Future of Manufacturing through Convergence

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Future of Manufacturing through Convergence

The global challenges

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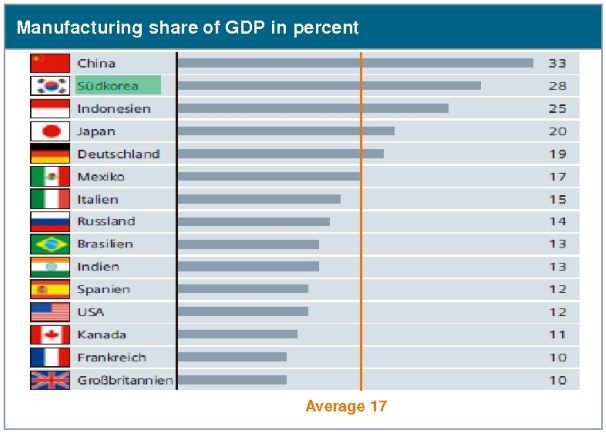
Korea into the top ranks of global manufacturing

- 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)

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Manufacturing is getting more and more important all around the world

Governments are launching initiatives to strengthen industry

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Challenges for industry are growing worldwide

- Energy and resource efficiency are decisive factors of competitiveness

- Shorter innovation cycles
- More complex products
- Larger data volumes

- Individualized mass production
- Volatile markets
- High productivity

Manufacturing is changing faster than ever before

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

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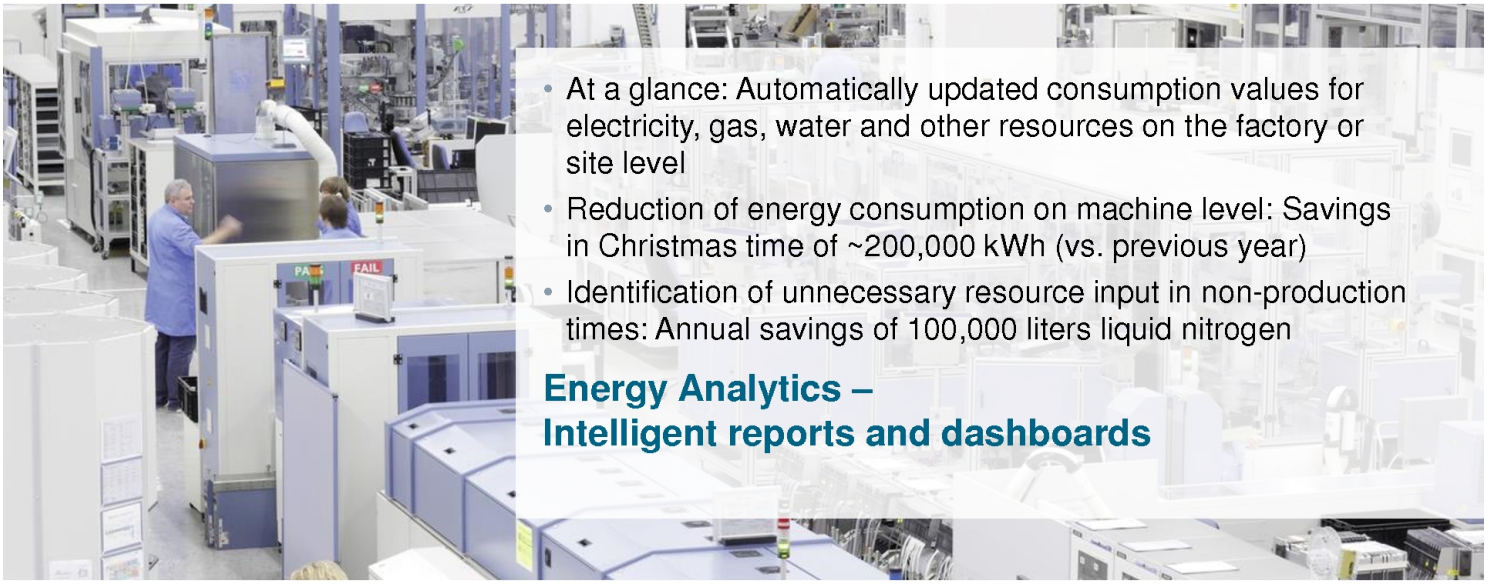

- At a glance: Automatically updated consumption values for electricity, gas, water and other resources on the factory or site level
- Reduction of energy consumption on machine level: Savings in Christmas time of ~200,000 kWh (vs. previous year)
- Identification of unnecessary resource input in non-production times: Annual savings of 100,000 liters liquid nitrogen

Energy Analytics – Intelligent reports and dashboards

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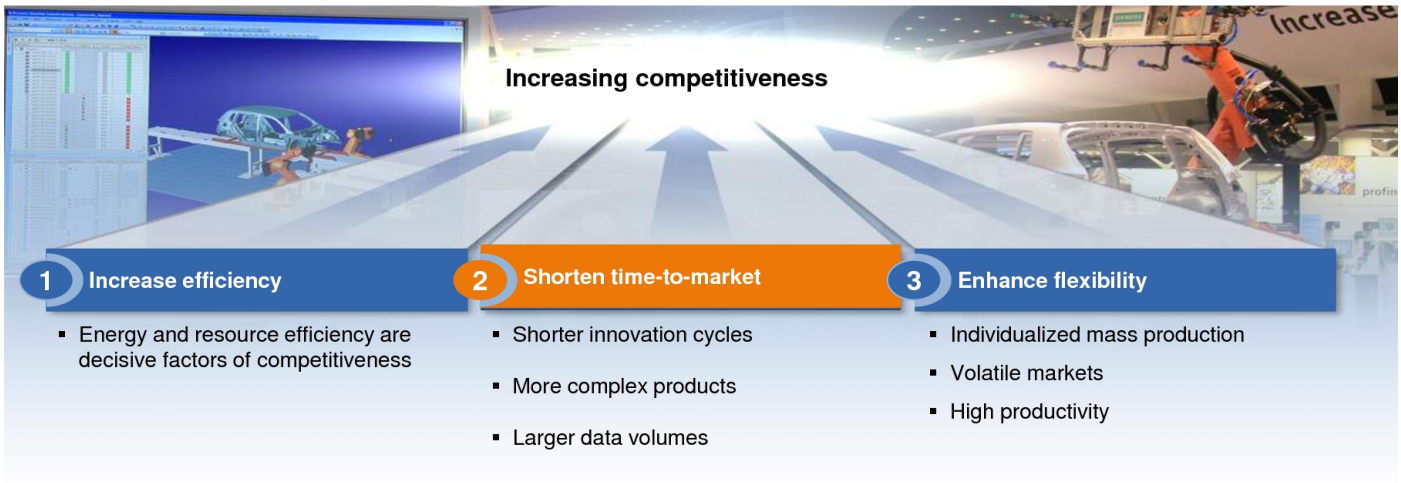
Challenges for industry are growing worldwide



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Manufacturing is changing faster than ever before

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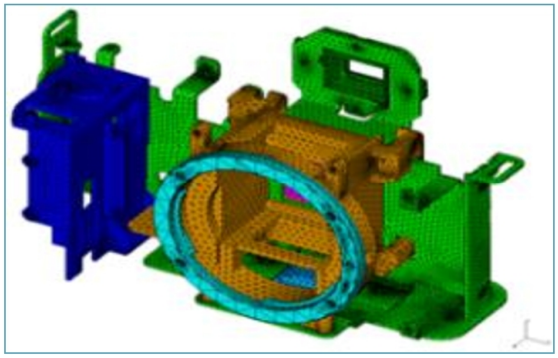
Big Data – Data is growing exponentially

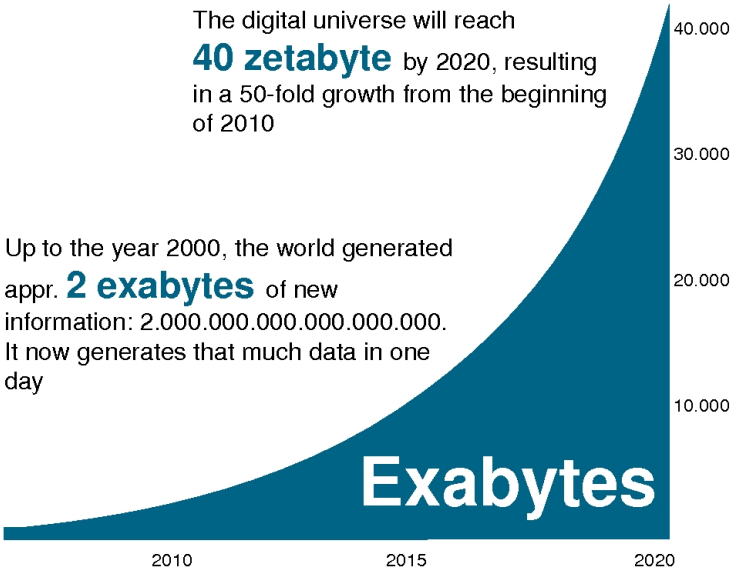


Product development

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, sponsered by EMC, December 2012

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Challenges for industry are growing worldwide

1 Increase efficiency

- Energy and resource efficiency are decisive factors of competitiveness

2 Shorten time-to-market

- Shorter innovation cycles
- More complex products
- Larger data volumes

3 Enhance flexibility

- Individualized mass production
- Volatile markets
- High productivity

Manufacturing is changing faster than ever before

Increasing complexity and product variety – For example automotive industry

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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

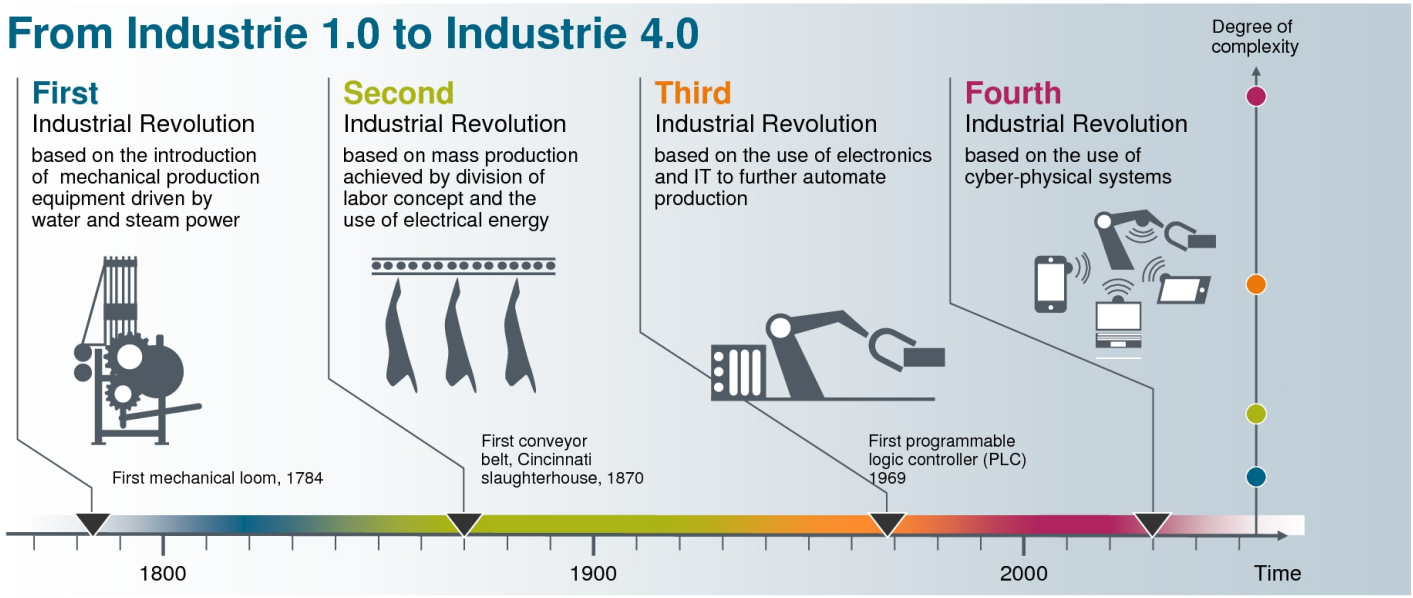
Several trillion possible combinations[1)]

Source: Volkswagen Configurator VW Golf, [1)]estimated

Future of Manufacturing through Convergence

The way to Industrie 4.0

Setting the pace for the next industrial "revolution"



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

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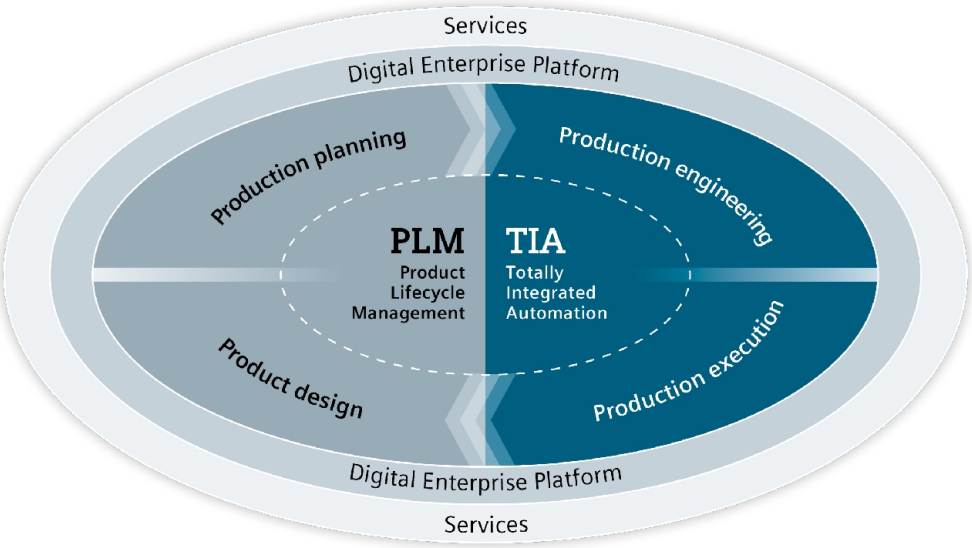
Virtual world



Real world

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

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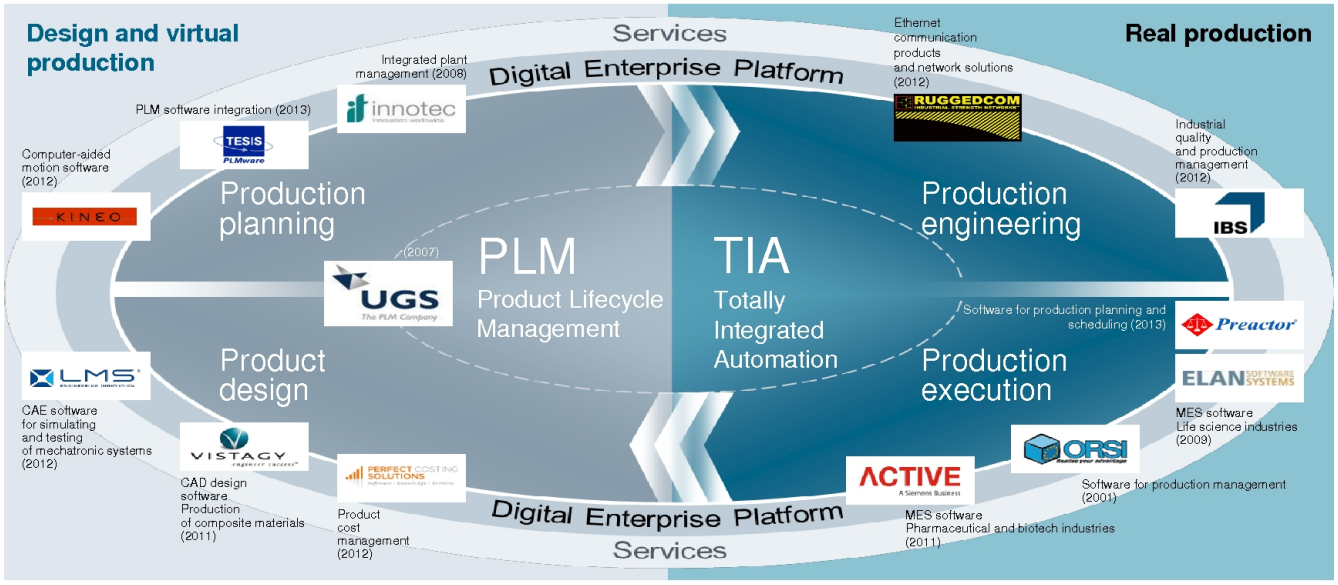

The answer for the future of manufacturing – Covering the entire product development and production process

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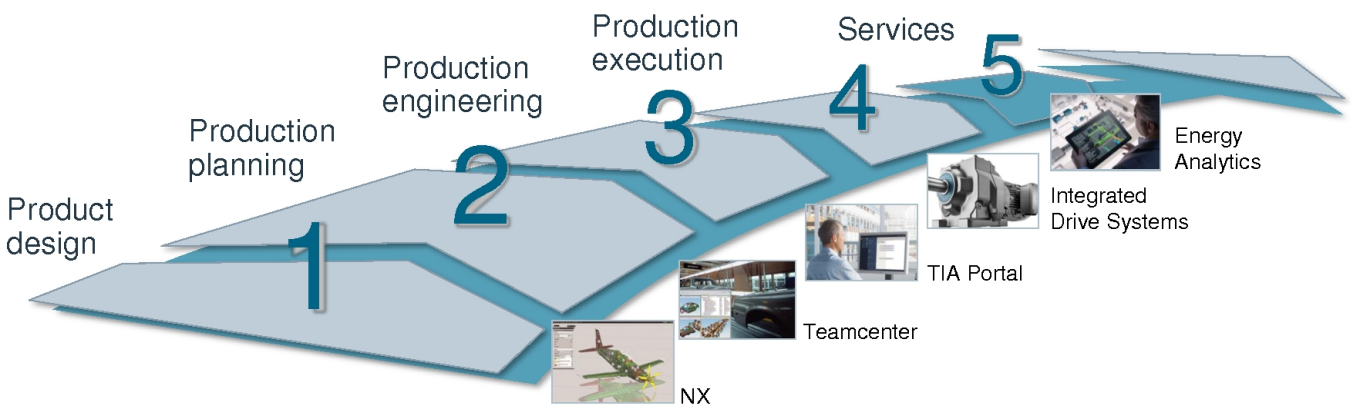

Verify design and manufacturing processes virtually – validate and optimize real production

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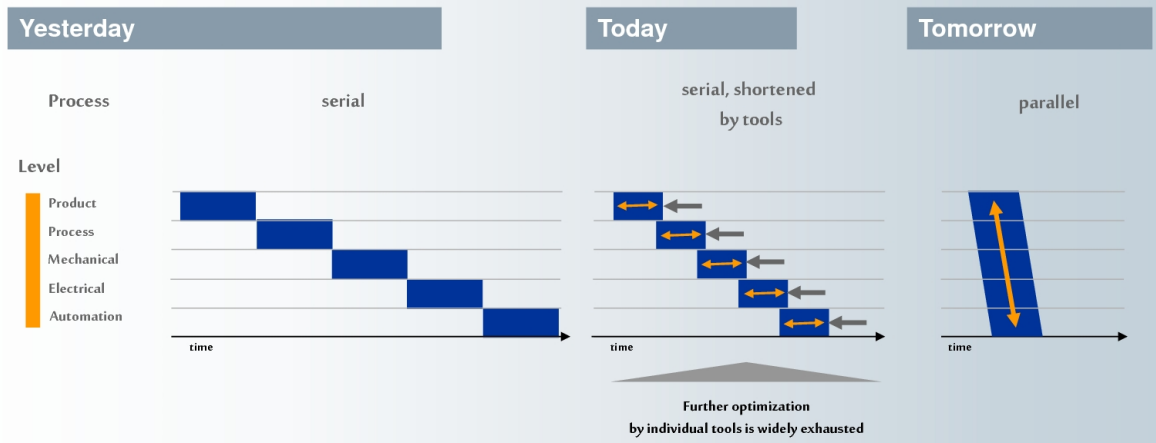
Customer value: Shorten the engineering process

The integrated view over all levels of production enables a shortening of processes



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What has to be done

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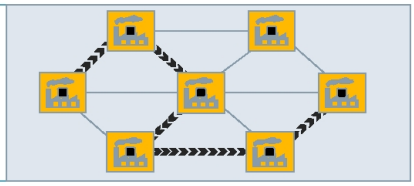
Industrie 4.0 – Three key elements

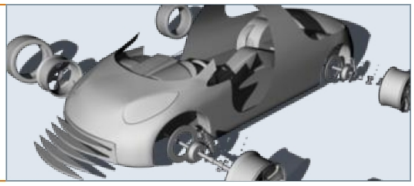
1 **Production network**

Flexible value chains with information available in realtime across company boundaries



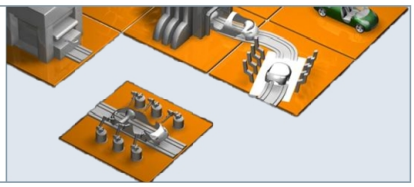
2 **Fusion of virtual and real world**

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!

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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

Today

- **Rule framework and architecture for dynamic topologies**
- **Massively extended semantics for M2M communication**
- **Integrated process simulation**
- **…**

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

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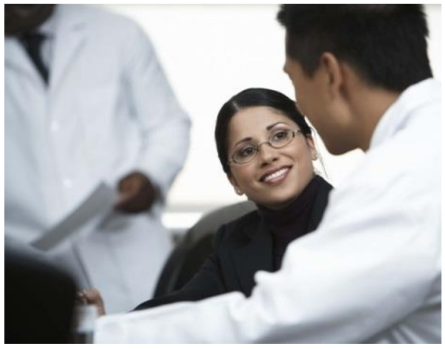
Industrie 4.0 – Prepare for change!



1 Look for strong partnerships

2 Strengthen R&D

3 Train your employees

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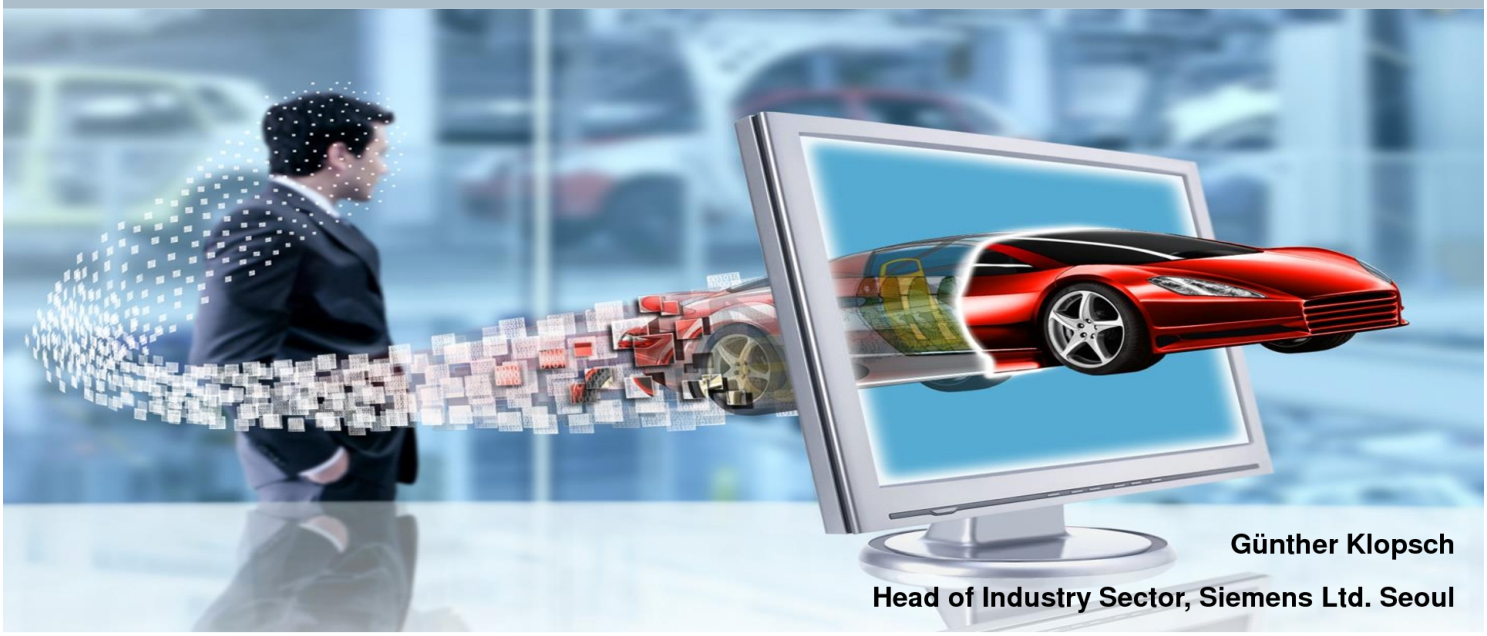
Thank you for your attention!



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