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# Future of Manufacturing

24<sup>th</sup> of October, 2014

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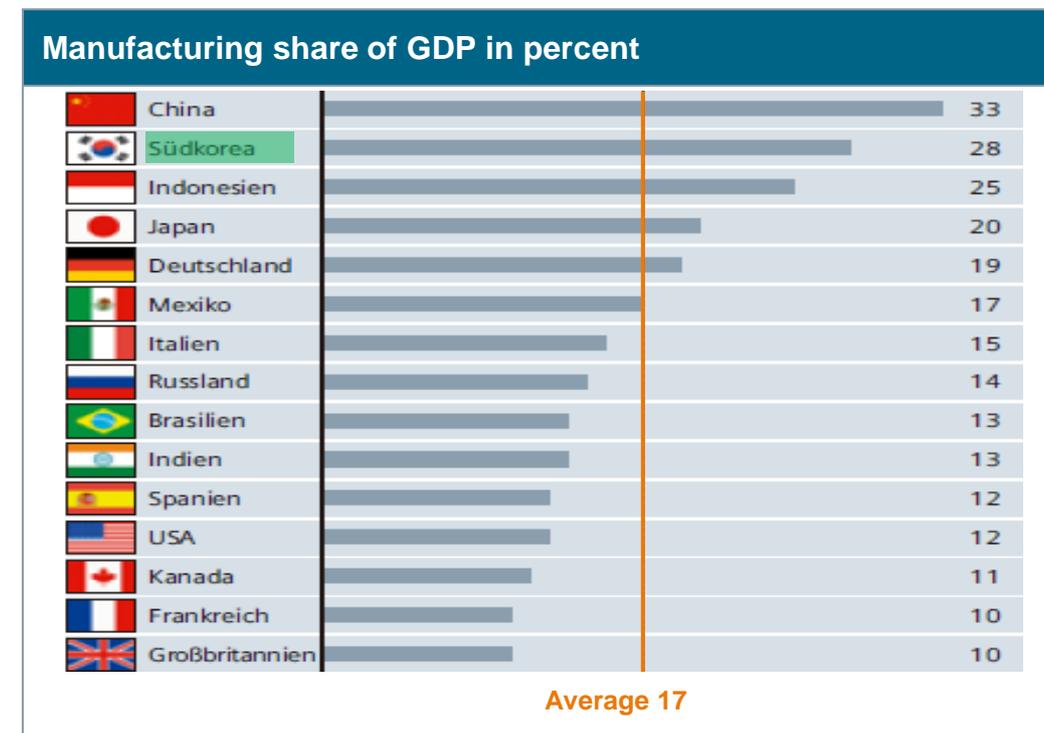


Future of Manufacturing

# The global challenges

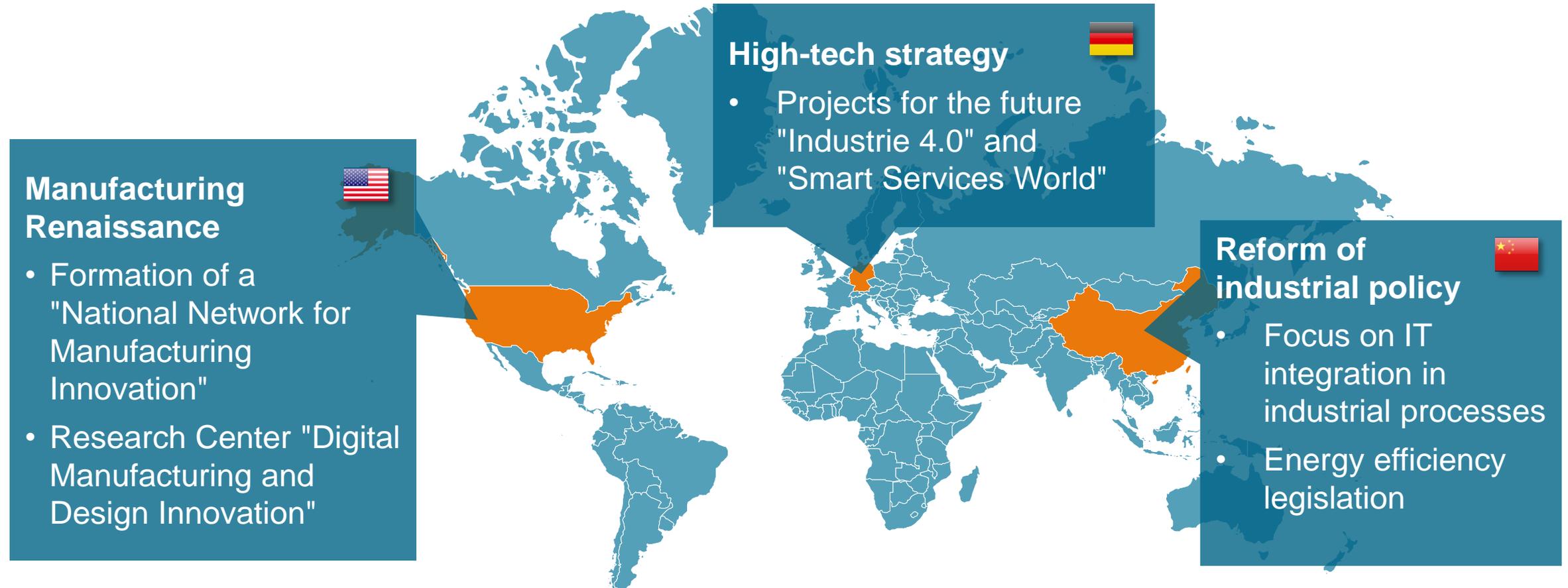
## Korea into the top ranks of global manufacturing

- 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 11<sup>th</sup> in 1990, 8<sup>th</sup> in 2000 and 7<sup>th</sup> in 2010.
- South Korea's manufacturing share of GDP is 28% ranked in the world's 2<sup>nd</sup> place.



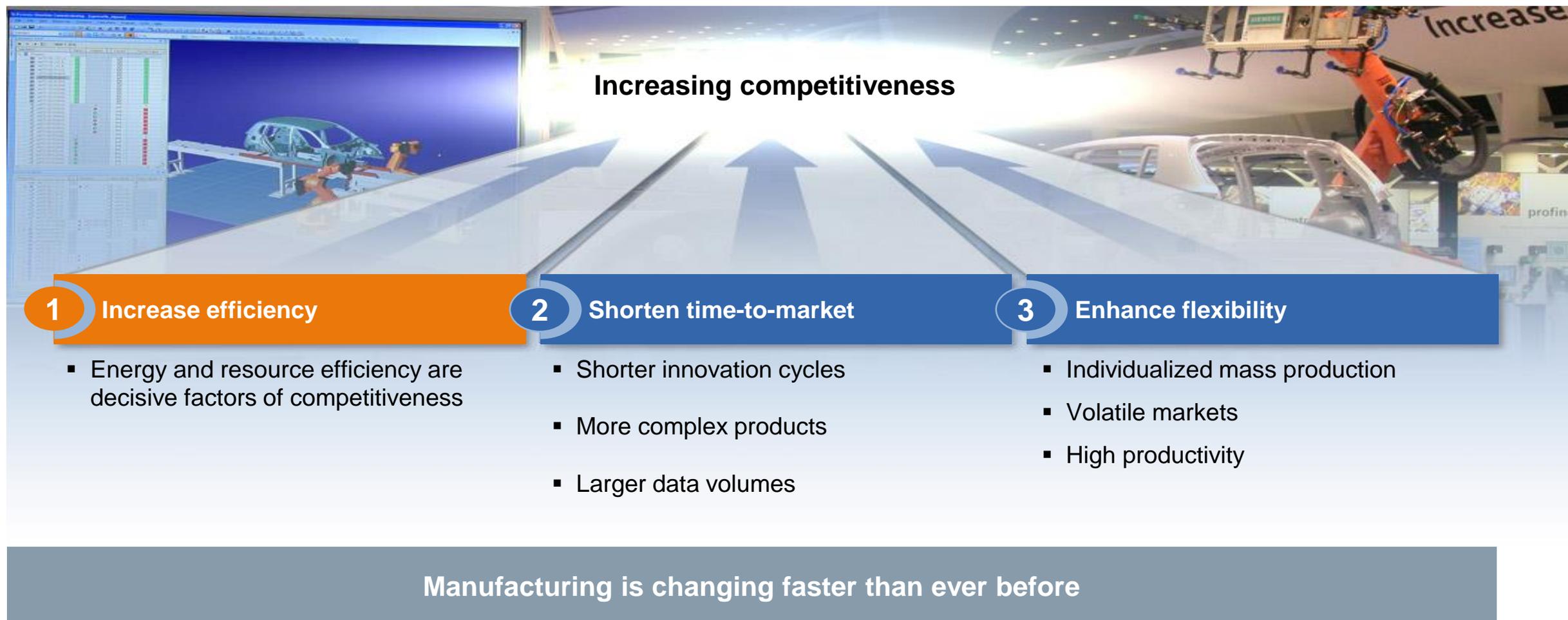
Source: McKinsey Global Institute, IHS Global Insight, United Nations Statistics Division, BEA (Nov., 2012)

## Manufacturing is getting more and more important all around the world



**Governments are launching initiatives to strengthen industry**

## Challenges for industry are growing worldwide



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



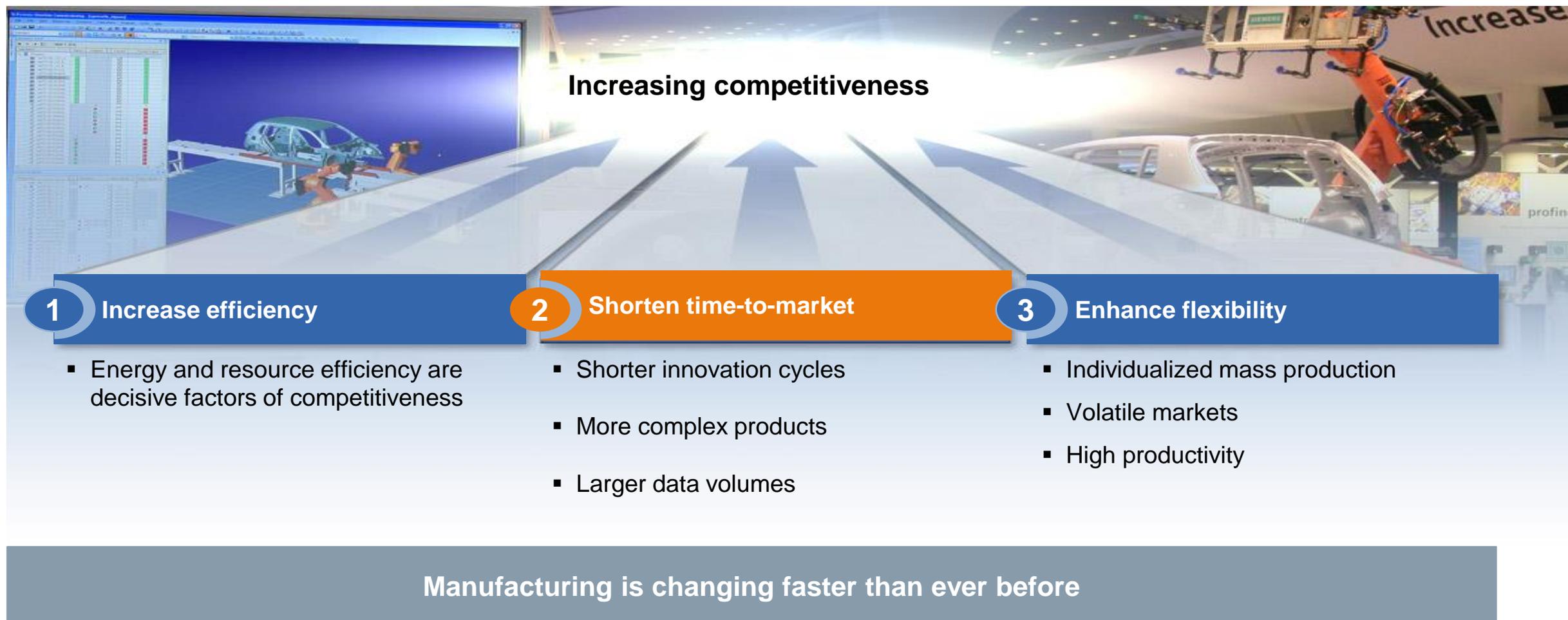
- At a glance: Automated monitoring of electricity consumption values for the factory or

**12 dpm =**  
**Quality: 99.9988 %**

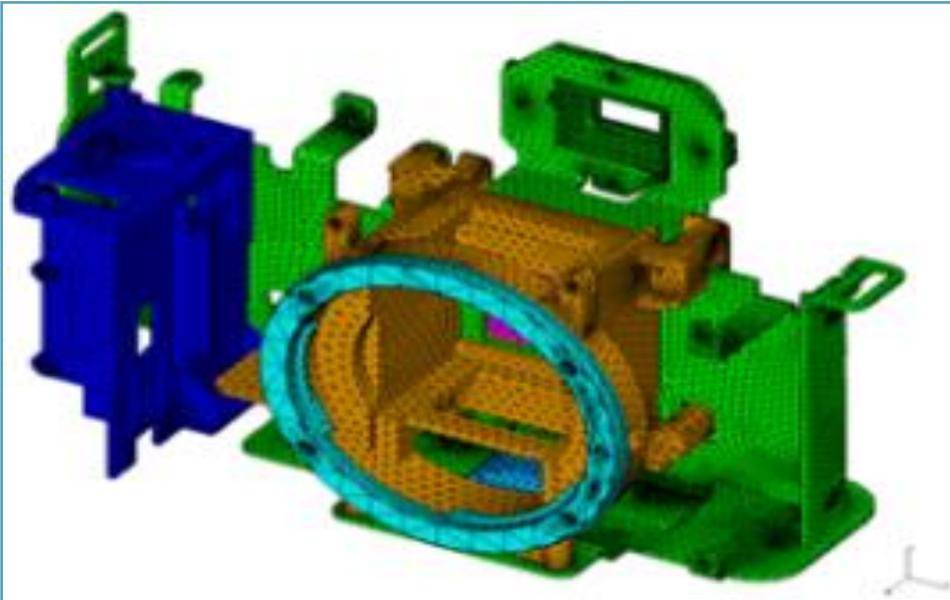
line level: Savings (previous year)  
source input in non-production  
of 100,000 liters liquid nitrogen

**Energy Analytics –  
Intelligent reports and dashboards**

## Challenges for industry are growing worldwide



## Big Data – Data is growing exponentially

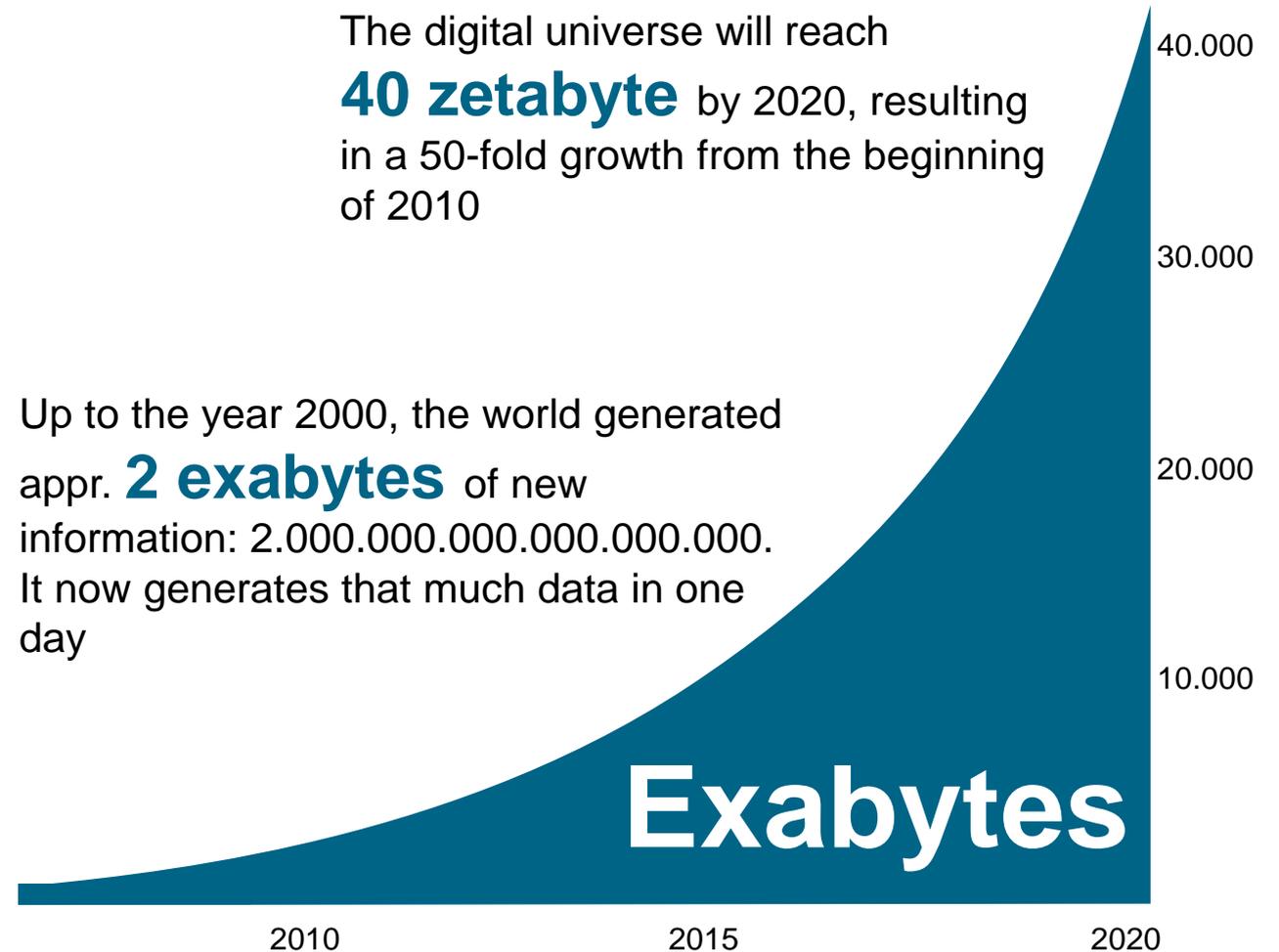


### Product development

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

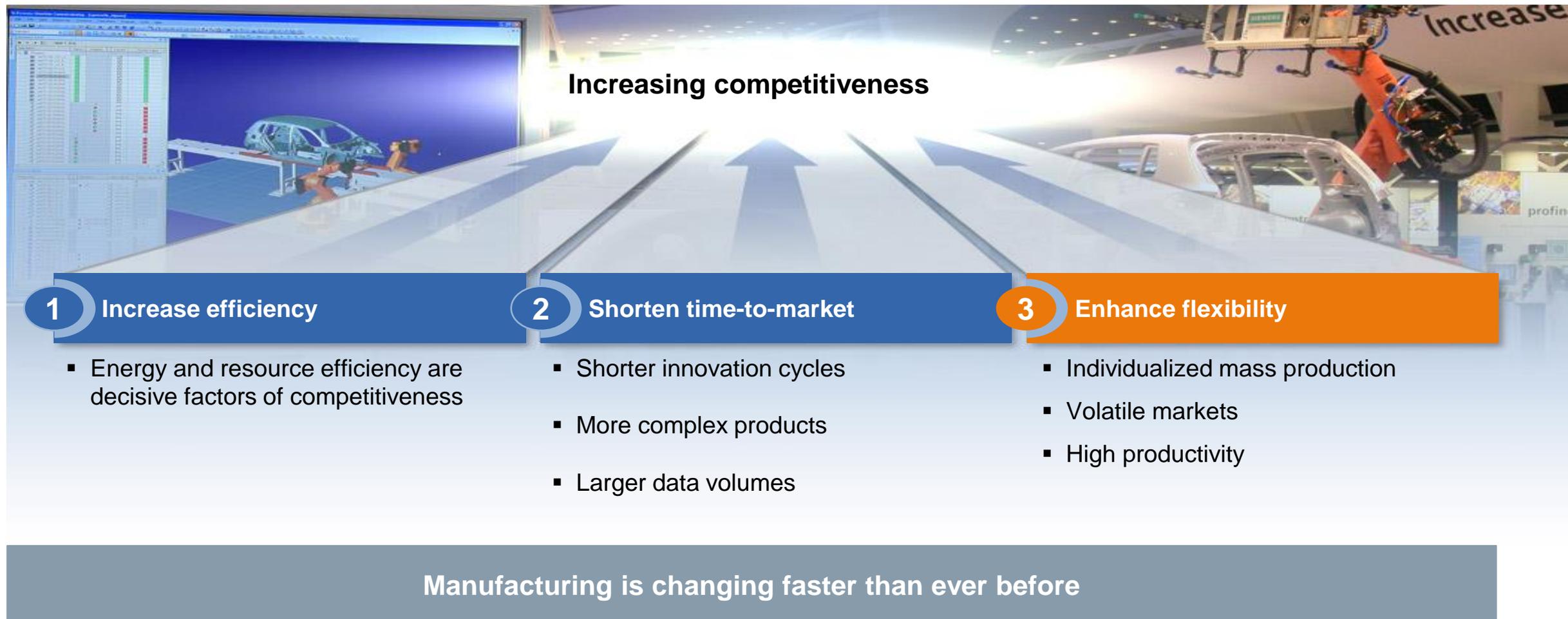
The digital universe will reach **40 zetabyte** by 2020, resulting in a 50-fold growth from the beginning of 2010

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



## 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 combinations<sup>1)</sup>

Source: Volkswagen Configurator VW Golf, <sup>1)</sup>estimated

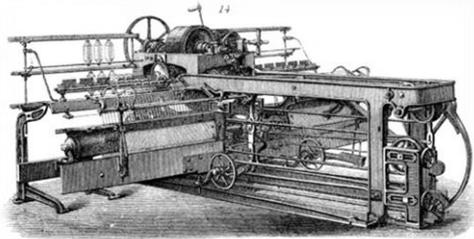
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# The way to Industrie 4.0

# Setting the pace for the next industrial "revolution"

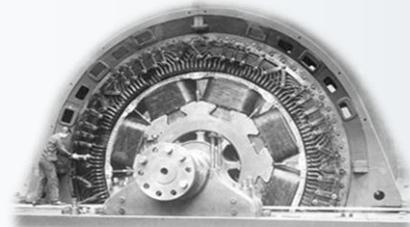


Mechanical loom

End of 18th century

## 1<sup>st</sup> Industrial revolution

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



Siemens single-phase generator

End of 19th century

## 2<sup>nd</sup> Industrial revolution

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



Programmable Logic Controller

1970

## 3<sup>rd</sup> Industrial revolution

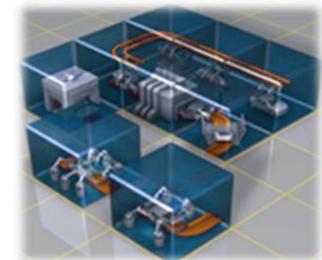
Introduction of **electronics and IT** to increase the level of automation

2010

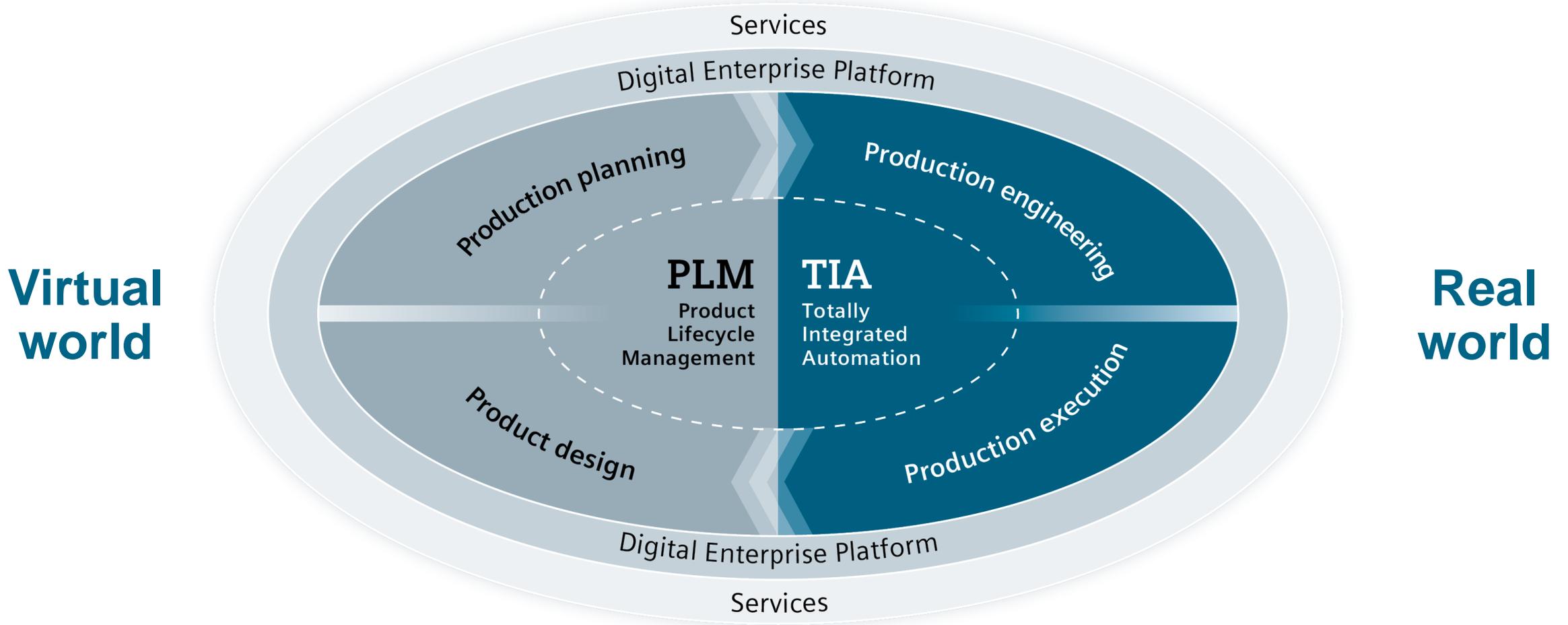
## 4<sup>th</sup> Industrial revolution

Introduction of **cyber-physical systems**

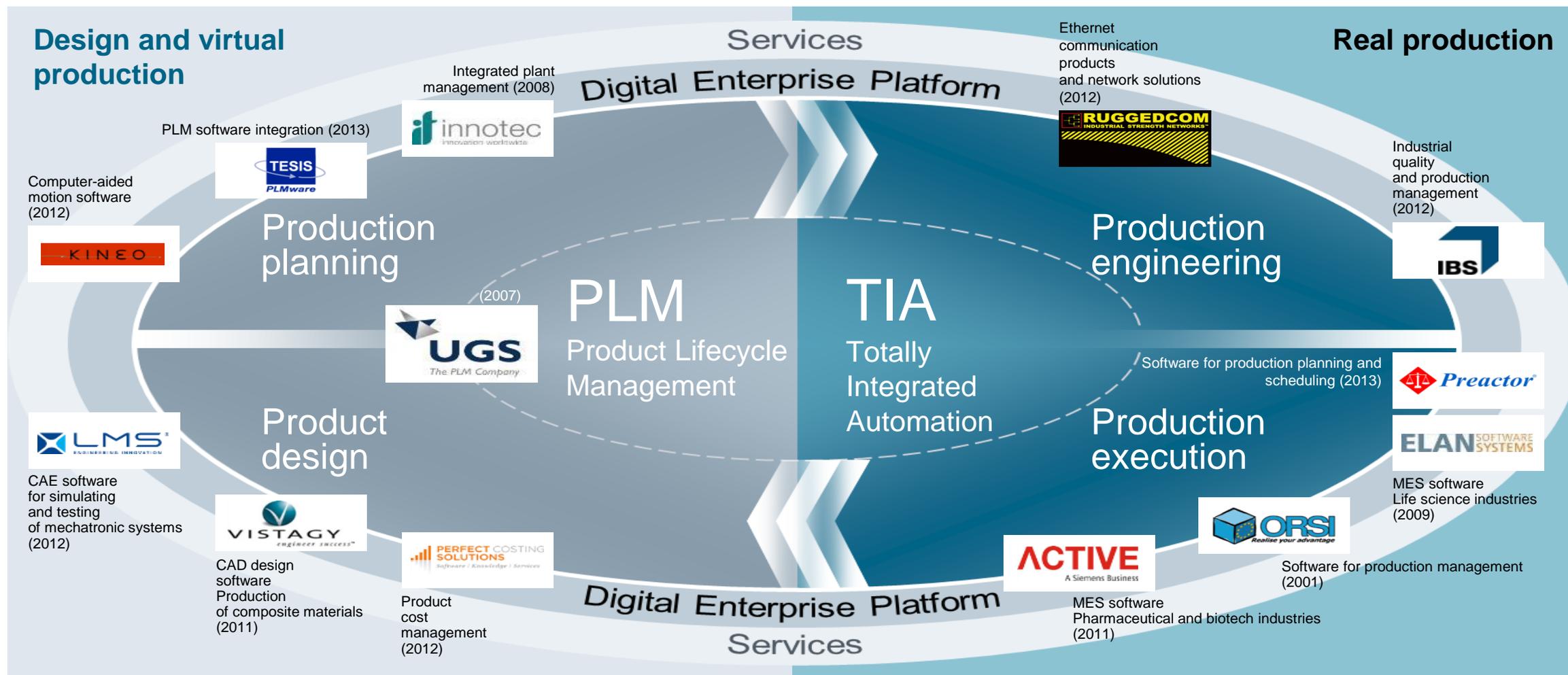
## Industrie 4.0



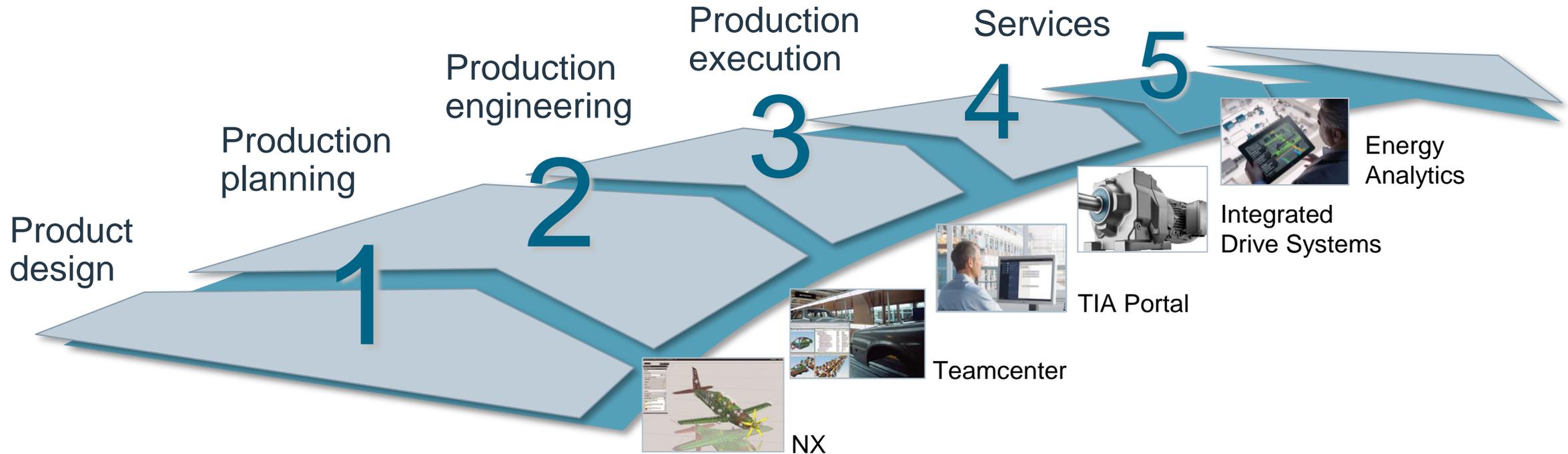
Real and virtual worlds are converging thanks to innovative software and powerful hardware



# 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

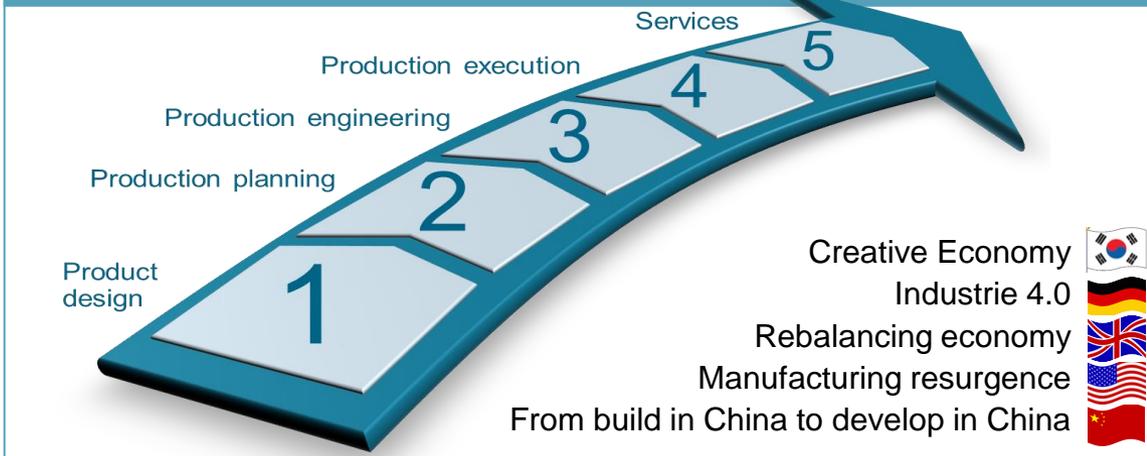


**Verify design and manufacturing processes virtually – validate and optimize real production**

# Future of Manufacturing

## 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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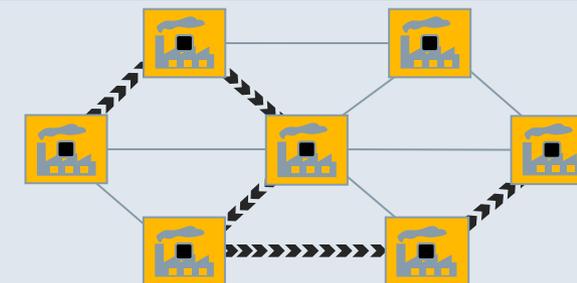
# What has to be done

## Industrie 4.0 – Three key elements

**1**

### Production network

Flexible value chains with information available in realtime across company boundaries

**2**

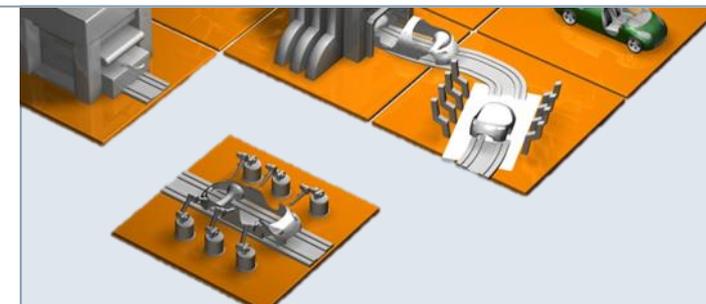
### Fusion of virtual and real world

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

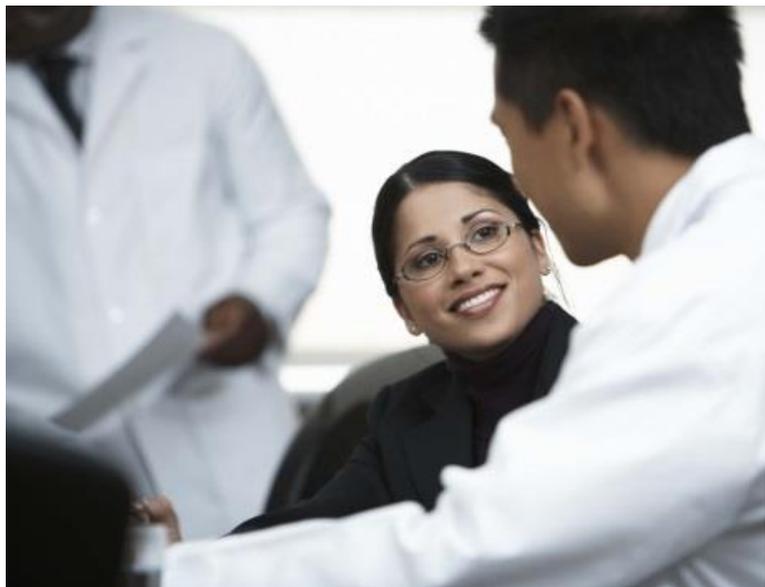
Digital models of the overall  
process and participants

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!

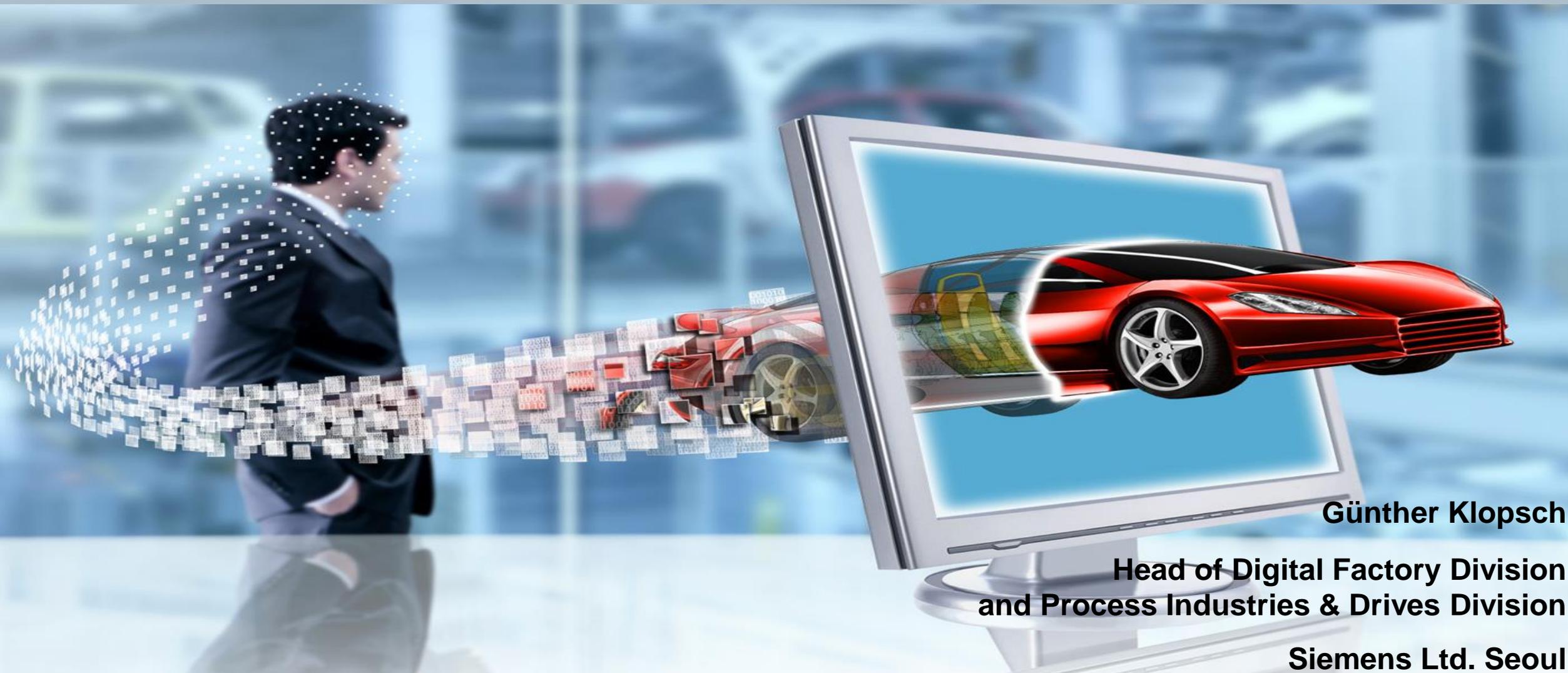


**1** Look for strong partnerships

**2** Strengthen R&D

**3** Train your employees

Thank you for your attention!



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and Process Industries & Drives Division**

**Siemens Ltd. Seoul**