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Future of Manufacturing

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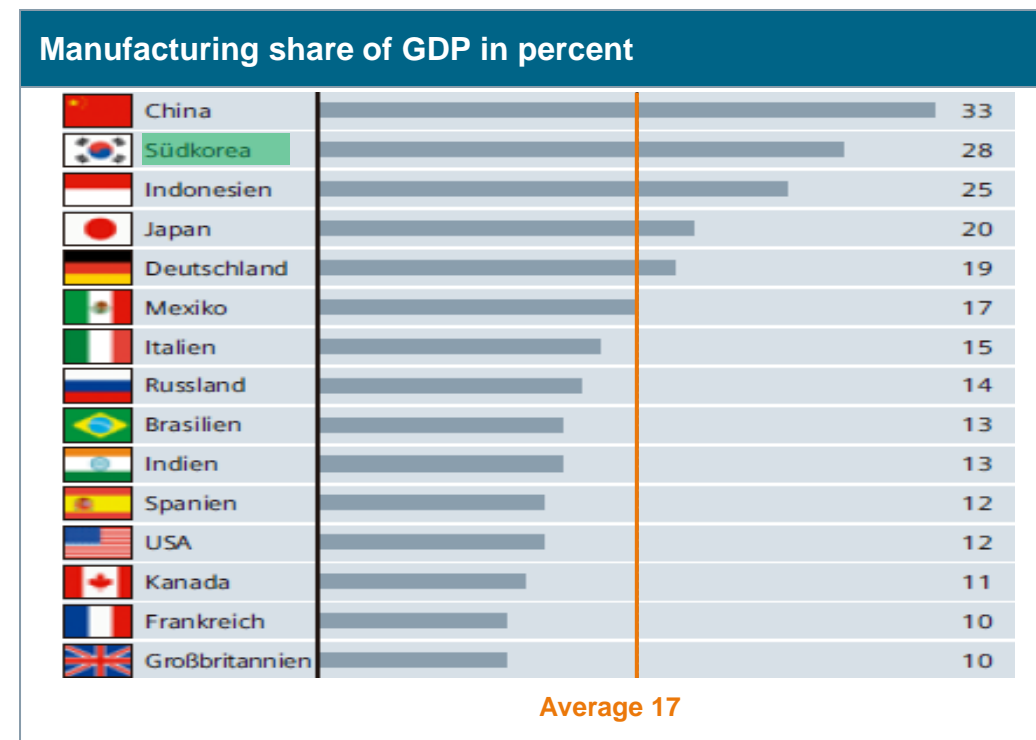
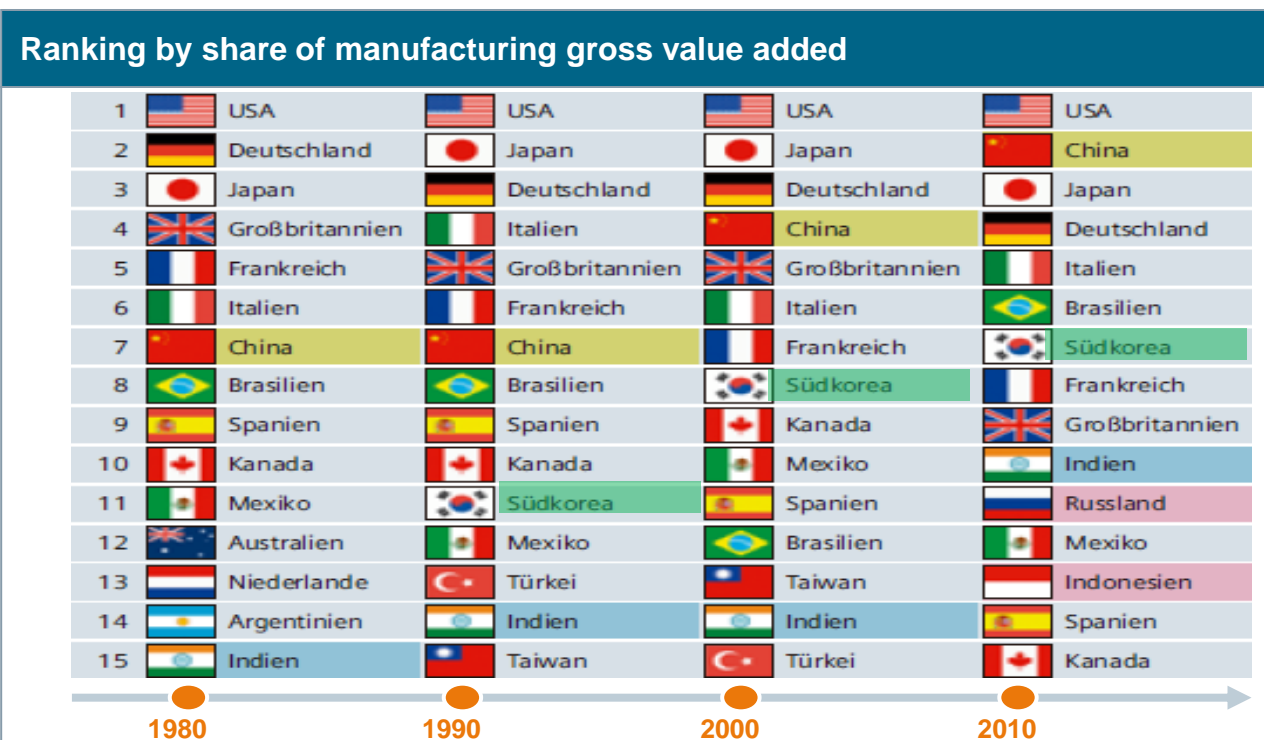


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The global challenges

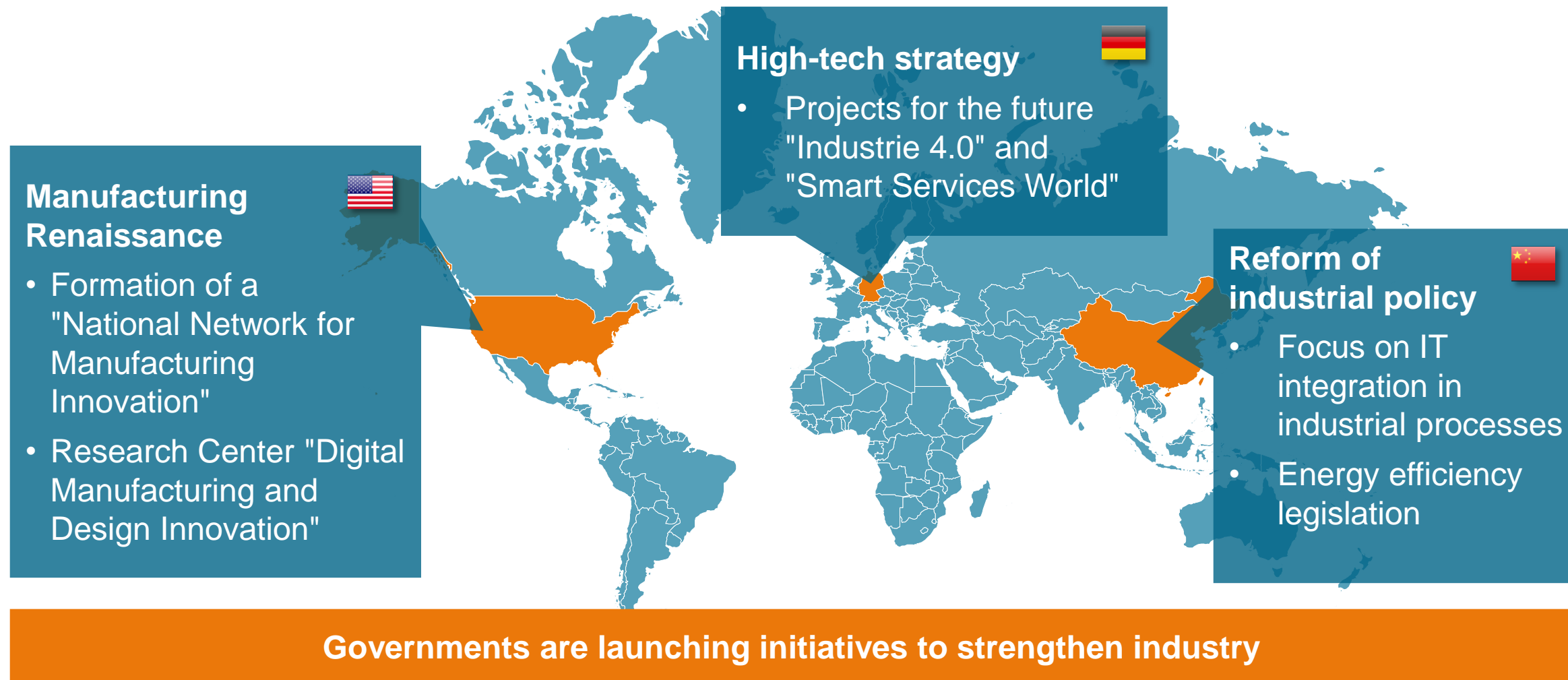
Korea into the top ranks of global manufacturing

- Manufacturing output continues to grow by about 2.7 percent annually in advanced economies and 7.4 percent in large developing countries (between 2000 and 2007)
- South Korea's economy has risen steadily in global manufacturing, ranked 11th in 1990, 8th in 2000 and 7th in 2010.
- South Korea's manufacturing share of GDP is 28% ranked in the world's 2nd place.



Source: McKinsey Global Institute, IHS Global Insight, United Nations Statistics Division, BEA (Nov., 2012)

Manufacturing is getting more and more important all around the world



Challenges for industry are growing worldwide



Manufacturing is changing faster than ever before

Siemens Electronics Factory Amberg – Increased productivity and energy efficiency through Plant Data Services

- At a glance: Automated monitoring of electricity consumption values for the factory or

12 dpm =

Quality: 99.9988 %

Energy Analytics –

Intelligent reports and dashboards

line level: Savings
(previous year)

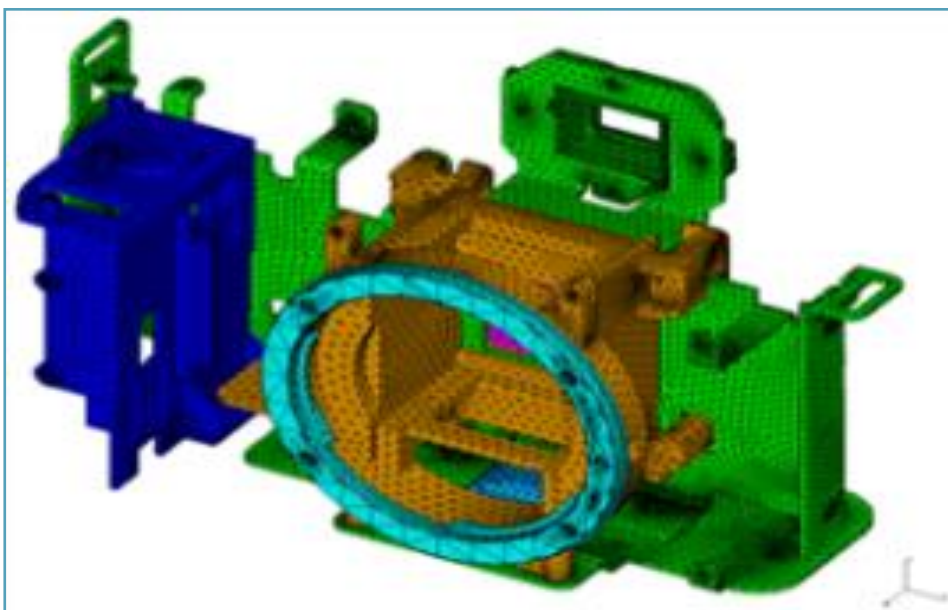
source input in non-production
of 100,000 liters liquid nitrogen

Challenges for industry are growing worldwide



Manufacturing is changing faster than ever before

Big Data – Data is growing exponentially

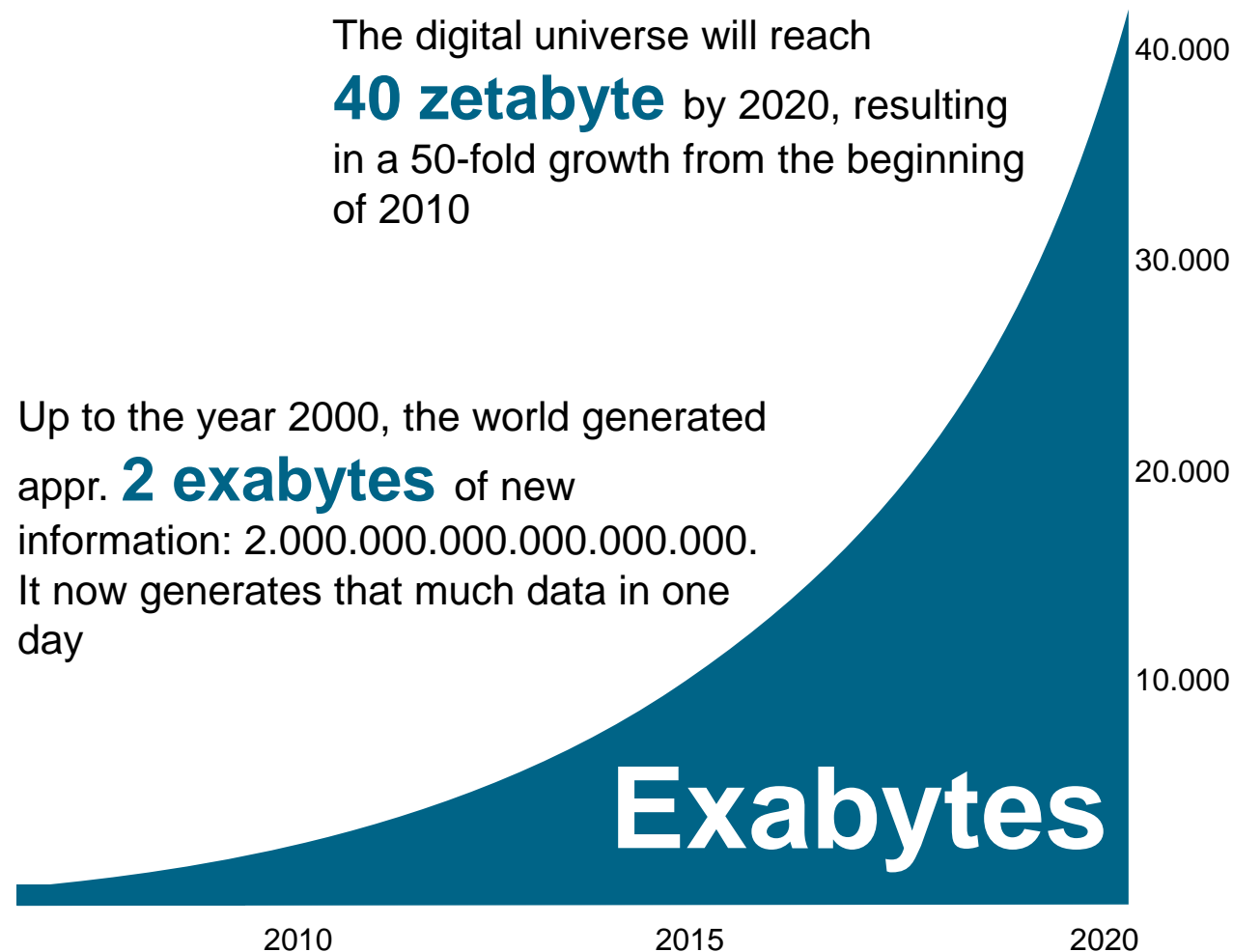


Product development

Product data of one camera increased from 1.8 terabytes to 296 terabytes

The digital universe will reach **40 zetabyte** by 2020, resulting in a 50-fold growth from the beginning of 2010

Up to the year 2000, the world generated appr. **2 exabytes** of new information: 2.000.000.000.000.000.000. It now generates that much data in one day



Source: IDC's Digital Universe Study, sponsored by EMC, December 2012

Challenges for industry are growing worldwide



Manufacturing is changing faster than ever before

Increasing complexity and product variety – For example automotive industry

Configuration options VW Golf

Engines	11
Gears	3
Bodypanels	2
Chassis	4
Tire/rim combinations	10
Colors	45
Multimedia systems	11
Phone options	6
Assistance systems	15
Other selectable options	43



Several trillion possible combinations¹⁾

Source: Volkswagen Configurator VW Golf, ¹⁾estimated

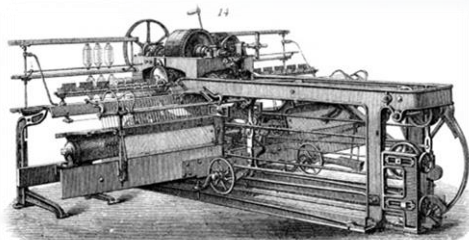
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The way to Industrie 4.0

Setting the pace for the next industrial "revolution"



Mechanical loom

End of 18th century

1st Industrial revolution

Introduction of **mechanical** production plants using water and steam power



Siemens single-phase generator

End of 19th century

2nd Industrial revolution

Introduction of mass production based on the division of labor using **electrical** energy



Programmable Logic Controller

1970

3rd Industrial revolution

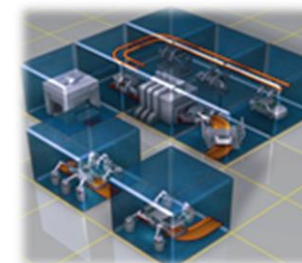
Introduction of **electronics and IT** to increase the level of automation

2010

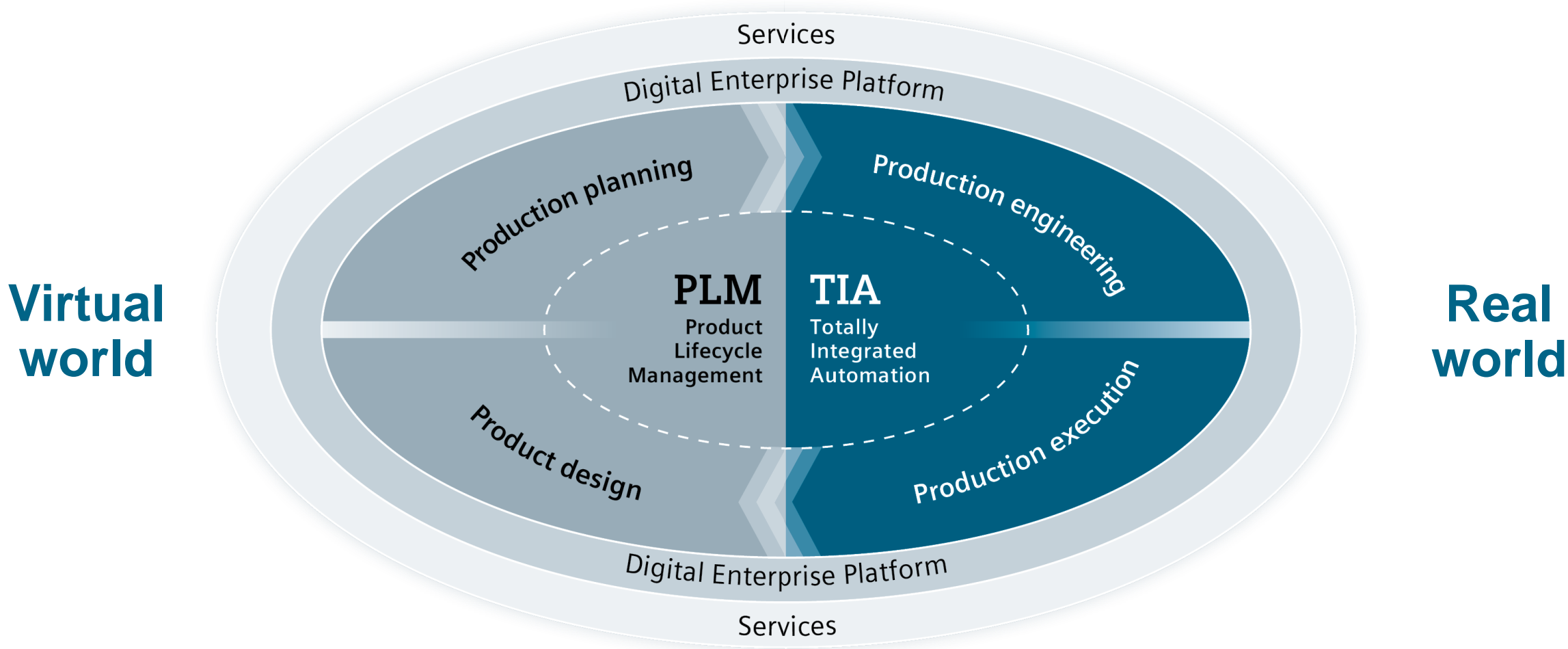
4th Industrial revolution

Introduction of **cyber-physical systems**

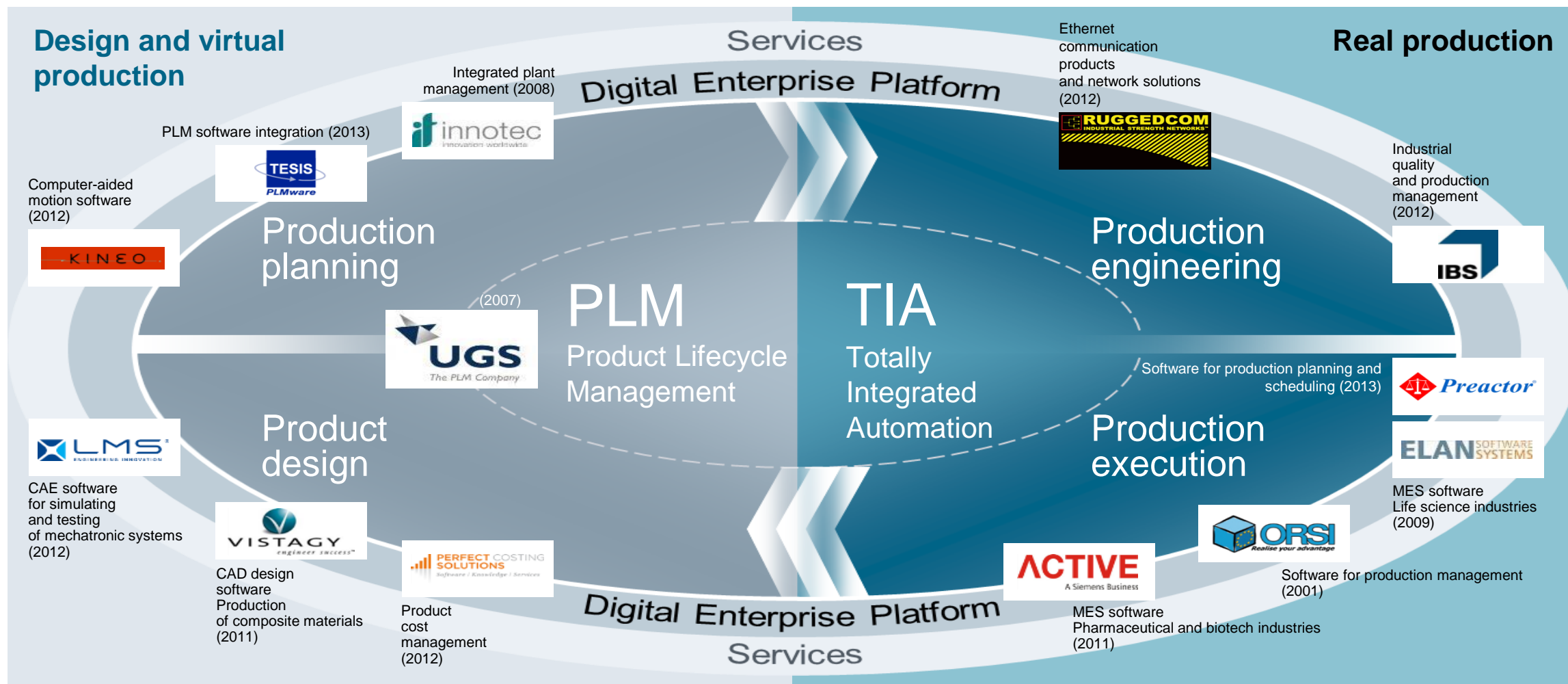
Industrie 4.0



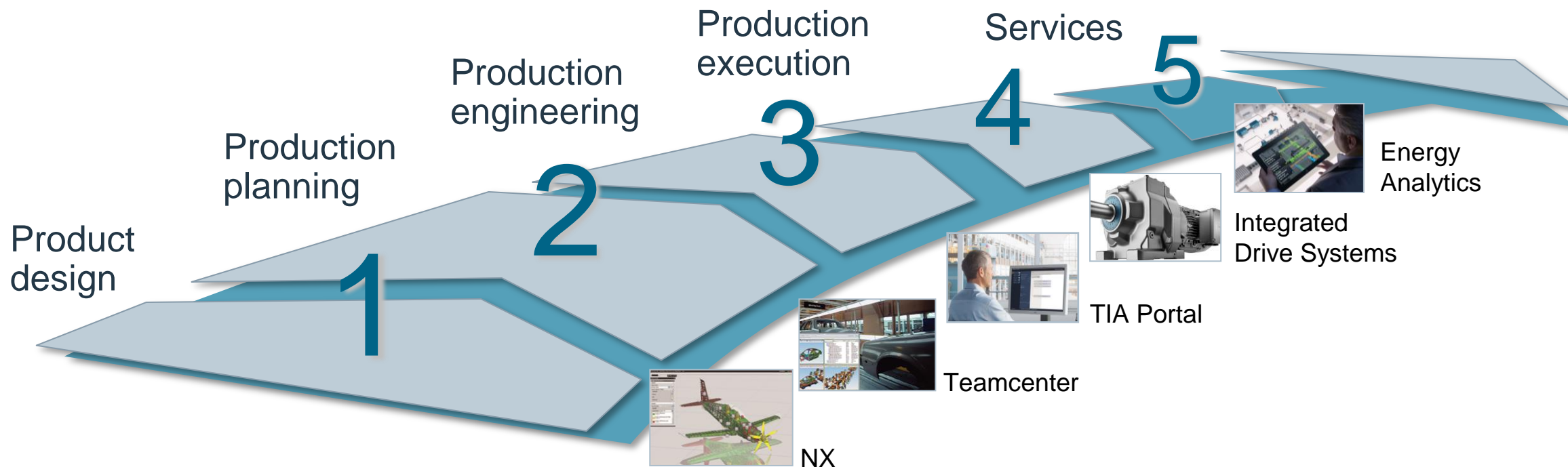
Real and virtual worlds are converging thanks to innovative software and powerful hardware



Siemens is linking digital product planning with physical production: 4 billion EUR invested since 2007



The answer for the future of manufacturing – Covering the entire product development and production process

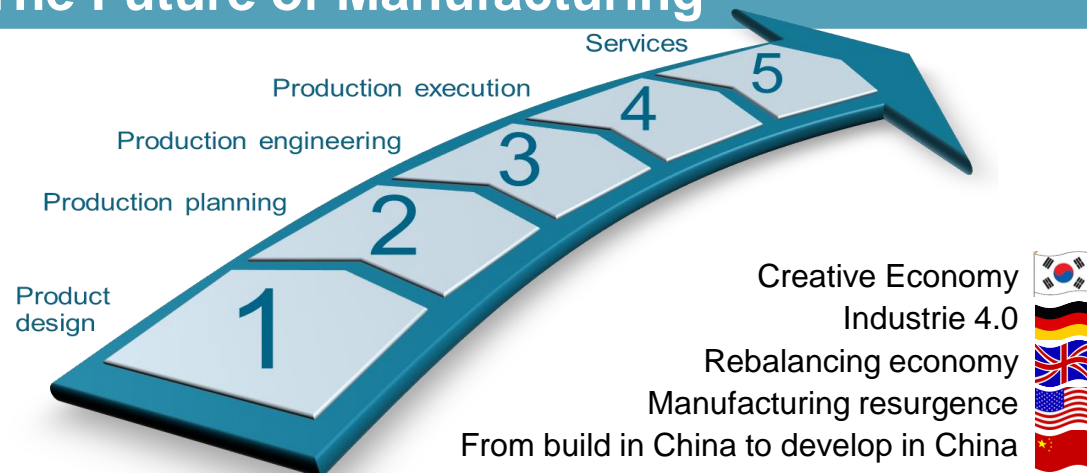


Verify design and manufacturing processes virtually – validate and optimize real production

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Lifecycle integration

The Future of Manufacturing

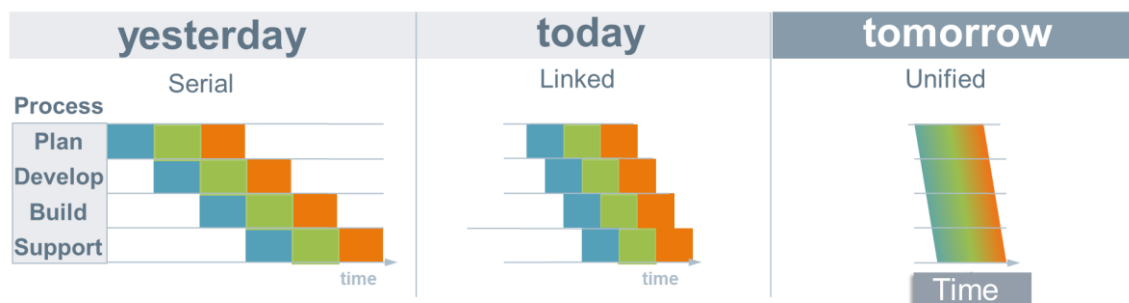


Automation becomes more and more complex

→ Siemens supports industrial enterprises **worldwide** in becoming more **competitive**

→ By strengthening the following key concepts:
Industry software, solutions for **resource-efficient** production, industrial **integration**

Digital Enterprise



We **integrate** all the steps along the value chain

- Based on excellent industry **software** and **automation** components
- To improve **productivity** and **efficiency**
- For our **target groups**.

Benefit: Faster time-to-market

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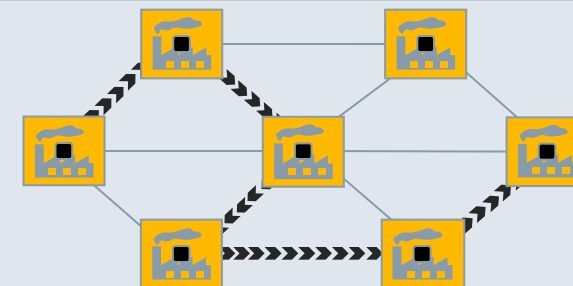
What has to be done

Industrie 4.0 – Three key elements

1

Production network

Flexible value chains with information available in realtime across company boundaries



2

Fusion of virtual and real world

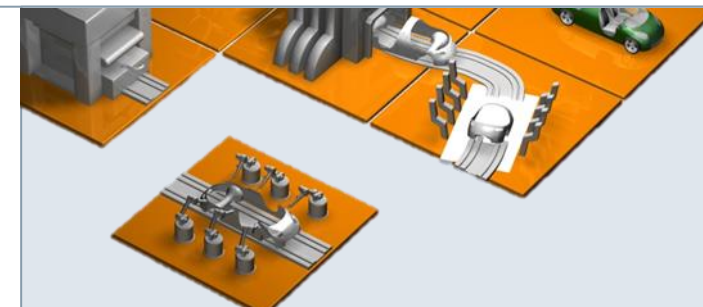
Integration of product design and production engineering for shorter time to market



3

Cyber-physical systems

Modular production units with complete and consistent virtual image



Our perspective of Industrie 4.0

What needs to be done!

Today: Industrie 3.x

Local controls

Realtime communication

Digital "copies" of products and production

Manufacturing Execution Systems

Industrial security concepts

Execution and decision making
mainly by humans

- **Rule framework and architecture for dynamic topologies**
- **Integrated process simulation**
- ...

Future: Industrie 4.0

Dynamic network of local controls

Extended complex communication

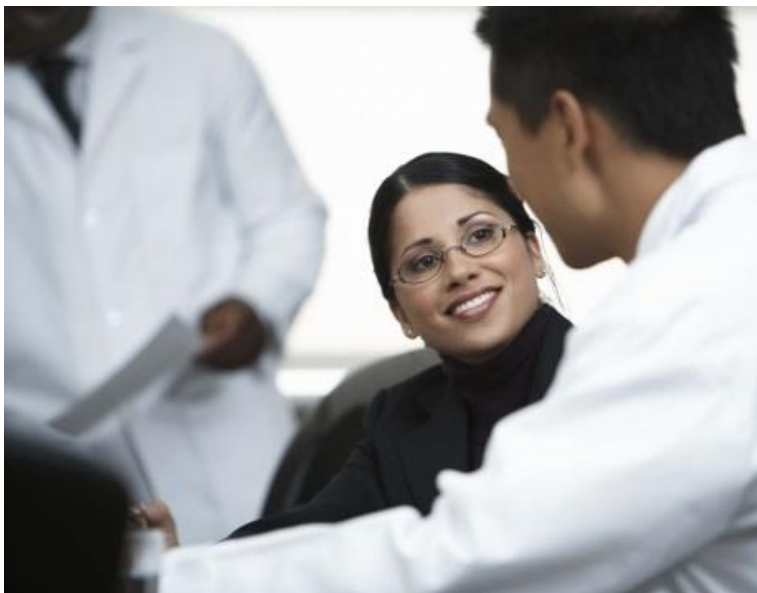
Digital models of the overall
process and participants

Process optimization in dynamic networks

Self-configuring security concepts
also for temporary requirements

Humans to define rules and frameworks
for decision making

Future of Manufacturing – Prepare for change!



1 Look for strong partnerships

2 Strengthen R&D

3 Train your employees

Thank you for your attention!



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