The Factory of the Future
Enabled by Robotics and Digitalization

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The Factory of the Future
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Outline

- Introduction
- Digitalization - Trends
- Factory of the Future
  - Robotics & Collaboration
- Digitalization in Customer Service
  - Connected Services
- Summary

Why aren’t you connected?
The Technical Revolution has started
We are all connected!

2005
Two days after pope Johannes Paul II died.
(Source: www.spiegel.de, Christian Klettner/BASF)

2013
His successor Benedict XVI retired and a new pope has been elected.

Within 8 years ~100% market penetration
Looking ahead
Increase in connectivity provides more opportunities

**Things and Connectivity**

- 6.4 billion connected “things” in 2016
- More than 20 billion by 2020
- 5.5 million new things every day
- In 2016, global Internet traffic will exceed the 1 zettabyte mark (1 trillion GB)
- Traffic growing at 23% per year
- By 2019, traffic will be 64x that of 2005
- Majority of traffic from non-PC devices

Why aren’t you connected?
Faster, cheaper connectivity enables digitalization
Wireless communication breakthrough

Mobile data speed per generation (kbps)

<table>
<thead>
<tr>
<th>Year</th>
<th>Generation</th>
<th>Speed (kbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>GPRS</td>
<td>50</td>
</tr>
<tr>
<td>1998</td>
<td>EDGE</td>
<td>250</td>
</tr>
<tr>
<td>2001</td>
<td>3G</td>
<td>348</td>
</tr>
<tr>
<td>2009</td>
<td>4G</td>
<td>150,000</td>
</tr>
<tr>
<td>2020</td>
<td>5G</td>
<td>6,400,000</td>
</tr>
</tbody>
</table>

Cost per MB of mobile data (USD)

<table>
<thead>
<tr>
<th>Year</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0.470</td>
</tr>
<tr>
<td>2012</td>
<td>0.025</td>
</tr>
<tr>
<td>2016</td>
<td>0.004</td>
</tr>
<tr>
<td>2020</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Connectivity is not a bottleneck
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Why aren't you connected?
Factory of the Future
Enabled by Digitalization and Collaboration

Automation needs
- Simple repetitive
- Local

Connectivity
- Complex, flexible
- Integrated

Human interaction
- Caged robot
- Collaborative robots
- Intelligent, adaptive
- On all devices, coordinated
- Machine learning
Robots will play a critical Role in the Factory of the Future
Low Mix, High Volume to High Mix, Low Volume Shift needs Flexible Automation

Efficient at every level
Razor-sharp operations with lower fixed costs and uncompromised quality and safety.

Reliable and available
Proactive, actionable intelligence that reduces incidents and speeds recovery.

Integrated ecosystem
Seamless collaboration across the value chain to better respond to customer needs.

Flexible and agile
Automation processes which can quickly and efficiently adapt in real-time to new situations.

The Factory of the Future is characterized by Flexibility and enabled by Collaboration & Digitalization
Defining Collaborative Automation
Collaborative means different Things to different People

- Shared tasks and workspaces
- No need for barriers or separation zones
- Lightweight, portable robot
- Up and running in minutes, not hours
- Via intuitive devices or by lead through
- No previous experience required
- Complete solution … not just a robot
- No traditional safety infrastructure required
The Benefits of Collaborative Automation

YuMi® – the World’s first truly Collaborative Robot

YuMi Dual Arm Robot

- Easy, intuitive programming – you don’t need an engineer or a rocket scientist!
- No Safety Zones or Cages or Barriers cluttering the shop floor
- Can safely interact with people
- Easy to install, commission and redeploy

Ease of Use & Safety are Key!
Collaboration example at ABB Factory in CZ
YUMI
Sensors, Connectivity, Intelligence ….
What does this mean?

Shared intelligence:

- Low cost sensors and improved connectivity are making greater intelligence available anytime, anywhere
- Greater accuracy and awareness improve understanding
- New programming methods and control, such as tactile touch

An Enabler for Digitalization
Digitalization & Simplification
Looking at the complete value chain

Programming
- RAPID
  - Configuration

Commissioning
- Calibration
  - Fine tuning

Operation
- Monitoring
  - Problem solving

Supervision
- Status
  - Alarms

Consistency across tasks
Simplification: Mixed reality
Visualization of proposed manufacturing solutions

Actionable information right in front of you
Simplification: Programming and Virtual Commissioning

Best in class engineering tools: Virtual Robots, Virtual PLCs, and Virtual Drives
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Why aren’t you connected?
From cost based to value based service
Enabled by digitalization

<table>
<thead>
<tr>
<th>Business Focus</th>
<th>Service Delivery</th>
<th>Skills Developed</th>
<th>Service Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost focus</td>
<td>Time Based</td>
<td>Repair technician</td>
<td>Spare part sales</td>
</tr>
<tr>
<td>Life Cycle Cost</td>
<td>Break-Fix</td>
<td>Hardware “The man with the van”</td>
<td>Call out when needed</td>
</tr>
<tr>
<td>Technical features</td>
<td>On site check-up</td>
<td></td>
<td>Reactive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value Creation</td>
<td>Condition Based</td>
<td>Process consultant</td>
<td>Service Agreements</td>
</tr>
<tr>
<td>Life Cycle Value</td>
<td>Predictive</td>
<td>Hardware and Software</td>
<td>Proactive</td>
</tr>
<tr>
<td>Customer benefits</td>
<td>Remote Monitoring</td>
<td>Remotely guided</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased productivity</td>
<td>Increased MTBF</td>
<td>Enhanced support</td>
<td>Peace of mind</td>
</tr>
<tr>
<td>Over the full life cycle</td>
<td>Reduced MTTR</td>
<td>Increased productivity</td>
<td>Budget control</td>
</tr>
</tbody>
</table>
Service is always about people helping people
Digitalization enhances our capabilities to support and add value

Digitalization in service business
Enhances our ability to support our customers

- Accurate information – improves first-time-fix
- Complete data – The “birth certificate” and “medical journal” of the equipment always available and updated
- Real time “health status”
- Faster response - Proactiveness

Enables self help capabilities

- Accurate asset and fleet information
- Access to personalized documentation
- 24/7 access to fleet status
Unlocking the ABB potential in digital

**ABB Ability™**: creating one common offering for digital end-to-end solutions

Digital ABB offering across businesses: integrate, penetrate, replicate

- Open access, intelligent cloud
- New end-to-end digital solutions
- Closing the loop with connected devices
Far-reaching partnership with Microsoft
Developing next-generation digital solutions

Customer benefits

Integrated digital platform – from device to system to cloud
Combined strength – each partner leading in its respective area

Together building the world’s largest industrial cloud platform
Connected Services
Most advanced offering on the market plus 5,000 robots connected

Condition Monitoring & Diagnostics  Backup Management  Remote Access  Fleet Assessment  Asset Optimization

Up to 25% fewer incidents, 60% faster response times and issue resolution
Connected Services

Film
Service Level Agreements

Building blocks

Traditional building blocks
- Technical Support
- Onsite-Response
- Reaction time
- On site Audit
- Preventive Maintenance
- Spare Parts

Connected Services building blocks
- Condition Monitoring & Diagnostics
- Remote Access
- Fleet Assessment
- Backup Management
- Asset Optimization

SLA
Service Level Agreement Packages
Preventive Maintenance as a crucial building block

An offer designed to meet your needs

Besides the flexibility of Robot Care tailormade solutions, we offer four standardized service agreement packages, supported by global processes and skilled service engineers:

- **ABB Basic Care**
  - Service included with robot delivery
- **ABB Preventive Care**
  - Service securing high reliability
- **ABB Express Care**
  - Service for reliability and availability
- **ABB Extended Care**
  - Extended warranty and predictability

Preventive Maintenance is the fundamental building block for all SLAs
It is not only about technology, you need the people and skills to drive it! 1,500 employees, 53 countries, more than 100 locations, state of the art technology

Service – A people business

People
- Well trained
- Service minded
- Close to your facilities

Process
- World Class Logistics

Technology
- Information at your fingertips
- Remote guidance
- Diagnostics and prediction
- Fleet management
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Summary

- Robots & Digitalization are the main drivers for the Factory of the Future.
- Look at the complete value chain when designing your digitalization strategy.
- What customer problems or pain points do you want to solve.
- Biggest challenge is not the technology, but the skills and people to drive it.

Start your journey today!