Leadership for the Next Industrial Revolution
Driving the Digital Enterprise in Product Development and Manufacturing

Ralf Leinen : Vice President, Siemens Digital Factory
6th CSIR Conference, October 6th, 2017
Digitalization changes everything

The next trillion dollars will be earned with data – for our customers and for our industries.

Michael Dell, founder of Dell Inc.

Digital is the main reason just over half of the companies on the Fortune 500 have disappeared since the year 2000.

Pierre Nanterme, CEO Accenture
New business models in the internet age are disrupting complete markets...
Five Megatrends shaping our world

Demographic change
World population¹, in bn

<table>
<thead>
<tr>
<th>Year</th>
<th>Developing countries</th>
<th>Industrial countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>6.10</td>
<td>1.25</td>
</tr>
<tr>
<td>2050</td>
<td>9.00</td>
<td>1.36</td>
</tr>
</tbody>
</table>

Growing and aging population

Global warming and weather extremes

Climate change
Annual mean temperature variations 1950-2014² (in °C)

Urbanization
Contribution to global GDP growth, 2007-2025³, in %

- Cities >10mn: 38%
- 5mn – 10mn:
- 2mn – 5mn:
- Other cities and rural areas: 150k – 2mn

Exponential growth of connected devices ...

Connected devices⁵, in bn

<table>
<thead>
<tr>
<th>Year</th>
<th>Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>9</td>
</tr>
<tr>
<td>2016</td>
<td>23</td>
</tr>
<tr>
<td>2020</td>
<td>50</td>
</tr>
</tbody>
</table>

Cities as main driver of GDP growth

Trend to bring investment back

Nationalization
Imports vs. GDP⁴

FDIs total⁵

From Industry 1.0 to Industry 4.0, an initiative of the German industry sponsored by the German Government

**Characteristics**

- Humans, devices and systems are connected along the entire value chain
- All relevant information is available in real-time – across suppliers, manufacturers and customers
- Parts of the value chain can constantly be optimized with respect to different criteria, e.g., cost, resources, customer needs
Our customers have essential requirements – throughout the manufacturing industry

- Speed
- Flexibility
- Quality
- Efficiency

Security
Technological forces transforming industry

Changing the way products come to life
- Generative design
- Intelligent models

Changing the way products are realized
- Intelligent automation
- Additive manufacturing

Changing the way products evolve
- Cloud ecosystems
- Knowledge automation
- Big data analytics
- Advanced robotics
- System of systems
Manufacturers must embrace the technologies and transform their business into a digital enterprise.
Applied across the entire value chain

1. Ideation
   - Product design

2. Production planning

3. Realization
   - Production engineering

4. Production execution

5. Utilization
   - Services
A common digital thread enables continuous business transformation
By compressing the innovation lifecycle

1. Ideation: Product design
2. Realization: Production planning
3. Realization: Production engineering
4. Utilization: Production execution
5. Utilization: Services
Analyze assets as they perform with MindSphere and feed back insights to continuously optimize the value chain.
Create a powerful Digital Twin of the entire value chain

Cloud-based, open IoT operating system: MindSphere

Collaboration platform: Teamcenter

Suppliers and logistics

1. Product design
2. Production planning
3. Production engineering
4. Production execution
5. Services
Product design

Design and simulate the product

NX CAD/CAE/CAM
Simulate the physical behavior

Simcenter
Product design

Perfect your product in the virtual world

NX CAD/CAE/CAM
Product design

Design and simulate electronic systems

Mentor Graphics
Product design

Develop, simulate, validate, and manage embedded software

Polarion ALM
| Digital Twin of the product | Digital Twin of the production | Digital Twin of the performance |
Production planning

Plan and validate your production process

Teamcenter Manufacturing
Production planning

Simulate working conditions for humans

Tecnomatix
Process Simulate
Production planning

Simulate work processes for robots

Tecnomatix Process Simulate
Production planning

Simulate and optimize your production processes

Tecnomatix
Plant Simulation
Production engineering

Automatically generate the PLC code for TIA Portal

Automation Designer
Production engineering

Validate the PLC code in the virtual world

Tecnomatix Process Simulate, PLCSIM Advanced, TIA Portal

Digital Twin of SIMATIC S7-1500
Fast and efficient engineering and commissioning

Totally Integrated Automation Portal

SIMATIC S7-1500
Digital Twin

Digital Twin of the product

Digital Twin of the production

Digital Twin of the performance
Production execution

Schedule your work operations

SIMATIC IT Preactor
Production execution

Easily process work operations

SIMATIC IT
Unified Architecture
Production execution

Run quality inspection operations

SIMATIC IT Unified Architecture
Production execution

Efficient and secure production with TIA

SIMATIC, SINUMERIK, SIMOTION, SIMOTICS, SINAMICS and SIRIUS
Let your products and your production speak to you

MindSphere – the cloud-based, open IoT operating system
Digital Twin

MindSphere

Digital Twin of the product

Digital Twin of the production

Digital Twin of the performance

feed back insights to continuously optimize product and production
PLM / MOM in Closed-Loop reduces engine assembly time by 60 hours
70,000 different product combinations are produced 3x faster with 30% decrease in Time to Market
We embrace digitalization in our own operations

1 per second
We produce more than 1 million products per month – one per second.

Speed

A growing portfolio of 1300 products digitally designed for 60,000 different customers.

Flexibility

Quality level of 99.99895% or 10.5 defects per million.

Quality
Thank you