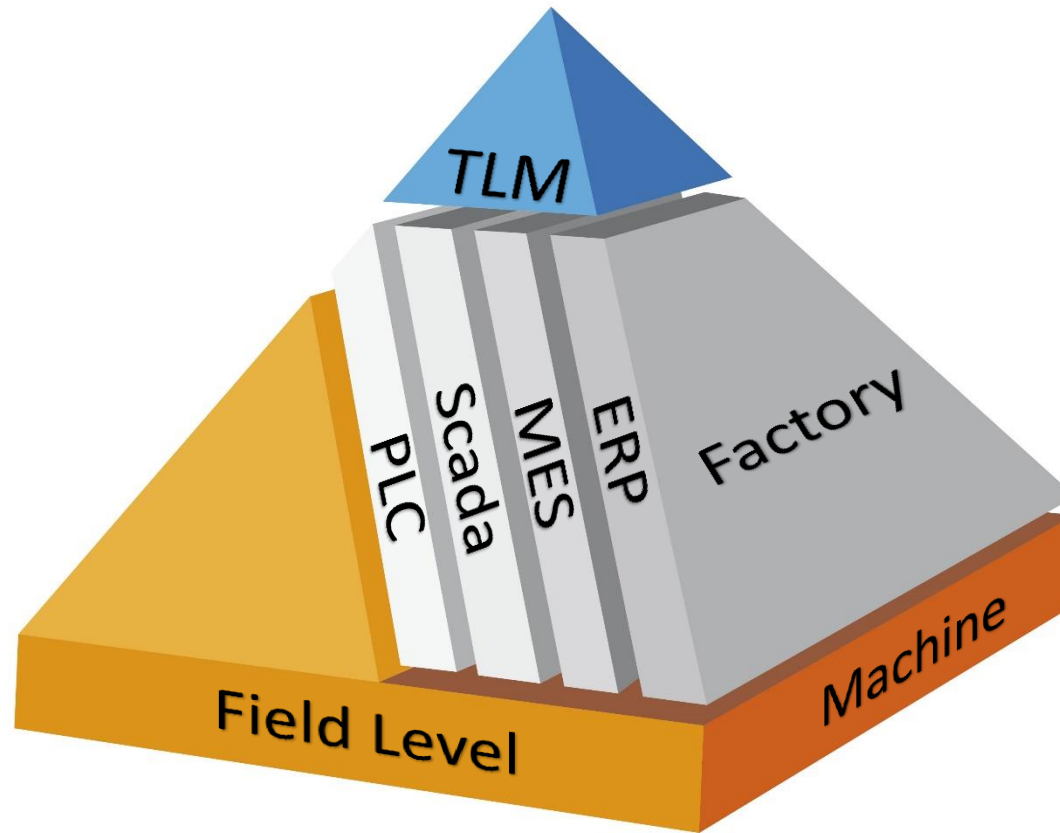
IoT

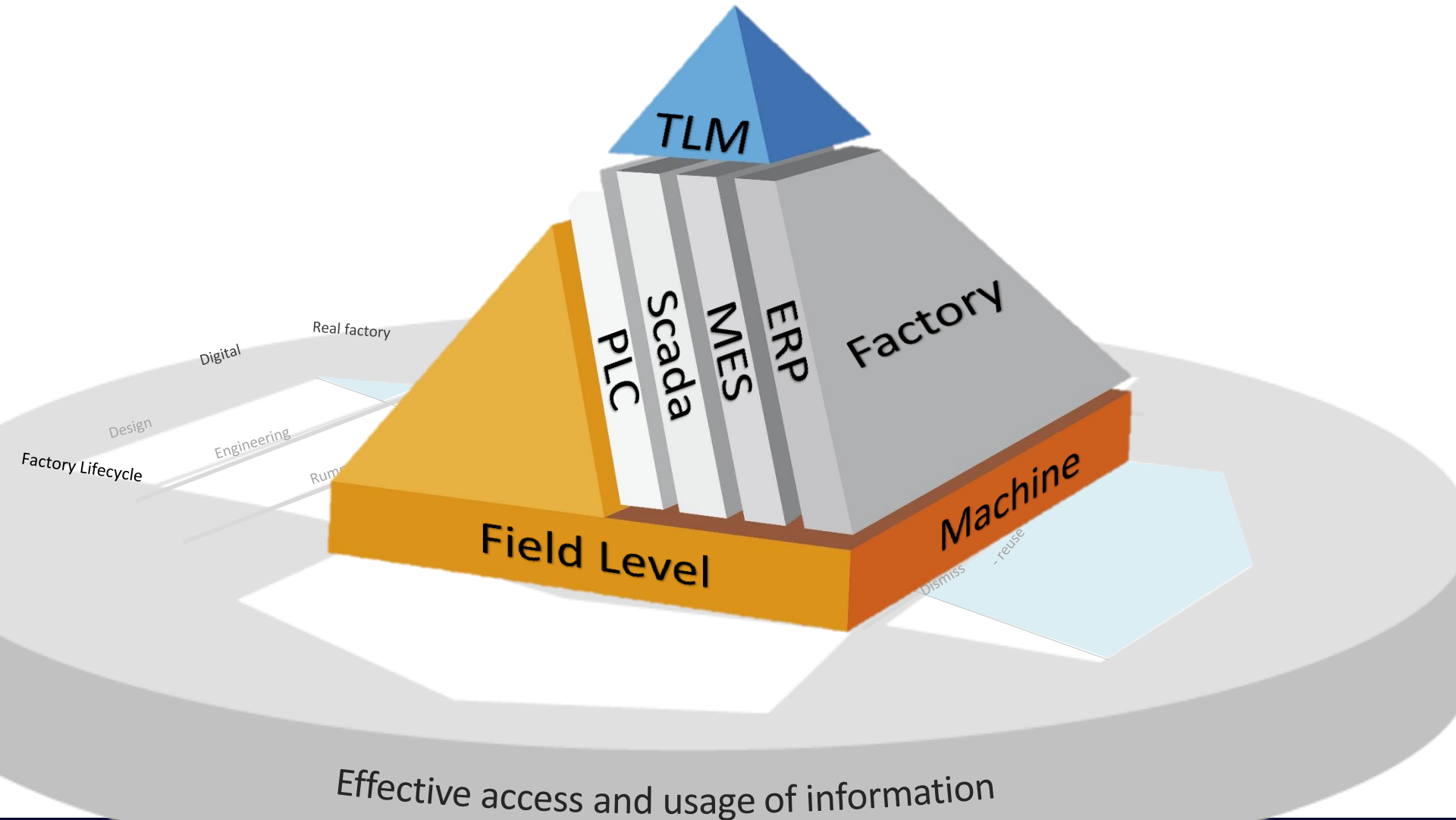


Add some areas

- Resources and factory are «things» – therefore CPS
- Products are things – therefore CPS
- Add some areas



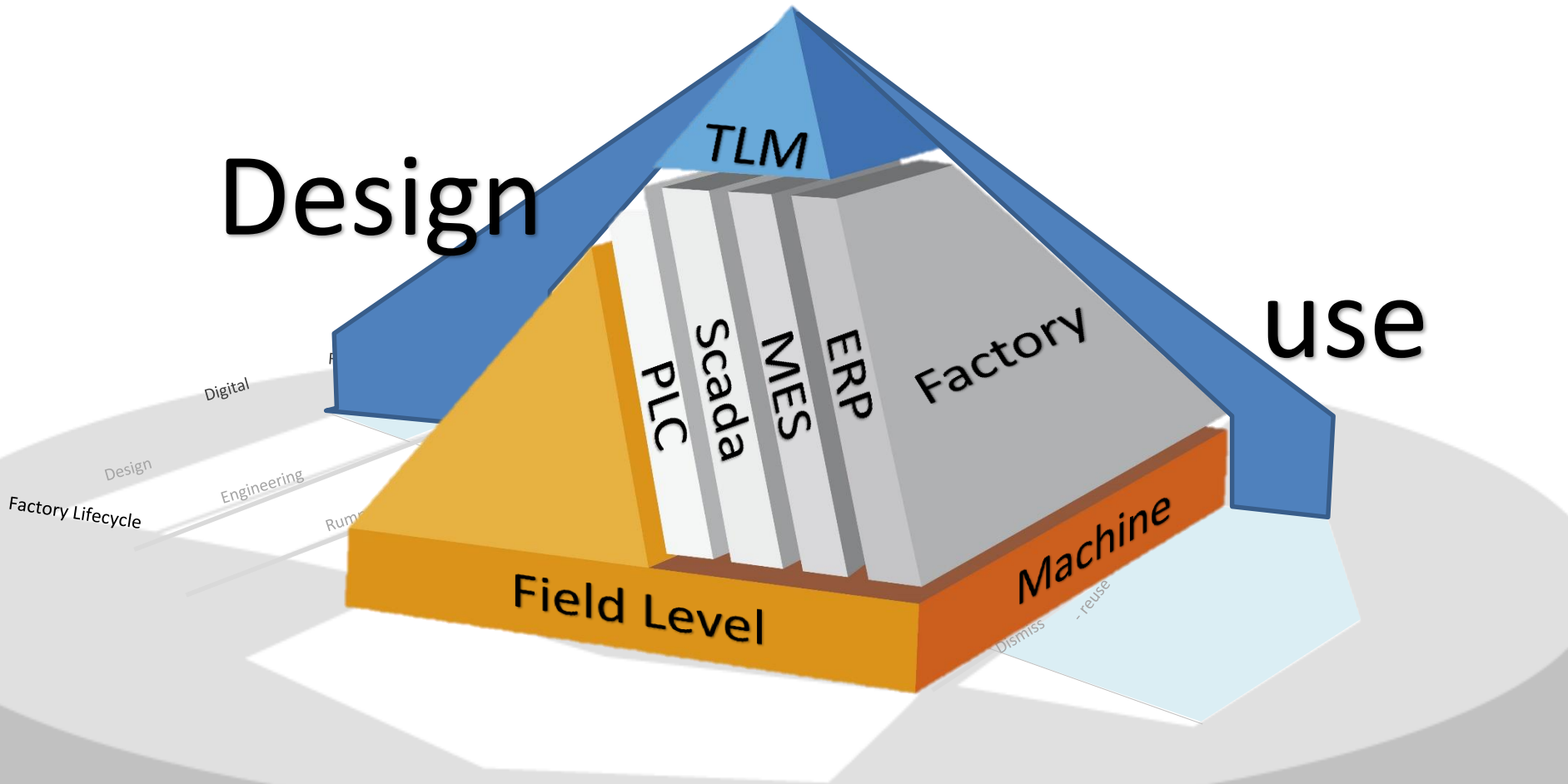






Design

use



Effective access and usage of information



People Life-cycle Design

