



 POLITECNICO DI MILANO



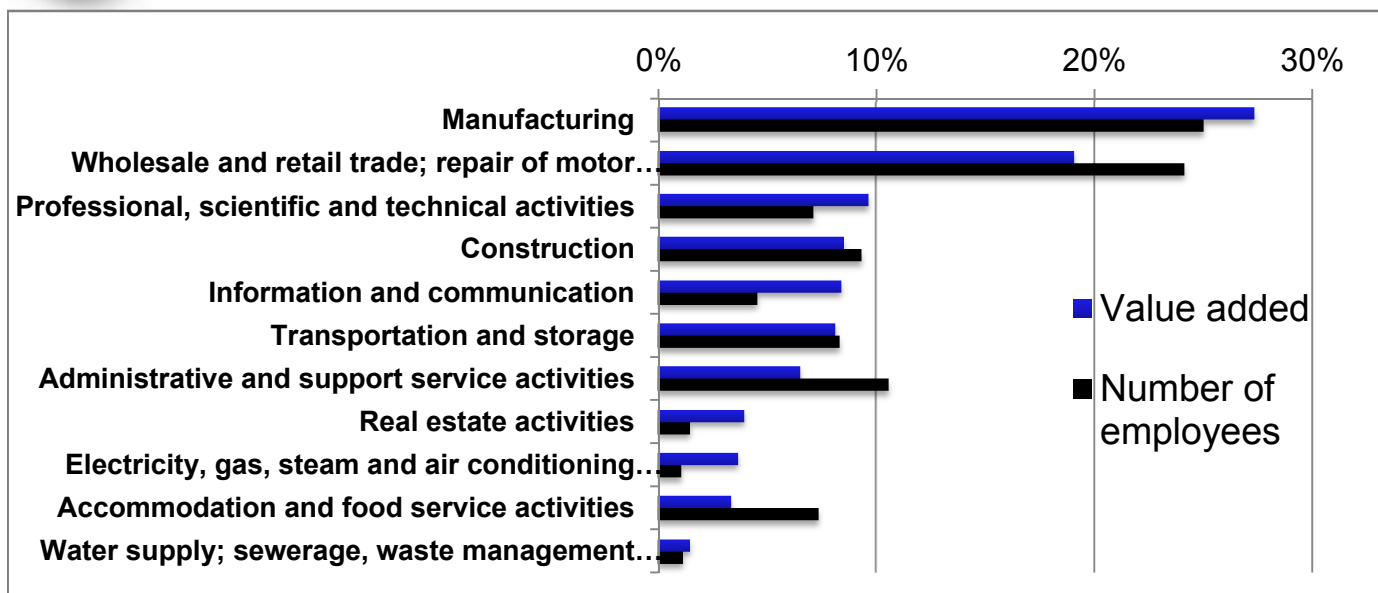
***Lo stimolo dei Cluster Tecnologici Regionali per
l'Innovazione, un caso di studio: Big Data e
Analytics nel settore Manufacturing***

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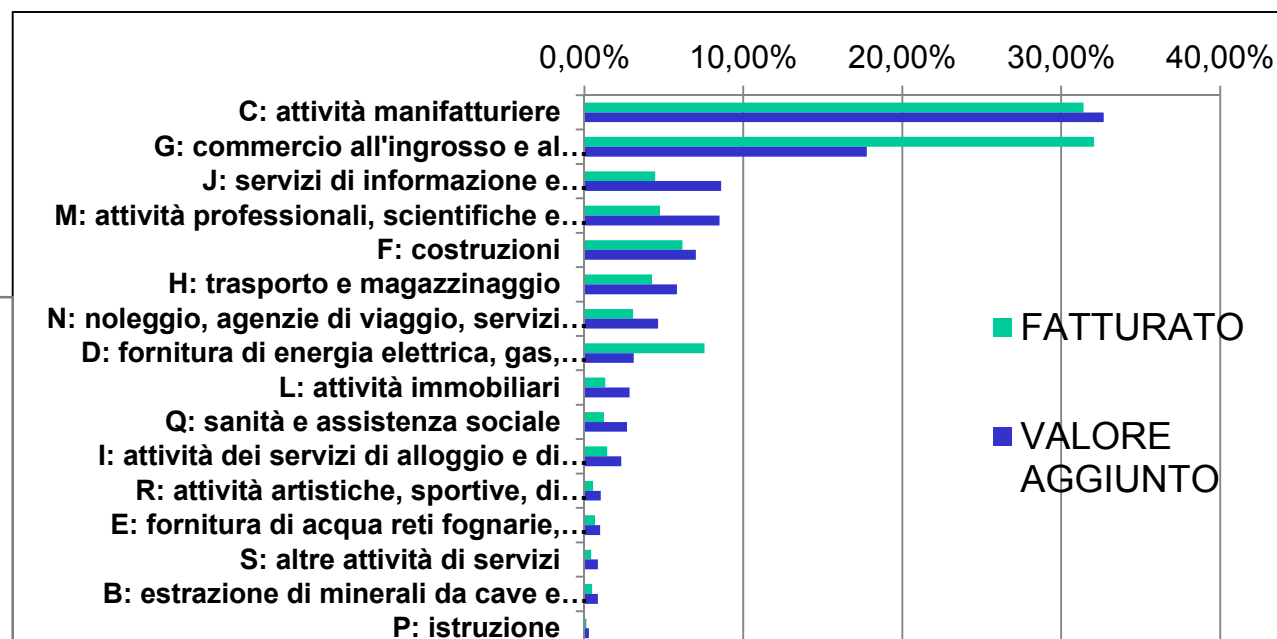
Importanza del Manifatturiero



Fonte: elaborazione Associazione Cluster Fabbrica Intelligente Lombardia (ACFIL) su dati Eurostat 2010

Fonte: elaborazione Associazione Cluster Fabbrica Intelligente Lombardia (ACFIL) su dati Istat 2010

- Fatturato: 836 mld euro*
- Valore aggiunto: 202 mld euro*
- Occupati attività produzione: 3,9 mln
- Occupati comprendendo i servizi: 10,5 mln

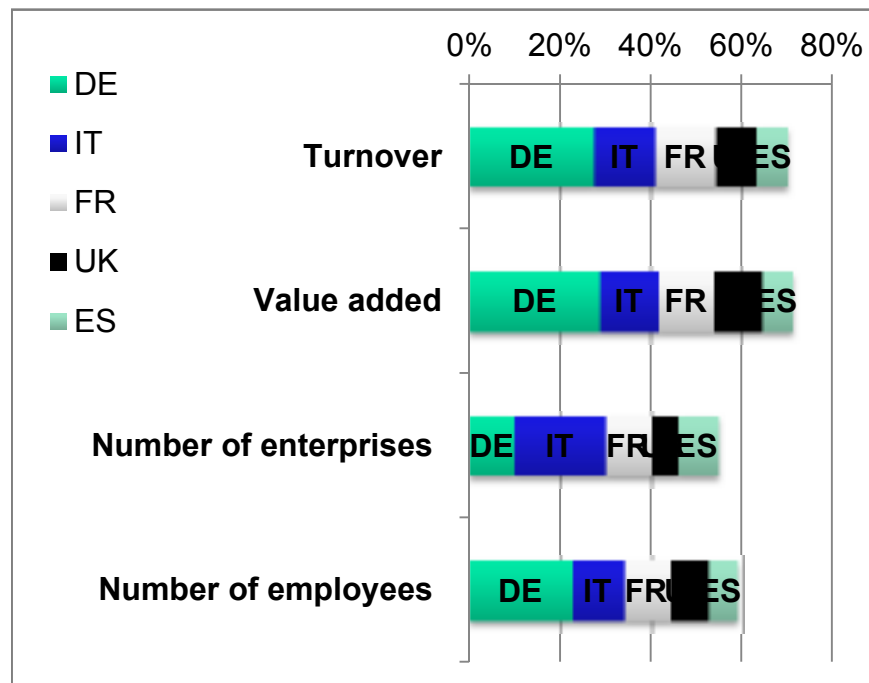




Il ruolo dell'Italia

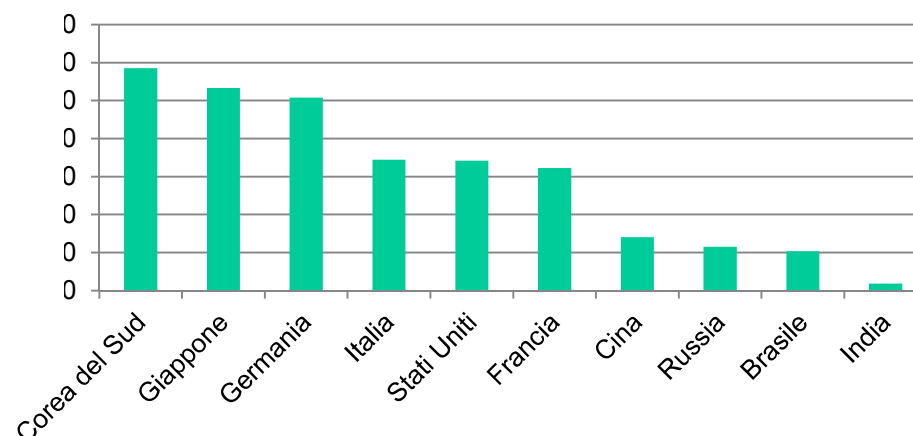
Fonte: elaborazione su dati Eurostat 2010 e 2011

Fonte: Elaborazioni Centro Studi Confindustria



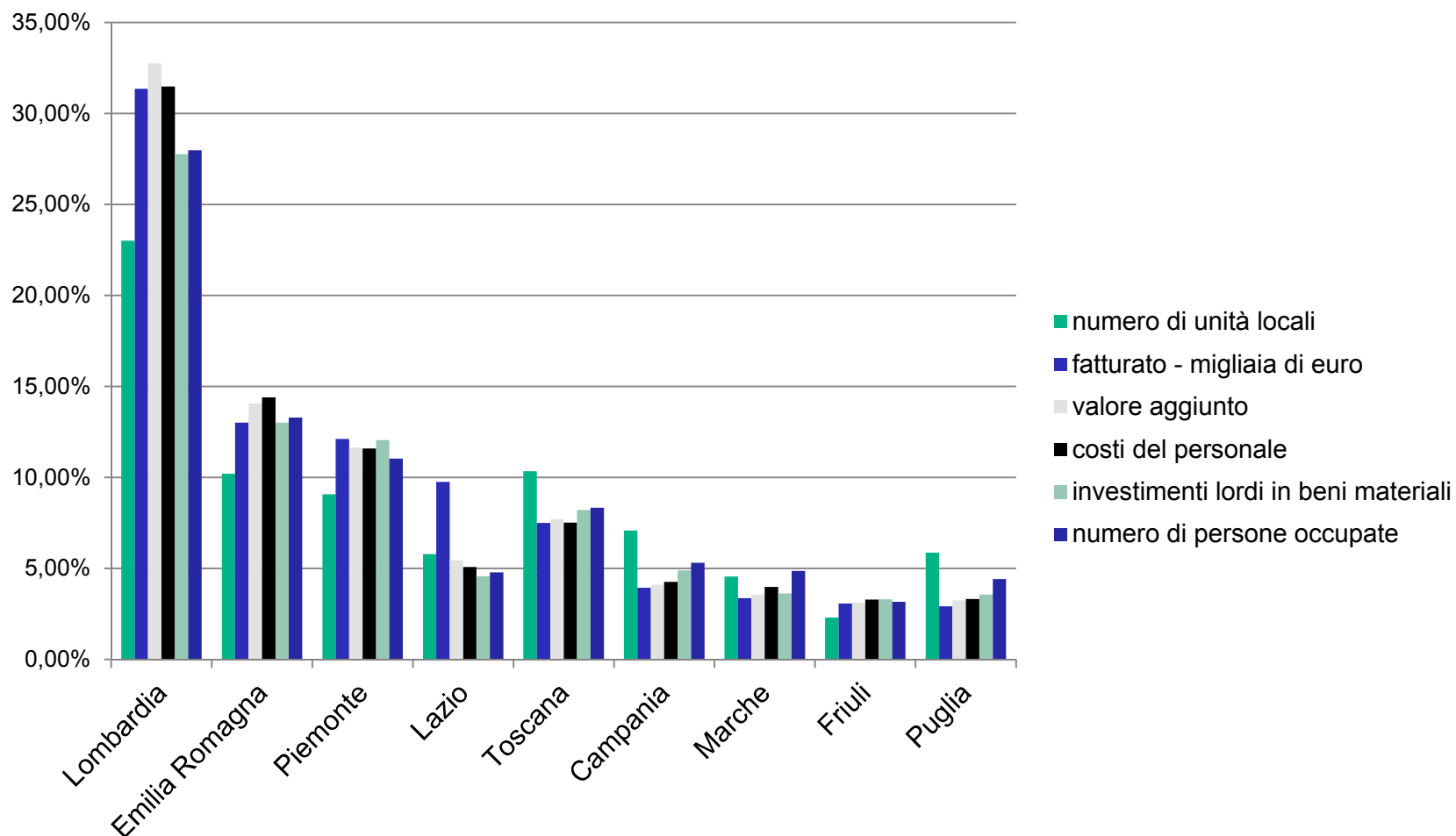
	Quota % sulla produzione manifatturiera mondiale (dollari correnti)			Tasso % di crescita medio annuo della produzione manifatturiera (dollari 2005)		Quota % sul totale della popolazione mondiale
	Media 1991-1992	Media 2001-2002	Media 2011-2012	1990-2012	2000-2012	
1 Cina	4,1	9,7	21,4	12,4	11,7	15,2
2 Stati Uniti	21,8	24,7	15,4	2,4	0,8	4,5
3 Giappone	19,4	13,4	9,6	-0,4	-0,7	1,8
4 Germania	9,2	6,9	6,1	1,7	1,8	1,2
5 Corea del Sud	2,4	3,1	4,1	7,7	7,2	0,7
6 India	1,2	1,9	3,3	7,5	8,6	17,9
7 Italia	5,5	4,4	3,1	-0,7	-2,5	0,9
8 Brasile	2,1	1,7	2,9	2,2	2,8	2,8
9 Francia	5,0	4,1	2,9	-0,1	-1,1	0,9
10 Russia	0,2	0,8	2,3	-	3,8	2,0
Mondo				2,8	2,7	
UE 15 + Stati Uniti + Giappone	73,3	64,9	45,5	1,0	0,1	12,0
BRIC	7,6	14,1	29,9	8,0	9,7	41,9
Nuovi UE	1,1	1,6	2,4	4,6	6,0	1,3

Paesi ordinati in base alla quota % sulla produzione manifatturiera mondiale, media 2011-2012.
Nuovi UE = Repubblica Ceca, Slovacchia, Bulgaria, Romania, Ungheria, Polonia.





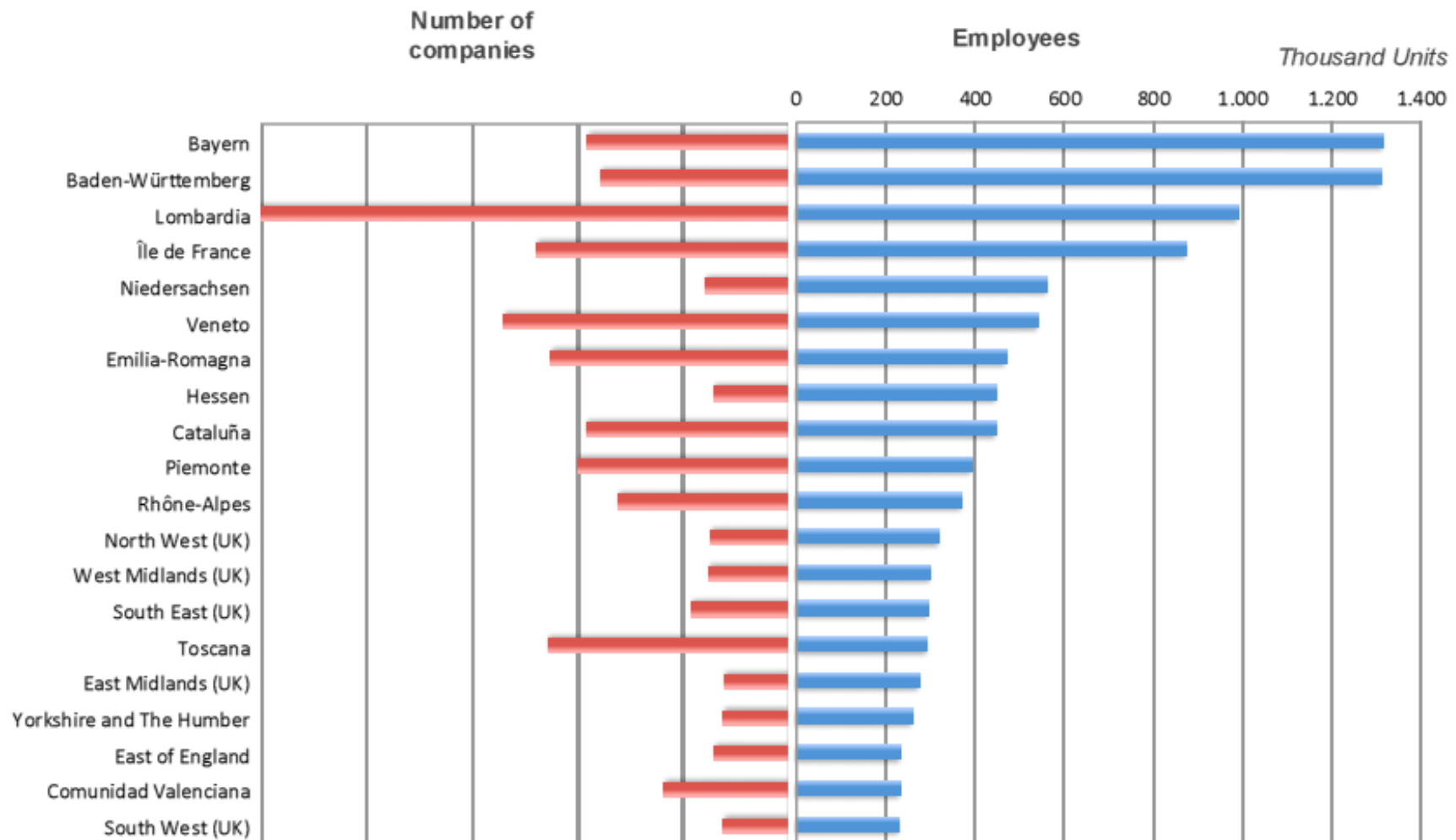
Il contesto lombardo



Fonte: elaborazione Associazione Cluster Fabbrica Intelligente Lombardia (ACFIL) su dati Istat 2010



Il contesto lombardo

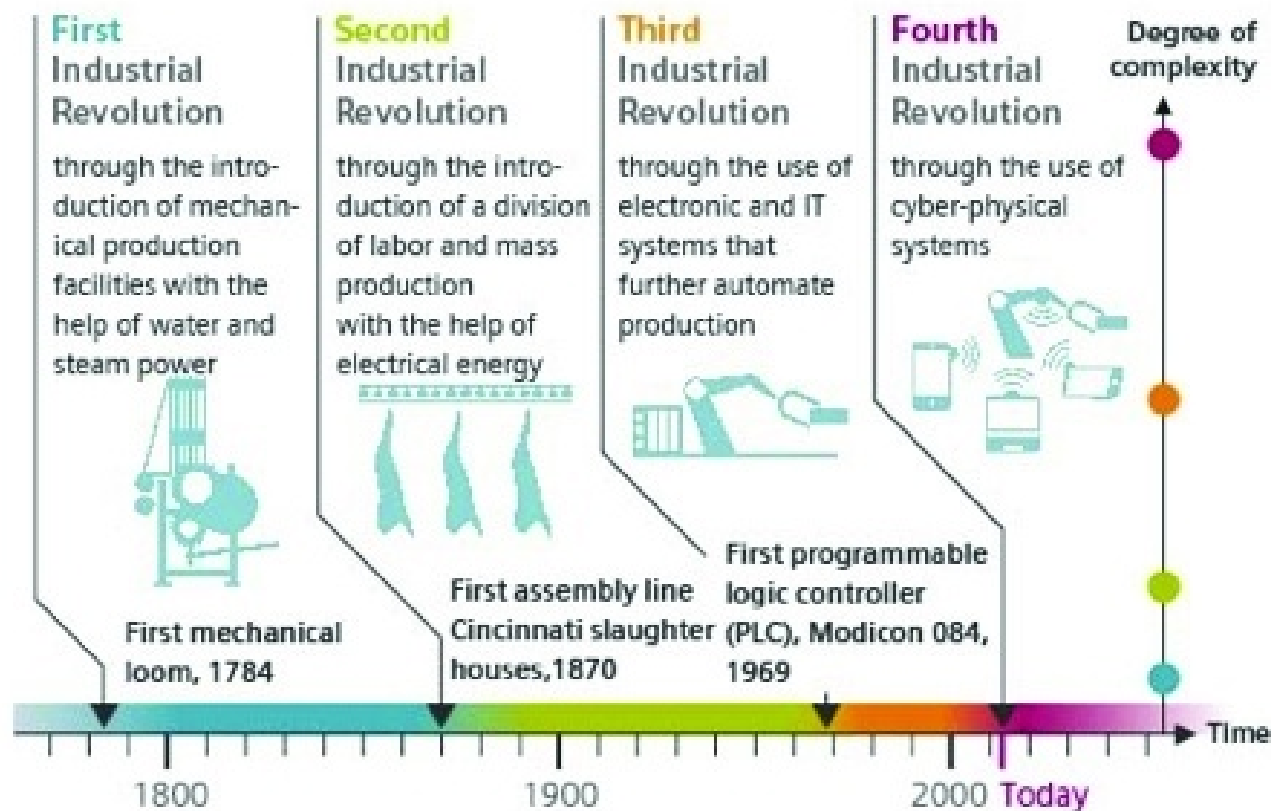


Fonte: Associazione Cluster Fabbrica Intelligente Lombardia (da Eurostat, 2010)



Industrie 4.0

From Industry 1.0 to Industry 4.0



Source: DFKI (2011)



Cyber-physical systems (CPS) enable the future of manufacturing

Communication everywhere and every time

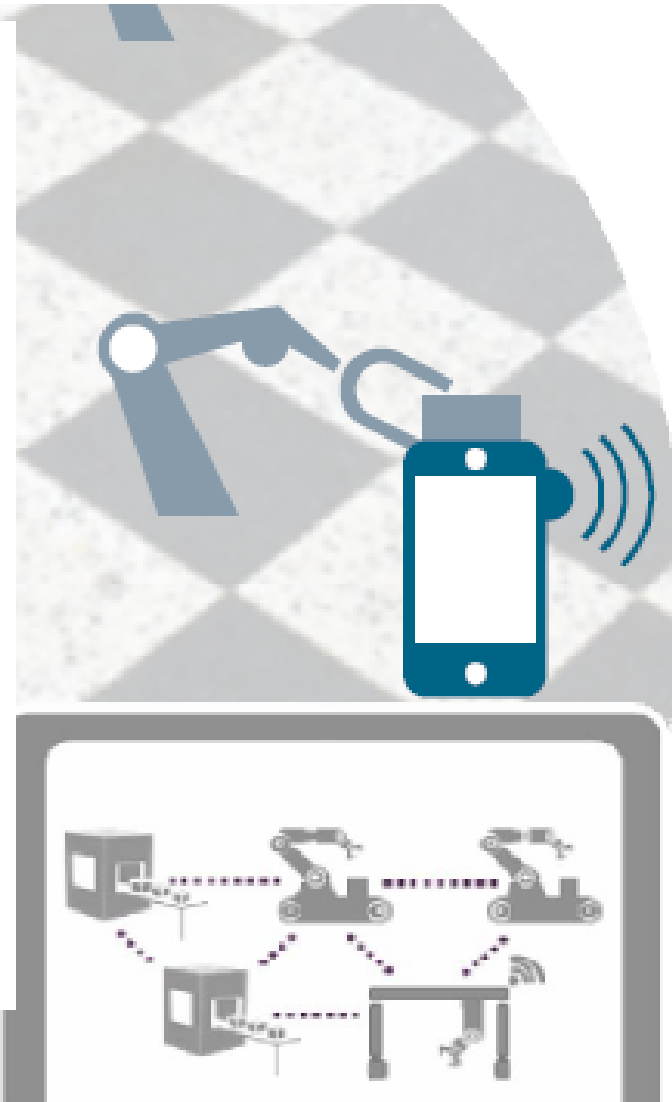
- Future infrastructure will support the access to information everywhere and every time without any specific installation / parameterization needs

Production and products will be intelligent

- Production resources will be autonomic and will connect to each other (M2M)
- Products know their own production systems

Digital and real world will merge

- Each real object will have a digital shadow, which reflects the characteristics of the real object



Cyber Physical Systems for Manufacturing and Production

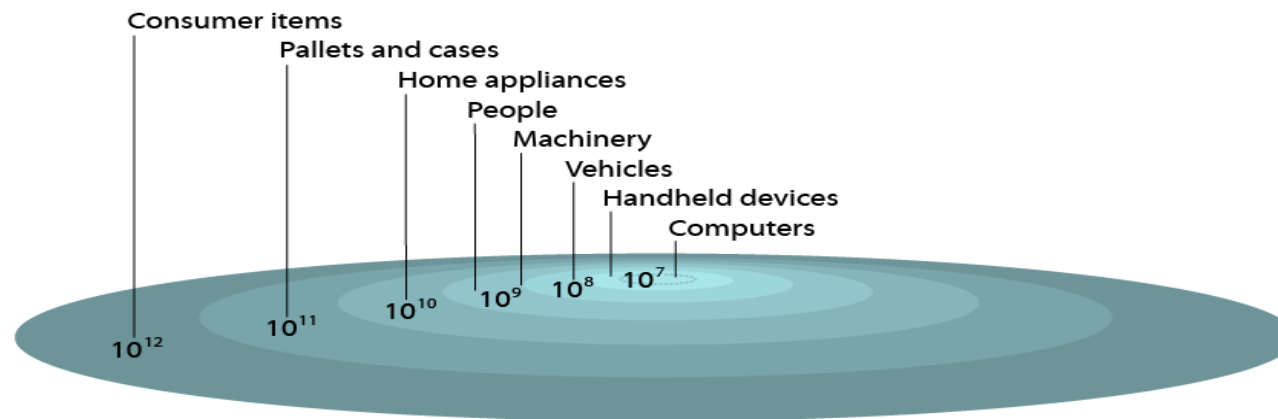
Thomas Runkler, Siemens Corporate Technology

Session: The role of Cyber-Physical Systems (CPS) for manufacturing

Cyber-Physical Systems in manufacturing and production workshop Brussels 30th October



Leading companies link their information systems to billions of physical objects to meet regulations, competition and customer requirements, automate business transactions and accelerate cooperation with employees and partners



Physical object	Firms taking advantage of Internet connection with this object
Vehicles	Norwich Union: Its "Pay As You Drive" car insurance scheme uses a telematics system to charge drivers a monthly adjusted premium based on actual car usage
Machinery	Caterpillar: Its MineStar system uses GPS to guide Cat machines in a mining field and uses data from embedded sensors to predict and prevent equipment failure Delta Air Lines: Analyzes telemetry data from its aircraft engines to prevent failure
Consumer items	Michelin: Is embedding RFID tags in its tires

Source:
Forrester Research, Inc
2006.



Internet of Things

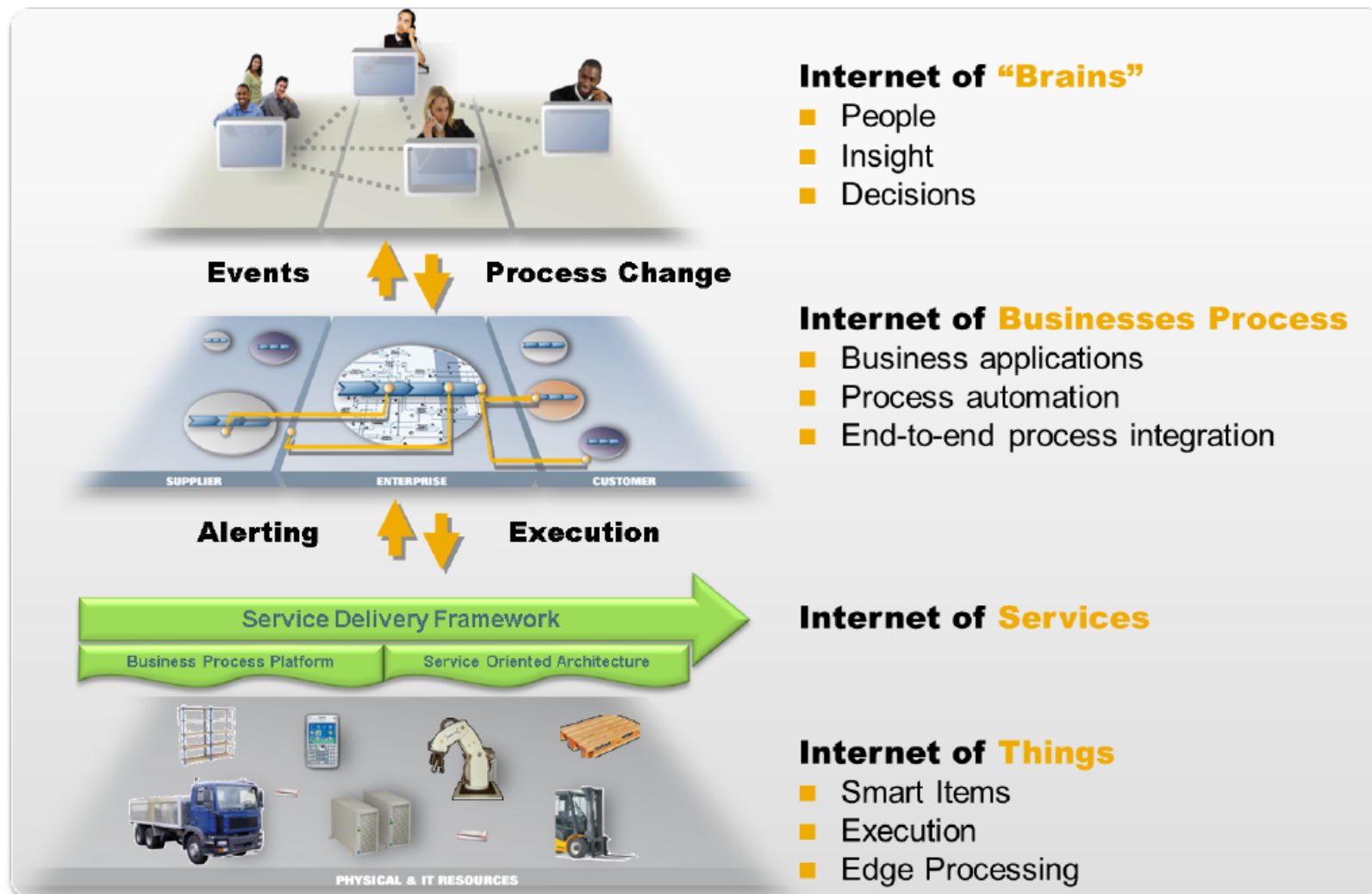
According to some estimates there will be 50 billion mobile wireless devices connected to the Internet across the globe by 2020

The total number of devices connected to the Internet in some way could reach 500 billion.

OECD (2012), "Machine-to-Machine Communications: Connecting Billions of Devices", *OECD Digital Economy Papers*, No. 192, OECD Publishing.



Interconnected Manufacturing



Stamatis Karnouskos

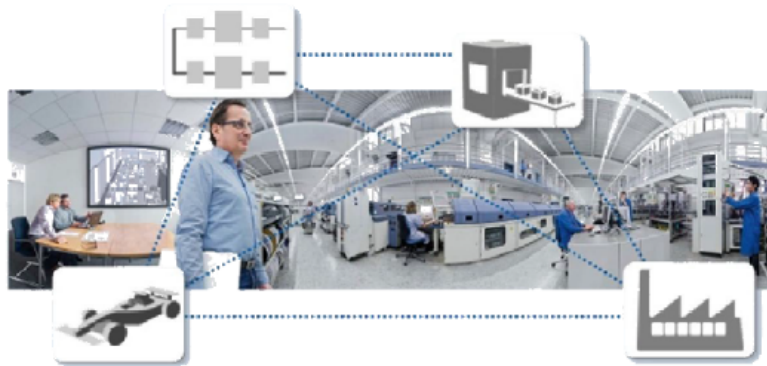
Cyber-Physical Systems in manufacturing and production workshop

Brussels 30th October 2013



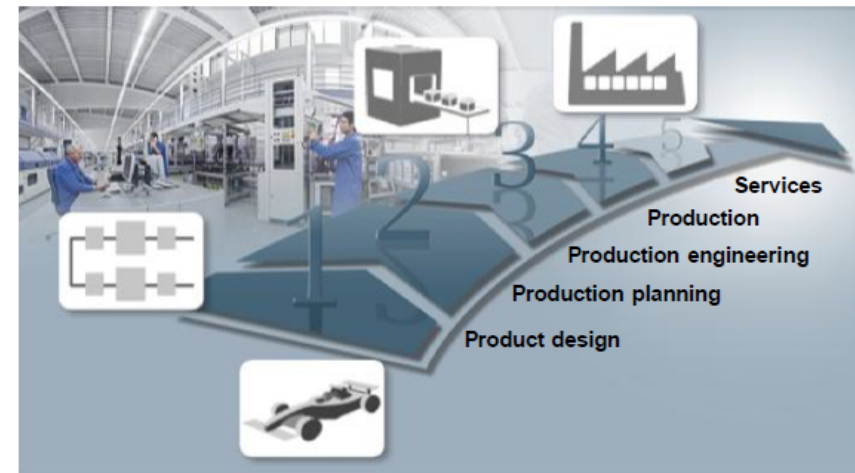
Holistic Engineering

Historically grown IT systems with complex interfaces



Seamless integrated tool chain

→ Product and production always harmonized on each other



- Enhanced quality
- Enhanced customer satisfaction
- Reduced operation costs

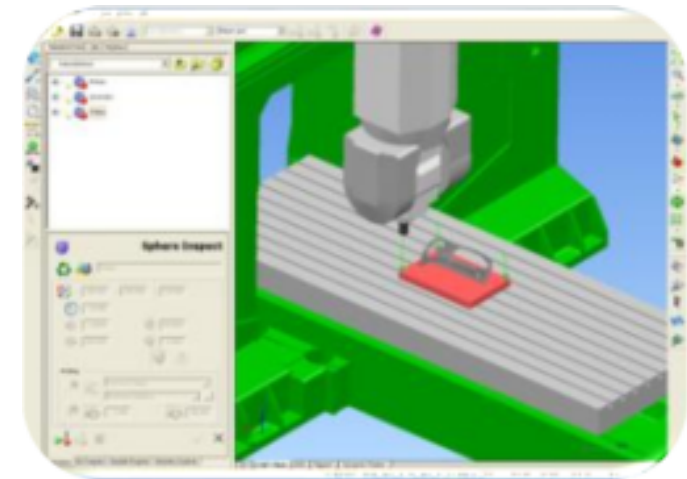


Modelling, Simulation & Forecasting

All previously mentioned enablers are reinforced by the capability of simulating manufacturing processes or forecasting the behaviour of manufacturing systems & processes. Advances in ICT are moreover enabling the further development of simulation & forecasting tools.

Research in this area will focus on:

- Modelling & simulation for the (co-)design & management of integrated product-process-production systems
- Virtual modelling spanning all levels of the factory life-cycle





Cyber Security in Manufacturing



Security Intelligence Index 2014



MFG ICT trends



Cyber Physical Systems

Product and Factory - Life Cycle Management

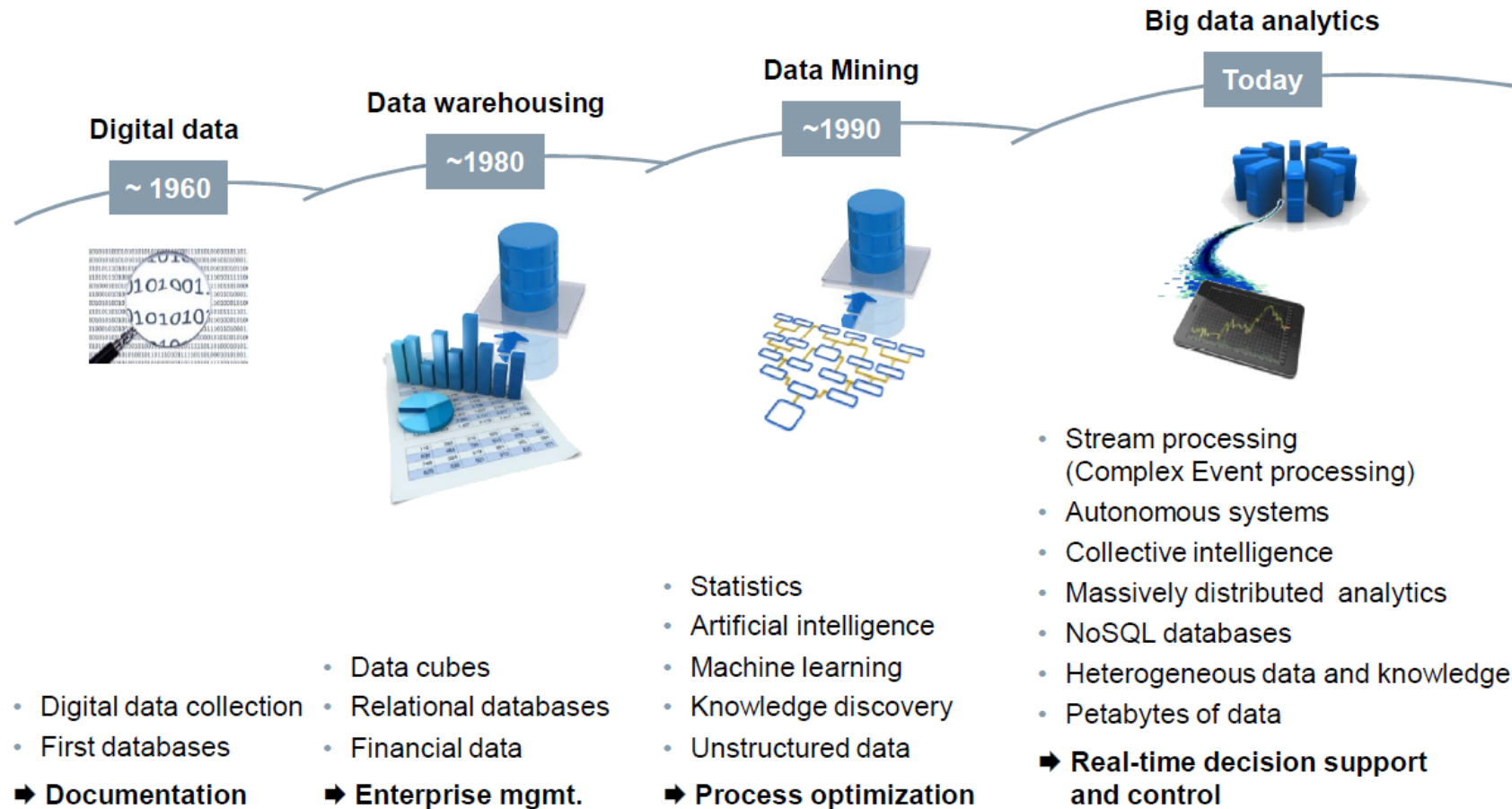
Modeling Simulation Forecasting

Big Data
Security, Reliability and Analytics



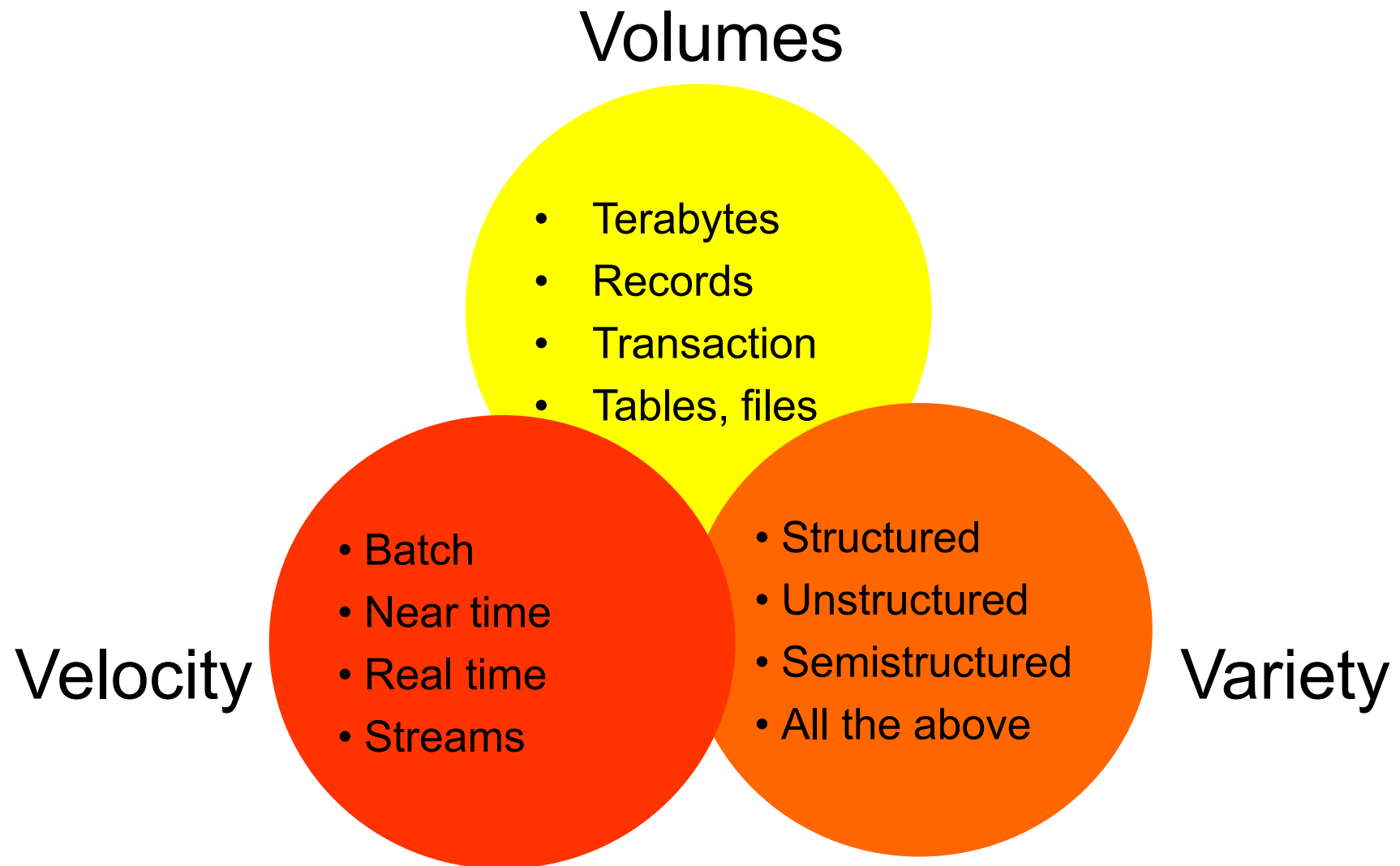
Big Data

Innovation waves lifting Business Intelligence / Data Analytics





Big Data Dimensions





Big Data Challenges

- Create a culture that integrates information everywhere in the company and allow all employees to take informed decisions;
- Proactively manage privacy, security and governance;
- Implement an architecture able to ensure:
 - Backward / Forward Compatibility and Scalability
 - Creation of Modular Services
 - Cross-network Dynamic interconnection
 - Cross-layer Integration
 - Real-time Interaction and Mobility Support

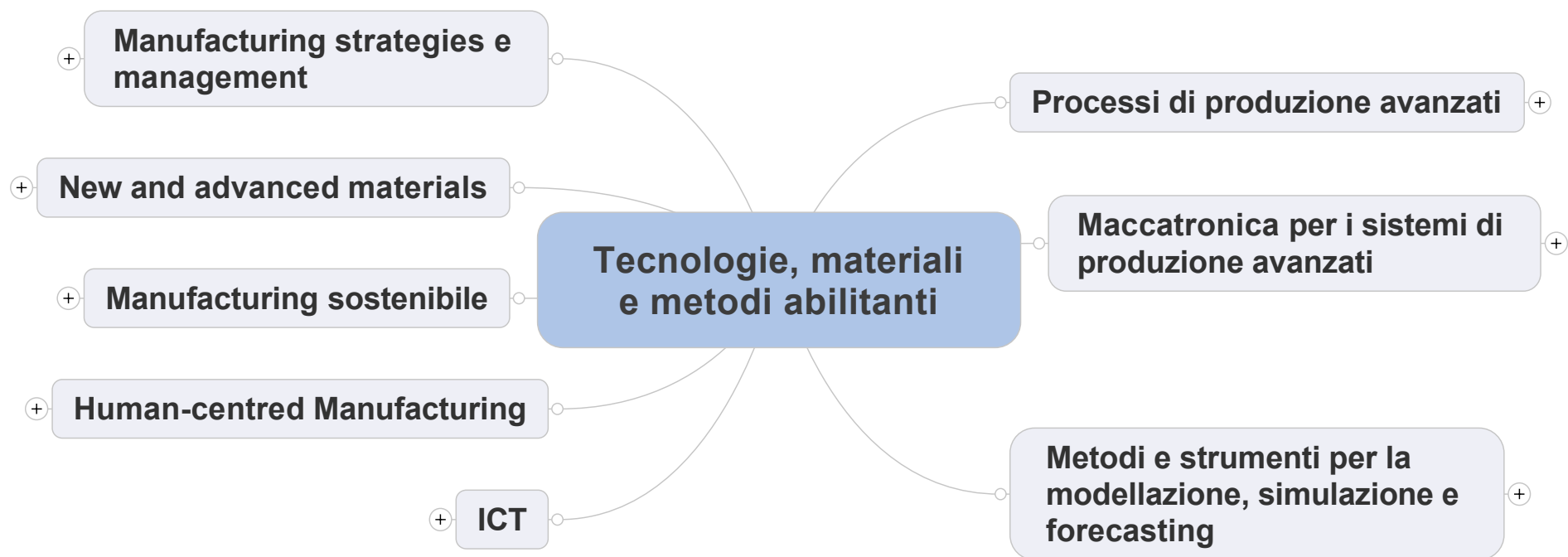


Polimi Projects and Initiatives

- EU Roadmapping:
 - ACTIONPLANT : ICT for Manufacturing
 - PATHFINDER : Simulation and Forecasting
 - sCorPiuS : CPS for the Manufacturing Industry
- Cluster Nazionale Fabbrica Intelligente
- Associazione Fabbrica Intelligente Lombardia (AFIL)

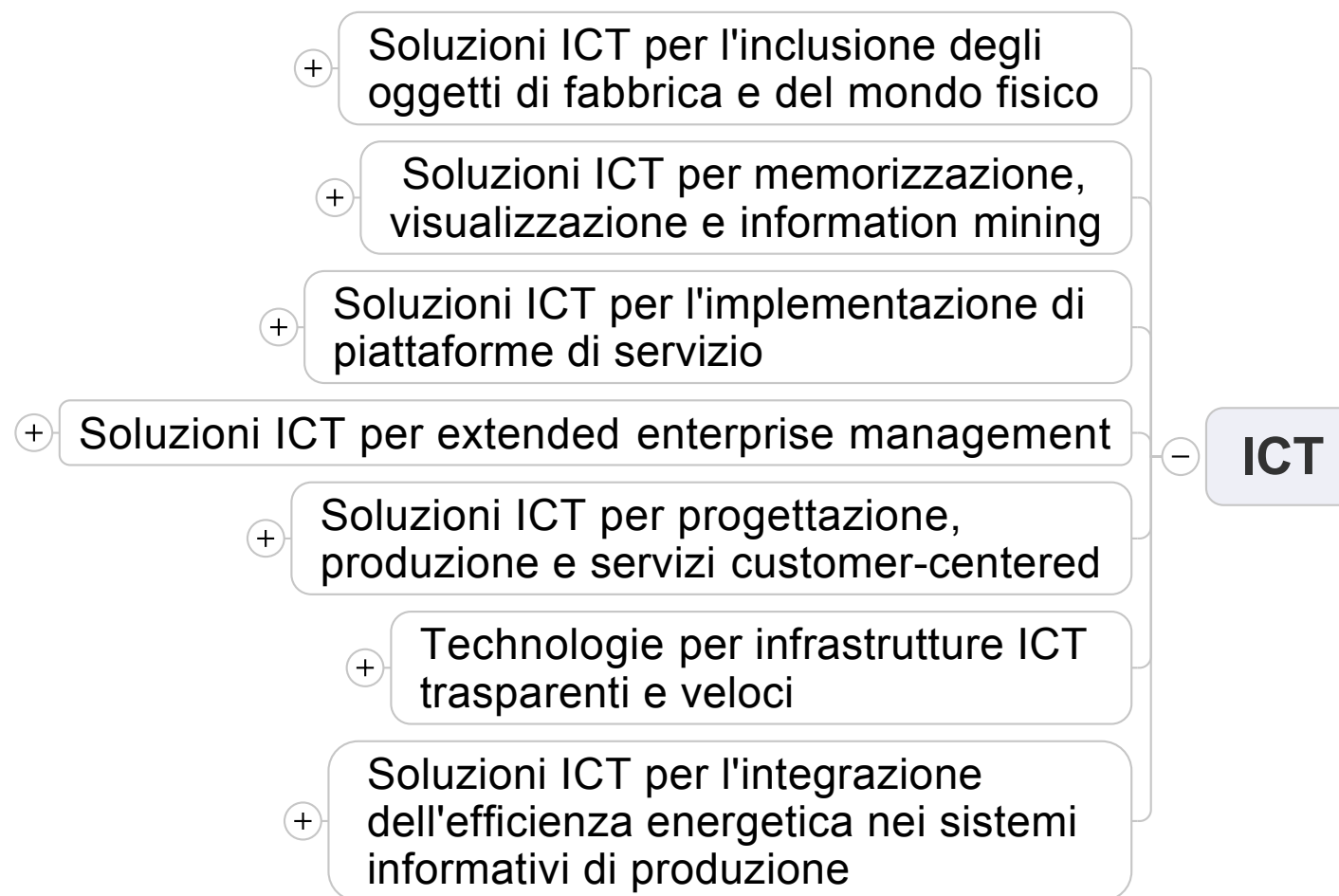


Lo stato attuale della roadmap





Lo stato attuale della roadmap





1. ESM - Efficient and Sustainable Manufacturing
 1. Demanufacturing
 2. Adaptive and Smart Manufacturing Systems
 3. Energy and Environmental Efficiency
 4. Sustainable surface treatments and coating technologies
2. High performance production with 3D printing
3. Advanced Manufacturing to meet the challenges for offshore oil/gas and renewable energy applications