KUKA Aktiengesellschaft
Dr. Till Reuter, CEO KUKA
Capital Market Day 2016
April 26, 2016
KUKA at the Hannover fair
Outlook – KUKA 2020

Development

Growth ~50%

Sales revenues
€3.0 billion

2015

China
General Industry
New products/Industrie 4.0

Swisslog/E-commerce

Sales revenues
€4 – 4.5 billion

2020

EBIT margin
> 7.5%

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€3.0 billion

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Global megatrends shaping KUKA’s present and future

- Globalization
- Digitalization and Technology
- Demographics
- Biosphere/Ecosystems
Intelligent machines and digital domains – key elements of Industry 4.0

The KUKA Group unites intelligent machines, digital domains and digitalization know-how under one roof. With innovative, robot-based automation solutions we make our customers all over the world more successful and simplify people’s lives and work.
Intelligent machines – the evolution

Innovation
Industrial automation
Robot cells with safety fences

Sensitivity and safety
Human-Robot-Collaboration

Mobility
Standard Automated Guided Vehicles (AGV)

Intelligence and perception
Intelligent machines & smart platforms
Intelligent Machines unleashing new customer benefits

**Characteristics**

- Identification - *Which kind of machine am I?*
- Connectivity - *With whom can I speak?*
- Storage - *Which information do I have?*
- Computing - *Which tasks can I do?*
- Autonomy - *Which decisions can I make on my own?*
- Location - *Where am I?*
- Integrated sensors - *What can I measure around me?*
- Internet connectivity - *Which information can I get?*

**Customer benefits**

- Higher uptime
- Better energy efficiency
- Higher flexibility
- Autonomous decisions
- Lower inventory
- Faster time2market
- Safe human-machine interaction
- Learning from data

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Digital Domains – the essence of new customer value

Digital domains provide...

• Big data correlations
• Optimization of complex systems
• Holistic transparency
• Immediate alerting
• Predictive forecasts
• Information and services on demand
• Optimization across system boundaries
• Enabling new information sources merged with the status quo

.... opportunities for new customer value

• Enabling new business models
• Creating highly integrated value networks
• Optimization of complete value networks
• Fast reaction to new situations
• Immediate reconfiguration to increase flexibility
• Prediction of the future to initiate preventive actions
• Insight & Control anytime and anywhere
KUKA is a long term partner of automotive customers

1. Value as a Service
   • Technology support – 2nd level support, optimization as a service

2. Module as a Service
   • Operating model – Digital manufacturability as a service

3. Platform as a Service
   • Supplier park – Productivity as a service, up to date technology as a service

4. Infrastructure as a Service
   • Eco-system supplier park – productivity, versatility, quality, logistics, availability as a Service

#1 Automotive
KUKA offers a complete solution and creates eco-systems in a new way.
Software and Industry 4.0 drive profitable growth of KUKA
Industry 4.0 strategy

Investments

- K3ee
- nebiiolo technologies
- roboception

Cooperation

Focus

- Increase R&D workforce
- Setup a Industry 4.0 team
- Pilot projects started
- Industry 4.0 solutions used in own facilities

R&D hubs Austin/ Texas and Budapest

New technology center in Augsburg
KUKA Aktiengesellschaft

Stefan Lampa, CEO KUKA Robotics

Capital Market Day 2016
April 26, 2016
3 Main Focuses

Service

General Industry

Automotive Industry
Strong growth of General Industry expected

Number of articulated robots sold worldwide to General Industry p.a.

- 2015: ~100,000
- 2020: ~200,000

1) Preliminary figures (IFR)
2) Expectation (KUKA)
Key success factors

- Global organisation
- Application know-how
- Product portfolio
Key success factor #1 - Extend global organisation
Key success factor #1 - China is changing Robotics

- High number of people
- Changing working conditions
- Lack of professional skilled workers
- Increasing labor cost
Key success factor #2 - Build up application know-how
Key success factor #2 - Electronics is changing Robotics

- Shorter product cycles
- Higher volumes
- Mass customization
- Global standards
Key success factor #3 - Offer complete product portfolio from 3 kg to 1,300 kg
Key success factor #3 - KR 3 AGILUS

- ★ KUKA QUALITY on a small footprint
- ★ ALL-ROUNDER for small parts assembly & handling
- ★ AGILE & DYNAMIC
- ★ LOWEST TOTAL COST of ownership in its class
- ★ Ideal for SMALL AUTOMATION CELLS on electronics assembly line
- ★ Developed for the DEMANDS OF ELECTRONICS INDUSTRY
Investing in innovation

Engagement in the highly innovative robotic technologies of the technology company KBee
Summary

• Three main focus areas for KUKA Robotics: Service, Automotive Industry and General Industry

• Next steps to improve further growth in General Industry

• KR 3 AGILUS offers best in class 3 kg robot
KUKA R&D footprint – Get the best talent around the globe

• Global R&D – better R&D talent across the globe
  – Different geographies have tailored and deep specialties
  – Germany – excellent mechatronics
  – USA – excellent Cloud and IT software
  – China – excellent mass production in electronics

• Global R&D – products tailored to each local market
  – With the right local costs
  – With a dedicated competence of technologies
  – With greater speed of local market delivery

• Global R&D investment is a multi-year journey

Augsburg, Germany
Focus: Platforms, Core Products
Employees:
2015: 500
2020: ~600

Austin, Texas
Focus: IoT, Cloud, Big Data Cloud
Employees:
2015: 20
2020: ~200

Budapest, Hungary
Focus: Mobile Robotics, Nearshoring
Employees:
2015: 25
2020: ~100

Shanghai, China
Focus: Electronics Applications, Close to the market
Employees:
2015: 25
2020: ~100
Digitalization has disrupted many areas. Manufacturing disruption is underway!

“A fundamental new rule for business is that the Internet changes everything.”
Bill Gates, 1999

• ...but in 1999, we had the Internet of people only!
• The Internet of Things (IoT) is changing much more!

Source: based on IIC
IT & OT are growing together

Connecting the Concrete to the Carpet Floor – IT and OT Convergence is a global R&D trend
Evolution of KUKA’s product portfolio

KUKA the robot, process and cloud/software company

KUKA the robot & process Company

- Robot & Process
- Connected
- Intelligent

- Robot & Process
- Connected
- Intelligent

- System of systems
- Connected
- Intelligent
- Optimized
- Digital Domain

- Robot System

- Welding

- Logistics

- ...
Ecosystem of KUKA’s cloud

KUKA’s cloud and Big Data
Connecting people, services and things

Processes & Intelligent Machines

People

Digital Domains & Services
Intelligent Machines – Human Robot Collaboration

- **Sensitive and safe robots** for Human Robot Cooperation (HRC)
  - **Assistant systems** for humans
  - **No fences** needed
  - **Smart safe sensors**
  - New **safe human approach recognition** technologies for bigger industrial robots

- Reducing the cost of automation; Easy to use Robots
  - Programming with **graphical languages**
  - **Teaching by doing** no programming required
Intelligent Machines – mobile robots & mobile platforms

- Mobile products, machines and tools are one cornerstone of Industry 4.0
- Mobility increases flexibility
- Optimize material flow reducing assembly time
- Autonomous navigation simplifies automation and reduces cost
  - Swarm-based navigation opens new fields within mobility
Digital Domains – Connectivity, mobile, cloud & big data

• **Connecting people, services, and things**
  – Industry standard communication protocols
  – Industry standard real-time edge cloud
  – Industry standard zero-touch deployment

• **Mobile** | Access live insights on any device at any time

• **Cloud & Big Data Services**
  – Asset management with full digital twins
  – Digitalized expert knowledge at your fingertips
  – Integrated service management
  – Cloud-2-Cloud connectivity with full federated clouds

• **Marketplace** for KUKA, partner, and customer ecosystem
KUKA enterprise software offers Industry 4.0 solutions

**Partner Site**
- Real-time component information and usage of data for remote optimization and remote management
- Real-time inventory control for automated supply of goods for shorter time2market

**Production Site**
- Flexible line concept and scheduling for handling more product variants
- Condition based monitoring and predictive maintenance for higher uptimes
- Automated software distribution and reconfiguration for more flexibility
- Flexible production logistics for faster supply and lower inventories
- Energy efficiency by real-time data and planning forecasts
- Data to information and investment protection by using fog computing

**Operations**
- Remote monitoring of production status
- Remote transparency of availability of production lines
- Optimized service management by using predictive data
KUKA offers a complete solution and open ecosystem

Human

Human/machine interface

Set value

Actual value

Apps for all layers

Marketplace

Cloud services

Cloud platform

Edge/Fog

Strategic partners

salesforce

Marketplace

KUKA

Asset efficiency & Big Data Mgmt.

Infosys

IIP Big Data Platform

Real-Time Fog Node

HUAWEI

5G Communication

Intelligent machines

Why this is all a sweet spot for KUKA’s customers and partners?

<table>
<thead>
<tr>
<th>KUKA</th>
<th>Eco-System Partners</th>
<th>KUKA</th>
<th>Central Industry 4.0 team</th>
<th>KUKA</th>
<th>swisslog</th>
</tr>
</thead>
</table>
| Holistic Industry 4.0 offering | • Apps & Cloud-Services Eco System  
• Technology Components  
• Industry 4.0 Middleware |  
KUKA Industry 4.0 Platform  
Enabling New Business Models  
Apps & Cloud Services |  
Industry 4.0 ready Intelligent Machines  
Domain Process Content |

We are able to offer a complete stack combined with domain knowledge & machines
## Strong growth in the U.S.

### North America (€ million)

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
<th>Share in % of KUKA’s total sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>268.0</td>
<td>-</td>
</tr>
<tr>
<td>2014</td>
<td>596.1</td>
<td>-</td>
</tr>
<tr>
<td>2015</td>
<td>1,035.7</td>
<td>34.9</td>
</tr>
</tbody>
</table>

2010: 24.8%
2014: 28.4%
2015: 34.9%
# Number of car models and combinations support Systems’ business model

## Combinations available when buying a Ford F150 pickup

<table>
<thead>
<tr>
<th>Equipment options</th>
<th>Variants</th>
<th>Theoretical combinations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trim</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Passenger compartment</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Power train</td>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>Cargo space</td>
<td>4</td>
<td>144</td>
</tr>
<tr>
<td>Engine</td>
<td>3</td>
<td>432</td>
</tr>
<tr>
<td>Transmission</td>
<td>3</td>
<td>1,296</td>
</tr>
<tr>
<td>Rear axle ratio</td>
<td>7</td>
<td>9,072</td>
</tr>
<tr>
<td>Wheels</td>
<td>9</td>
<td>81,648</td>
</tr>
<tr>
<td>Tires</td>
<td>8</td>
<td>653,184</td>
</tr>
<tr>
<td>Seats</td>
<td>18</td>
<td>11,757,312</td>
</tr>
<tr>
<td>Power seats</td>
<td>2</td>
<td>23,514,624</td>
</tr>
<tr>
<td>Radio</td>
<td>5</td>
<td>117,573,120</td>
</tr>
<tr>
<td>Running boards</td>
<td>4</td>
<td>470,292,480</td>
</tr>
<tr>
<td>Rear windows</td>
<td>3</td>
<td>1,410,877,440</td>
</tr>
<tr>
<td>Colors</td>
<td>12</td>
<td>16,930,529,280</td>
</tr>
<tr>
<td>Interior trim colors</td>
<td>3</td>
<td>50,791,587,840</td>
</tr>
<tr>
<td>16 individual options</td>
<td>12,870</td>
<td>653,687,735,500,800</td>
</tr>
</tbody>
</table>

Source: Siemens

## Total number of existing and new car models in the U.S.

- **Number of car models**
  - Existing: 12,870
  - New: 653,687,735,500,800
Global automotive OEMs - development of capex/sales ratio
Requirements of future production lines

• Megatrends driving automation
• Alternative fuel – electric vehicles
• Connectivity – connected vehicles
• Autonomous navigation
• Fleet/car sharing
• New mobility ecosystem
New business models offer margin potential for KUKA

Digitalization of domains

- Digitalization of homogeneous processes and physical objects
- Real-time modelling of data in the “Digital Shadow”
- Digital control and optimization of complex systems
- Prediction of future performance and conditions by efficient use of Big Data (“correlation instead of causation“)

New industrial business models

- **Value as a service**
  Personalized services to satisfy customer needs, e.g. Productivity as a Service (pay-per-welding spot, pay-per-rivet)

- **Module as a service**
  Open hard- and software modules for personalized service, e.g. KUKA Connect

- **Platform as a service**
  Lifecycle environment and communication to supply soft- and hardware modules, (e.g. KUKA App Store, KUKA Asset Management)

- **Infrastructure as a service**
  Holistic infrastructure as a basis for platforms and module supply, e.g. Supplier park with mainstream IT and standardized interfaces
Development of production lines (1)

High volume/ low number of models

Low volume/ high number of models
Development of production lines (2)
Development of future Aircraft plant production

- Media -

A Futuristic View Of The 777 Fuselage Build

- Fuselage Automated Upright Build, or FAUB
- Advanced Manufacturing technology
- Customer benefits
  - Improves workplace safety
  - Increases product quality
  - Increases production rates
  - Reduces rework
  - Improves efficiency and productivity.

- With FAUB, fuselage sections will be built using automated, guided robots that will fasten the panels of the fuselage together, drilling and filling the more than approximately 60,000 fasteners that are today installed by hand.
- The traditional hand-installation method has proven challenging over the years, with employees positioned inside and outside of the fuselage, drilling and filling in sync.
KUKA is in the perfect position to deliver 4.O/IoT, Hardware & Software fully Integrated

- Media -

**Morgan Stanley**

**GLOBAL INSIGHT**

Robotics Case Study – Laying the Basis of IIoT with Kuka KTPO

**What is KTPO?** KTPO stands for Kuka Toledo Production Operations (Ohio, US) and is an exclusive cooperation with Fiat Chrysler Automobiles (FCA). In that set up, Kuka manufactures the complete body shells for Jeep Wrangler, including all closure panels. This collaboration, also involving Magna and OMMC, started in 2006 and has since manufactured the body of all Jeep Wranglers sold in the world with close to 1.5 mn units completed so far. Kuka, Magna and OMMC have invested jointly close to USD 1 bn for the manufacturing set up of the Wrangler.

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