IWL Logistiktage
Zukunft der Digitalisierung am Beispiel der Siemens AG
Gerhard Fohringer | Head of Digitalization Strategy
Ulm, 10. Juni 2016
Siemens is a global powerhouse in electronics and electrical engineering.

**Energy Supply**
- Resource saving power generation & transmission

**Health-care**
- The enabler for healthcare providers worldwide

**Industrial manufacturing**
- Boosting industrial productivity

**Mobility and Building Infrastructure**
- Intelligent infrastructure automation

The enabler for healthcare providers worldwide.
Global presence – Close to customers all over the world

All figures refer to continuing operations. CIS: Commonwealth of Independent States

Revenue by customer location

Employees as of September 30, 2015

---

Germany
- €11.2 billion
- 15% Share of total worldwide
- 114,000 employees

Europe (excluding Germany), CIS, Africa, Middle East
- €27.6 billion
- 36% Share of total worldwide
- 98,800 employees

Americas
- €21.7 billion
- 29% Share of total worldwide
- 73,500 employees

Asia, Australia
- €15.1 billion
- 20% Share of total worldwide
- 61,500 employees

---
Five Megatrends shaping our world of tomorrow – Changes in the markets are accelerating

Demographic change
World population\(^1\), in bn

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

Growing and ageing population

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing countries</td>
<td>0.16</td>
<td>0.83</td>
</tr>
<tr>
<td>Industrial countries</td>
<td>-0.01</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Global warming and weather extremes

Climate change
Annual mean temperature variations 1950-2014\(^2\) (in °C)

Digital transformation
Connected devices\(^5\), in bn

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connected devices</td>
<td>9.00</td>
<td>40.0</td>
</tr>
</tbody>
</table>

Exponential growth of connected devices ...

... and digital data\(^6\)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2016</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZB = Zettabytes = 10(^9) Terabytes</td>
<td>2.8 ZB</td>
<td>9.00 ZB</td>
<td>40.0 ZB</td>
</tr>
</tbody>
</table>

Cities as main driver of GDP growth

<table>
<thead>
<tr>
<th></th>
<th>Cities &gt;10mn</th>
<th>5mn – 10mn</th>
<th>2mn – 5mn</th>
<th>150k – 2mn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to global GDP growth, 2007-2025(^3), in %</td>
<td>38%</td>
<td>Other cities and rural areas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Trend to increase investment abroad

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign direct investment vs. global GDP, in %(^4)</td>
<td>0.00</td>
<td>1.25</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.12</td>
</tr>
</tbody>
</table>

1 UN World Population Prospects (2015)
2 Met Office Hadley Centre observations (2014)
3 McKinsey Global Institute Cityscope (2011)
4 UNCTAD (2013)
5 Cisco: The Internet of Everything (2013)
6 IDC: The Digital Universe (2012)
Digitalization changes everything
From record store ...
From record store …

… to streaming

Spotify®
... to e-book
From taxi ...
... to ride sharing
Will this disruption stop in front of our business markets?
From centralized power generation...
From centralized power generation…

to decentralized & fluctuating power generation
From ‘one size fits all’ and mass production in manufacturing ...
From "mass production" to "mass customization"...

mass personalization...
From limited information…
From reality enriched and augmented with information...
From fixed interval maintenance...
From fixed interval maintenance schedules based on prediction
Digitalization at Siemens is about leveraging digital technology and insights from data for concrete customer benefits.

Siemens Digitalization

Collaboration and mobile

Big data and analytics

Cloud technologies

Connectivity and internet of things

Cyber-Security

- Improved productivity & time-to-market
- Higher flexibility & resilience
- Increased availability & efficiency

Design & engineering

Automation & operation

Maintenance & services

Combining the virtual & physical world …
… across entire customer value chains
Siemens Vision 2020 – Leading position in Electrification, Automation, Digitalization

Market development (illustrative)

- **Electrification**
  - ~2 – 3% market growth

- **Automation**
  - ~4 – 6% market growth

- **Digitalization**
  - ~7 – 9% market growth

**Global trends**
- **Digital transformation**
  - Networked world of complex and heterogeneous systems
- **Globalization**
  - Global competition driving productivity and localization
- **Urbanization**
  - Infrastructure investment needs of urban agglomerations
- **Demographic change**
  - Decentralized demand of a growing and aging population
- **Climate change**
  - Higher resource efficiency in an all-electric world

**Power Generation**
- Power transmission, distribution, and smart grid
- Efficient energy application
- Imaging and in-vitro diagnostics

**Global trends**
- **Digital transformation**
- **Globalization**
- **Urbanization**
- **Demographic change**
- **Climate change**

**Market development**
- **Today**
- **Mid term – 2020**

**Power Generation**
- Power transmission, distribution, and smart grid
- Efficient energy application
- Imaging and in-vitro diagnostics
As digital technologies take hold, performance in many areas increases.

Improvements through digitalization – Selected examples

**Manufacturing**
- **PLM Software**
  - Products get to market up to 50% faster
- **TIA**
  - Reduces engineering costs by up to 30%

**Energy**
- **Smart Grid**
  - Integration of renewable energy sources into the grid at up to 40% lower costs
- **Self-learning software**
  - Predict electricity output from renewable sources with 90% accuracy (over 72-hour-period)

**Infrastructure**
- **Buildings**
  - Intelligent building technology reduces energy costs by up to 40%
- **Traffic mgmt solutions**
  - Up to 20% fewer traffic jams, accidents and CO₂-emissions

**Healthcare**
- **Int. data management**
  - Can reduce laboratory test errors by 73%
- **Medical Imaging**
  - Software accelerates cardiac CT examination reporting by average of 77%
Enabling the customer benefit – Vertical Software

1. Vertical Software

2. Digital Services

3. Digitally enhanced electrification and automation

Digital twin of the product and the production line for Maserati
Comprehensive integration of data from the entire value chain incl. suppliers
→ Development time of 30 months down to 15 months

Meter Data Management system for Jacksonville Electric Authority
Energy IP collecting meter reads and outage events to automate workflows
→ ~100,000 truck rolls avoided per year
"We don't get a chance to retry or rebuild or service or redesign. We have one shot..."

Bill Allen, Mechanical Design Engineer, Nasa's Jet Propulsion Laboratory
Enabling the customer benefit – Digital Services

1. Vertical Software

2. Digital Services

3. Digitally enhanced electrification and automation

Availability guarantee for train operator Renfe
Analytics enabled flexible maintenance intervals, 24/7 service
⇒ On-time rate of 99.9%

Building energy efficiency services for Carlson Rezidor hotels
Energy optimization and remote monitoring
⇒ ~25% energy savings
Enabling the customer benefit – digitally enhanced electrification & automation

1. Vertical Software
2. Digital Services
3. Digitally enhanced electrification and automation

Driverless trains for Riyadh
Sensors, IP-communications, advanced automation
⇒ 50% capacity increase, 15% energy savings

Optimized wind turbines
Data-driven automation upgrades
⇒ 5% rise in energy output
Next step: self learning
⇒ Additional 1-3%
Customer benefit translates to substantial revenue growth for Siemens – Vertical Software

**Digital services**
- €0.6 billion revenue in FY15
- +15% yoy growth FY15
- >300k devices
  - Remotely monitored and administered
  - Data driven
  - Analytics enabled

**Vertical software**
- €3.1 billion revenue in FY15
- +16% yoy growth FY15
- Leading provider across verticals

**Digitally enhanced electrification and automation**

**#1 automation player** in industry, buildings, grids, power plants, and rail
Siemens continuously invested in the future which is increasingly digital

1958
Patent for SIMATIC

1996
Totally Integrated Automation (TIA)

2009
TIA Portal provides access to all automation tasks

2013
Siemens the only company whose technologies combine real and virtual production world under one roof

Future
Virtual and real production worlds increasingly merge

Production engineering and execution
Beginning ca. 2000 – software for product and manufacturing design becomes increasingly important

Product development

~€5 billion in investments since 2007
Digital Factory driving competitiveness of manufacturing customers

Merging the virtual and real worlds

End-to-end view of product development and production process

Increased efficiency

-40% energy
+14% output

Shortened time-to-market

-20% development time

Enhanced flexibility

Shenyang: 3 models on 1 line

Improving competitiveness through
Today, Siemens is the 2\textsuperscript{nd} largest Europe based software player

<table>
<thead>
<tr>
<th>#</th>
<th>Company</th>
<th>Software revenue 2014, in US$ bn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Microsoft</td>
<td>68.1</td>
</tr>
<tr>
<td>2</td>
<td>Oracle</td>
<td>29.9</td>
</tr>
<tr>
<td>3</td>
<td>IBM</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>SAP</td>
<td>19.7</td>
</tr>
<tr>
<td>5</td>
<td>Symantec</td>
<td>6.3</td>
</tr>
<tr>
<td>6</td>
<td>EMC</td>
<td>5.9</td>
</tr>
<tr>
<td>7</td>
<td>VMWare</td>
<td>5.6</td>
</tr>
<tr>
<td>8</td>
<td>Salesforce</td>
<td>5.0</td>
</tr>
<tr>
<td>9</td>
<td>HP</td>
<td>4.3</td>
</tr>
<tr>
<td>10</td>
<td>CA</td>
<td>3.9</td>
</tr>
<tr>
<td>11</td>
<td>Adobe</td>
<td>3.7</td>
</tr>
<tr>
<td>12</td>
<td>Dell</td>
<td>3.1</td>
</tr>
<tr>
<td>13</td>
<td>Siemens</td>
<td>3.0\textsuperscript{1}</td>
</tr>
<tr>
<td>14</td>
<td>SAS</td>
<td>2.8</td>
</tr>
<tr>
<td>15</td>
<td>Dassault</td>
<td>2.7</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>GE</td>
<td>1.1</td>
</tr>
</tbody>
</table>

\textsuperscript{1} Equaling €2.4bn, as announced at CMD Dec 2014

Source: Gartner 2015/Siemens
Customer benefit translates to substantial revenue growth for Siemens – Digital Services

**Digital services**
- €0.6 billion revenue in FY15
- +15% year over year growth FY15
- >300k devices
  - Remotely monitored and administered
  - Data driven
  - Analytics enabled

**Vertical software**
- €3.1 billion revenue in FY15
- +16% year over year growth FY15
  - Leading provider across verticals

Digitally enhanced electrification and automation

#1 automation player in industry, buildings, grids, power plants, and rail
Digital Services powered by Sinalytics provide customer value and attractive business cases

**Power Generation Digital Services**
- Remote diagnostics and prediction of service needs
- Fleet statistics, benchmarking
- Spare parts analytics and additive manufacturing
- >40 Flex LTP-contracts sold
- Attractive customer value from performance based contracts
- Delivery and life cycle optimization

**Mobility Digital Services**
- 26 trains for Renfe (Spain)
- High Speed Train service between Madrid and Barcelona
- 99.9% availability
- Full reimbursement of ticket prices for passengers when a train is >15 minutes late
- Only one of 2,300 trips is really late

---

Asset availability and flexibility
Operating efficiency
Optimized service delivery
Remote diagnosis facilitates predictive maintenance
Shift from corrective to preventive measures
Increased availability and avoidance of unplanned downtimes
Siemens Digital Services demonstrate proven success in diverse industries

**Cement**
- Antea Cement (ALB)
  - Asset Analytics
  - No unplanned system downtimes

**Minerals**
- EU Manufacturer of asphalt
  - Energy Analytics
  - 147% RoI

**Glass**
- Pilkington (UK)
  - Energy Analytics
  - Over £1 million energy cost savings

**Chemical**
- Int. Oil & Gas company
  - Security Services
  - 0% incidents within 18 months

**Automotive**
- EU car manufacturer
  - Asset Analytics
  - Higher plant availability

**Food and Beverages**
- US car manufacturer
  - Energy Analytics
  - Higher resource efficiency

**Pharma**
- EU Coffee Producer
  - Energy Analytics
  - Target 5% energy cost savings
- Global pharma company
  - Energy Analytics
  - 12% energy cost savings

Siemens Digital Services demonstrate proven success in diverse industries.
MindSphere enables OEMs to create new data-driven services in only two easy steps

**STEP 1 Connect**
- Get MindSphere user-account, receive and integrate Connector Box into machine/equipment

**STEP 2 Configure**
- Configure data acquisition, connectivity and Visual Analyzer via MindSphere

**Run Service**
- Monitor e.g. health status of all assets in MindSphere with Fleet Manager and drill into details using Visual Analyzer
Sinalytics Platform powers – Siemens Digital Services

Connectivity

300,000+
connected devices
including wind turbines,
buildings, trains

Advanced analytics
Greeting new insights from
smart data by leveraging
world-class technologies

Know-how

– Product, domain and
data science know-how
– Overall IT know-how with about
17,500 Software
Engineers
160 Data
Scientists

Customer outcomes

– Higher availability
– Lower costs
– Increased performance
– More security

Sinalytics
Provides connectivity,
advanced analytics
and cyber security
Siemens driving Digital Service and Platform business leveraging strong automation core

Customer benefit

- Performance-based Services (e.g., flexible long-term programs)
- Outcome-oriented Services (e.g., availability guarantees)

Platform

- Siemens Sinalytics Platform
  - Industry grade advanced analytics and connectivity, cloud and on premise

Automation

- Industry automation
- Energy automation
- Rail automation
- Building automation

Installed base

- ~300,000 systems connected

Source: CD ST SD DI
Siemens digitalization ecosystem – Technology platforms, partners and world-class talent pools

**Leveraging technology platforms**
- Scale and speed from cross-divisional technology investments
  - Smart data analytics
  - Cloud
  - Cyber security

**Expanding powerful IT partner ecosystem**
- **Strong** IT partner ecosystem
- Complementary strengths

- **Strategic alliance**
  - Atos
  - Strategic alliance

- **Industrial cyber security**
  - McAfee

- **Partnership for analytics**
  - Teradata

- **Integration partner**
  - Accenture
  - JV for smart grids
  - IBM
  - Cerner
  - Alliance for Healthcare IT

**Investing in innovation**
- Modern software development methods
- Digital skill pools expanded
- Leveraging external innovation

- **Siemens Venture Capital**
  - > €800 million invested in 180 start-ups

- **Siemens Innovation AG**

- >12 start-ups founded, e.g.

- **Unrestricted © Siemens AG 2016**
The German industrial ecosystem is well positioned

User generated data

2.9 ZB 2013
26 ZB 2020

Targeted advertising
Facebook
LinkedIn
Google

Share economy

Social/advertising

Machine generated data

1.5 ZB 2013
18 ZB 2020

Engineering

Automotive

Automotive supplier

Chemical industry

Digitalization

Automation

Electrification

Siemens

T·SAP

Infineon

Atos

Festo

Rexroth Bosch Group

Kuka

Liebherr

Siemens

E·e·on

RWE

EnBW

Nordex

Siemens

Industrie 4.0

Plus: German "Mittelstand"

Thousands of companies

Targeted advertising

Social/advertising
Werner von Siemens might have called it “Erfindergeist”.

We call it “Ingenuity for life”