

Potentiale von Industrie 4.0 bei Bosch

Dr.-Ing. Stefan Aßmann



i4.0
**CONNECTED
INDUSTRY**

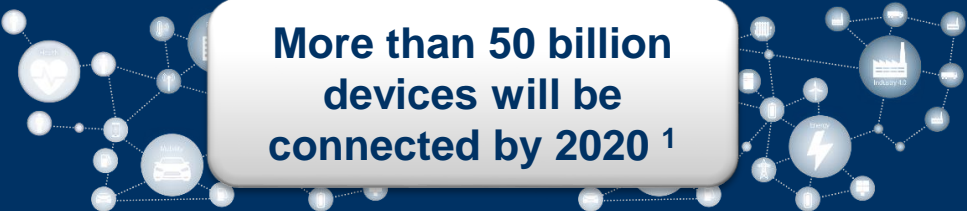


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Connected Industry - one forecast for 2020

- Volatile markets** 
- Individual customer requirements** 
- Shortened delivery times** 
- Shortened product life cycles** 
- 24/7 worldwide service** 
- Social behavior, new cooperation** 
- Disruptive business models** 

More than 50 billion devices will be connected by 2020 ¹



80% of companies will have digital value streams ²

40 bn EUR/year additional investment in industrial assets ²

14.0
CONNECTED INDUSTRY

30 bn EUR/year additional value add by digital products & services ²

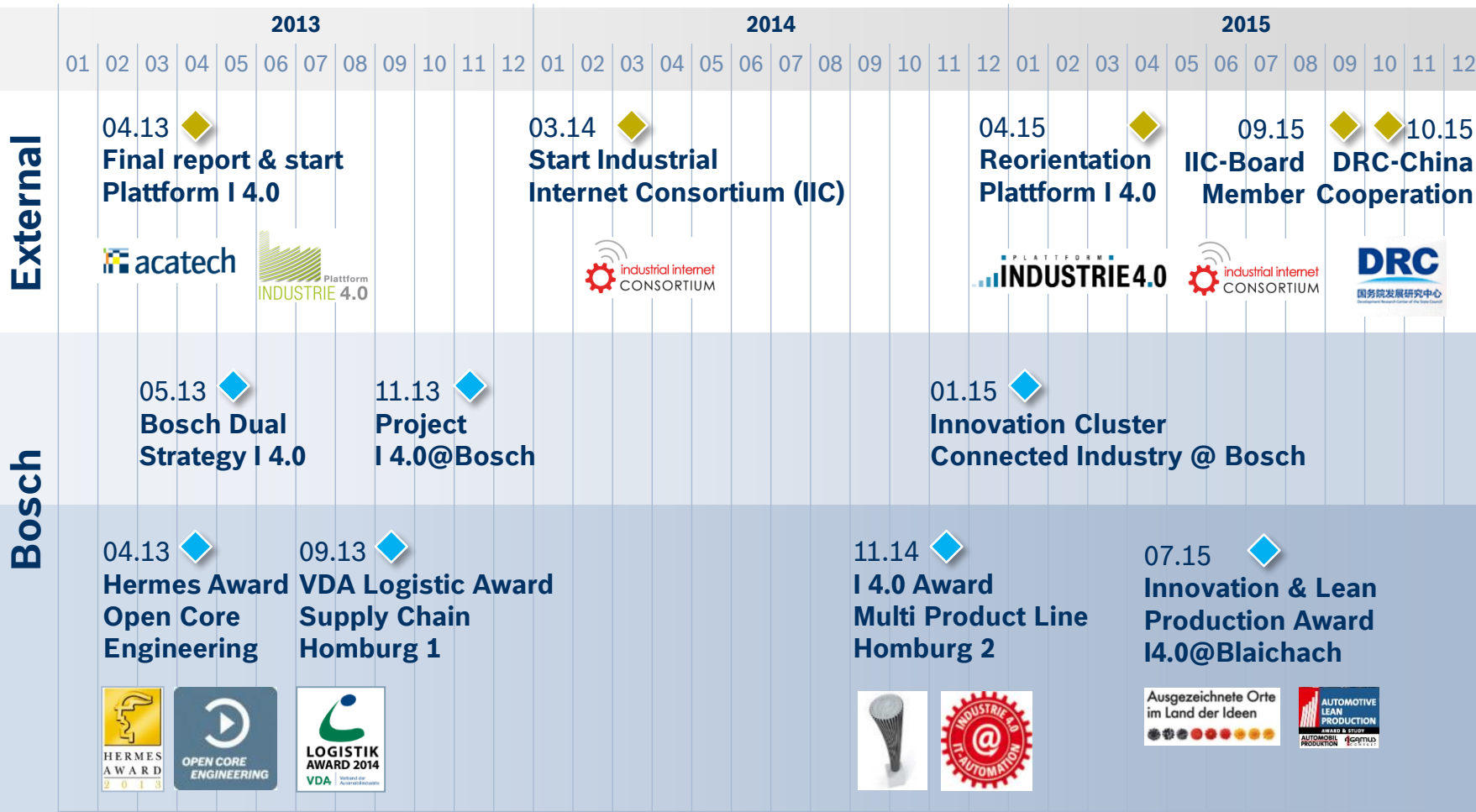
18% growth in efficiency and performance ²

1) Source: Cisco IBSG April 2011, device per person

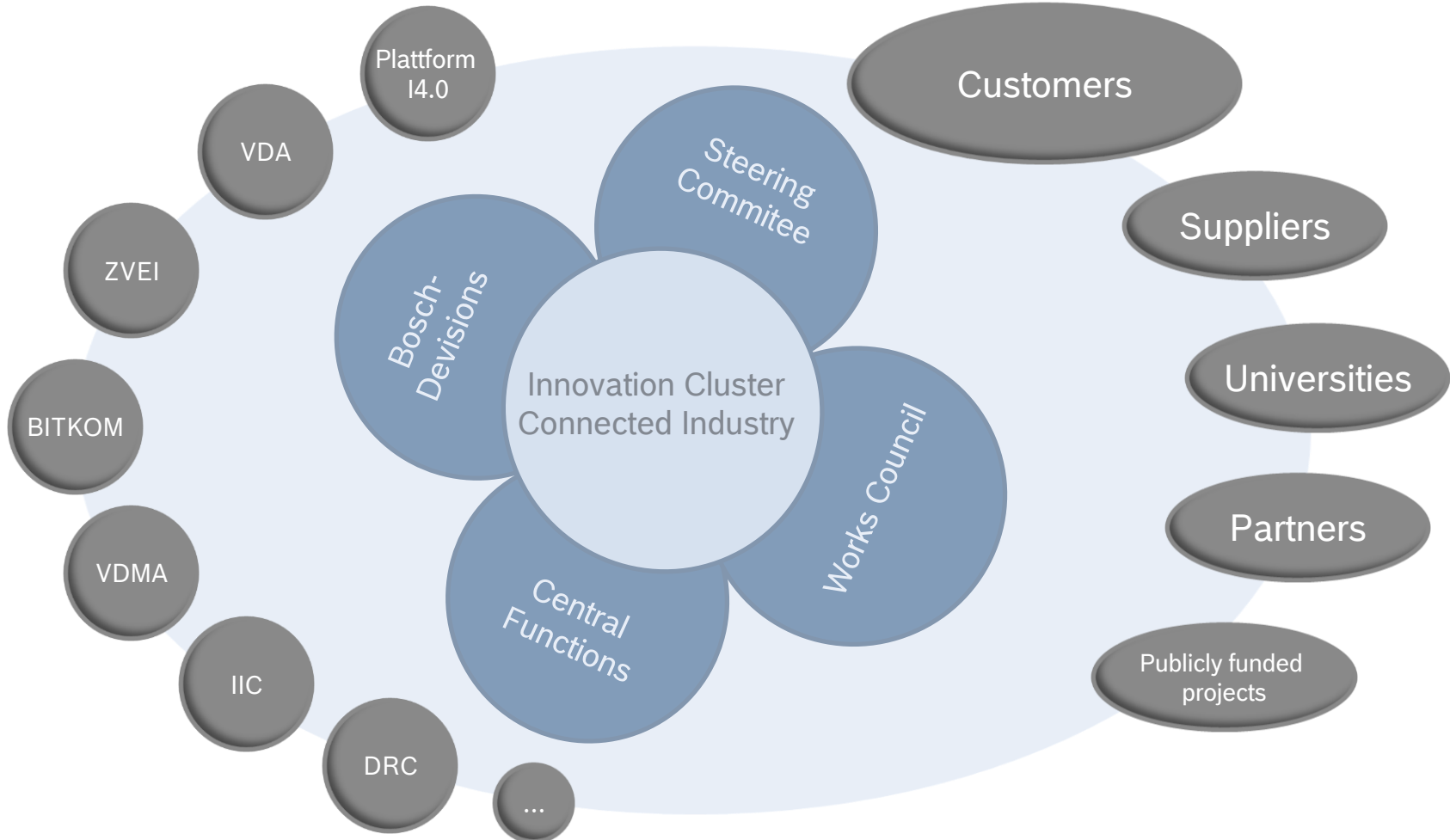
2) Source: PWC Study October 2014, Industry 4.0 – Chances and Opportunities of the 4th industrial revolution



Connected Industry @ Bosch – our journey so far



Overview and interfaces of the Innovation Cluster

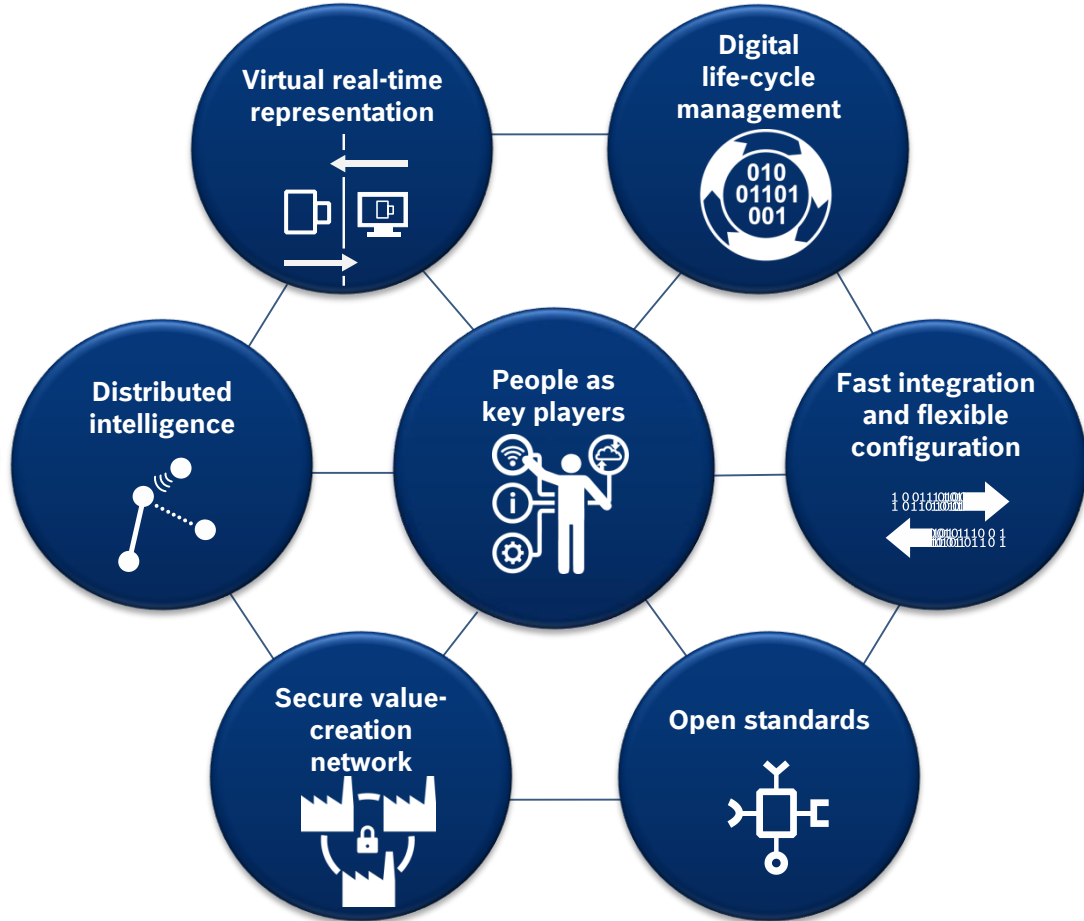


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Characteristics for Connected Industry (Bosch definition)

Trends

- Volatile markets**
- Individual customer requirements**
- Shortened delivery times**
- Shortened product life cycles**
- 24/7 worldwide service**
- Social behavior, new cooperation**
- Disruptive business models**



Characteristics

Dual Bosch strategy for Connected Industry

Lead Provider

System manufacturer/
Production resource view

I 4.0 solution provider
With external business

Enabler technology or
Internal I 4.0 solution provider



Drive and Control
Technology



Industrial Sensor
Solutions



Bosch Software
Innovations



Bosch Sensortec



Packaging Technology



Innovations-
management Logistik



Assembly Systems
and Special Machinery



Machine Platforms



Bosch Connected
Devices & Solutions



Data Mining, Big Data



Bosch
Service Solutions



Center of Competence
RFID@BOSCH

...

Corporate IT, RBEI, ...

Lead Operator

Product manufacturer/
Product view



250 Bosch plants world wide

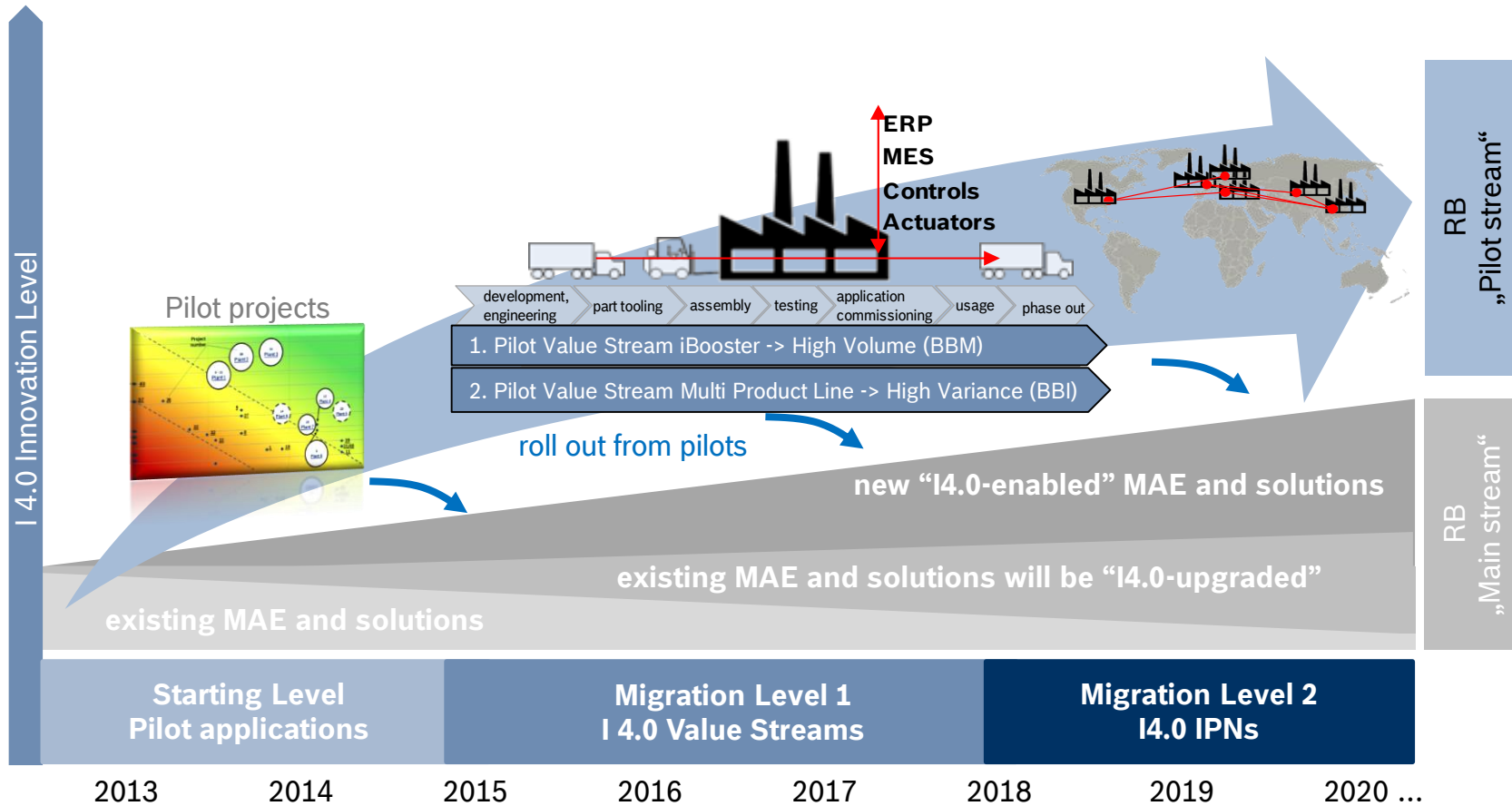
- **Manufacturer of products**
- **Machine operator**
- **Plant operator**
- **Interface to customers/suppliers**

Experience out of more than 100 pilot
projects for connected industry



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Bosch approach to a holistic I4.0 value stream

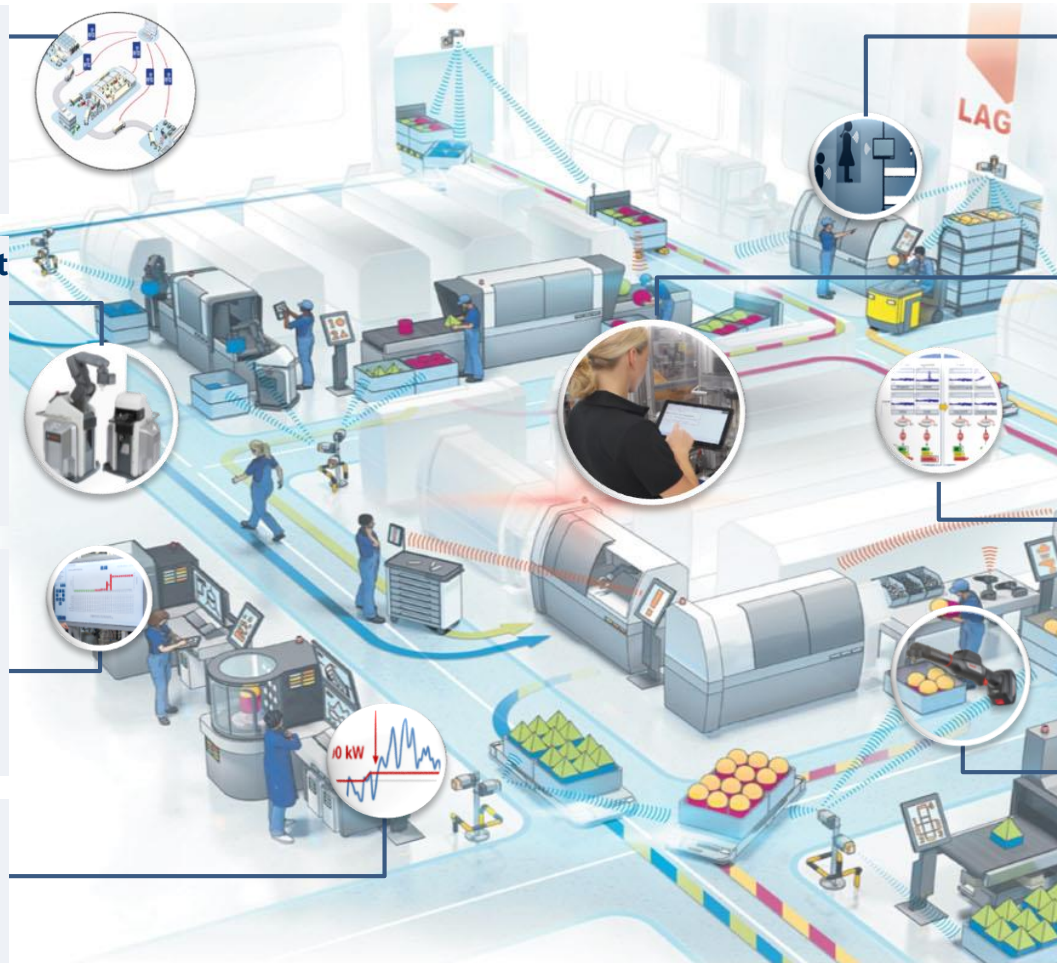


Systematic roll out for holistic approach driven by strategically focused pilots



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Use cases & benefits in a value stream - examples



Digital supply chain

- ✓ stock saving
- ✓ efficiency increase
- ✓ transparency along supply chain

Convertible Equipment

- ✓ fix cost reduction
- ✓ efficient M2H collaboration
- ✓ human relief of heavy load / repetitive tasks

Shop Floor Mgmt. Information

- ✓ real time data
- ✓ fast escalation
- ✓ paperless

Power / Energy Management

- ✓ peak reduction
- ✓ energy cost saving

Operator support

- ✓ agility & quick reaction
- ✓ quality increase
- ✓ efficiency increase

Predictive Maintenance

- ✓ improve OEE
- ✓ no sudden breakdown

Adaptive Testing

- ✓ increase efficiency
- ✓ less invest

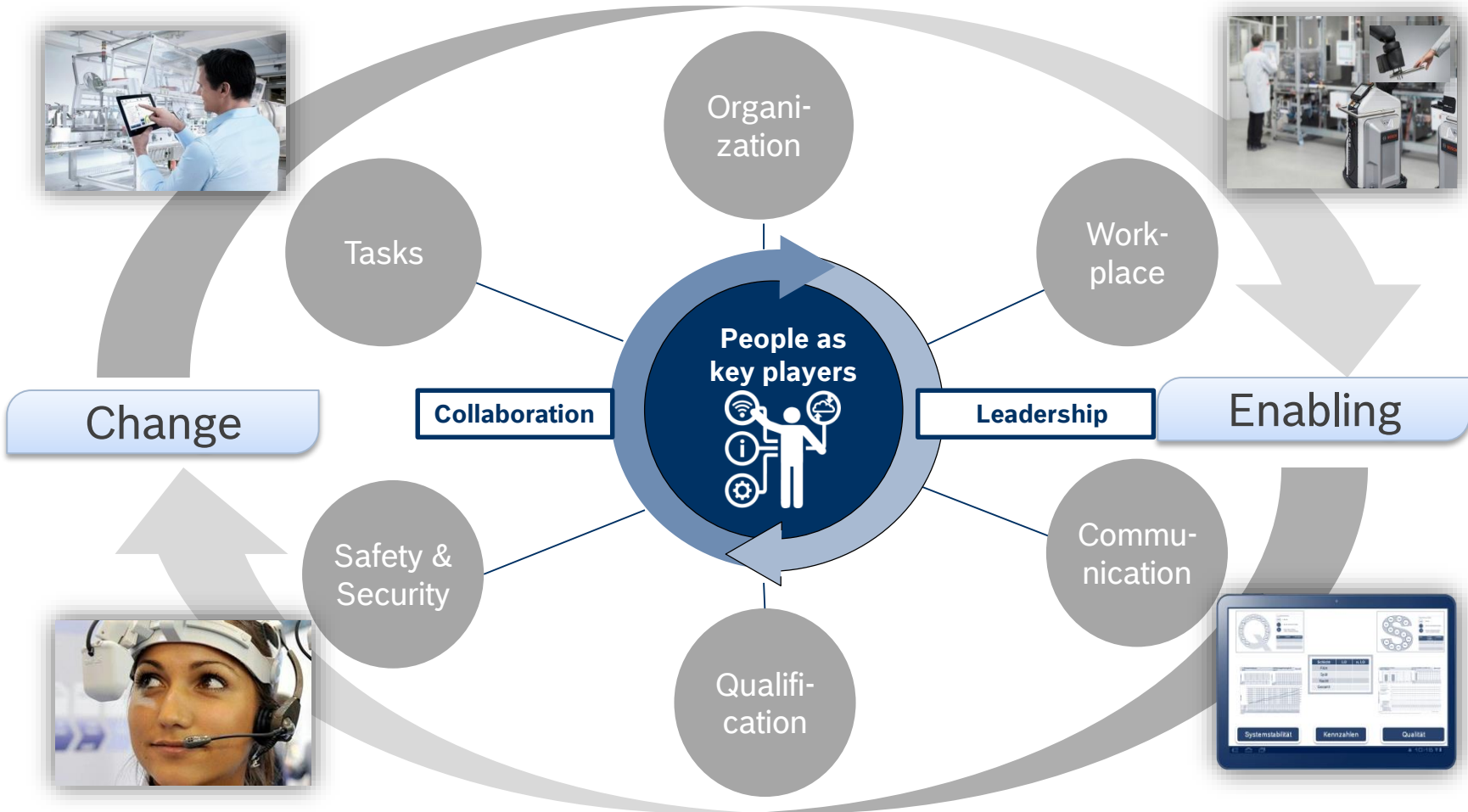
Quality Improvement

- ✓ instant feedback
- ✓ fast identification of error sources

M2H: Machine to Human, OEE: Overall Equipment Effectiveness



People are the key players for Connected Industry



Example Homburg: I4.0 in a multi-product line (lot-size 1)

User Provider



The diagram illustrates the integration of various systems in a factory. At the top, SAP and OpCon MES are connected by a double-headed arrow. Below them, a yellow BPM (Business Process Management) box is connected to both SAP and OpCon MES. At the bottom, a CIP Board (Computer Integrated Production Board) is connected to the BPM box. The background shows a factory floor with workers and machinery.

Use Case

Assembly of hydraulic valves for mobile applications in Homburg plant

I 4.0 Approach

- Unique product identification by RFID, flexible work sequence
- Exchangeable autonomous stations, user-specific work place configuration
- Line-/product status via „active Cockpit“

Results

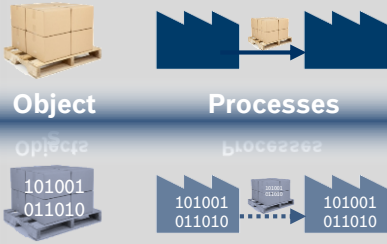
- 30 % Stock reduction, no setup
- 10 % output increase

Adaptive assembly line with intelligent operator support for high product variance

Example Blaichach: I4.0 in a whole plant



Digital image of physical material flow



Material Flow

Production

High utilization rate

Automatic alerts

Detect deviation

Order & booking automation

Full transparency

People as key players

Operator & maintenance support systems

Energy management

Fork lift fleet management

Product field data feedback to development

customized software & updates

Product

Plant

Staff restaurant (RFID based payment)

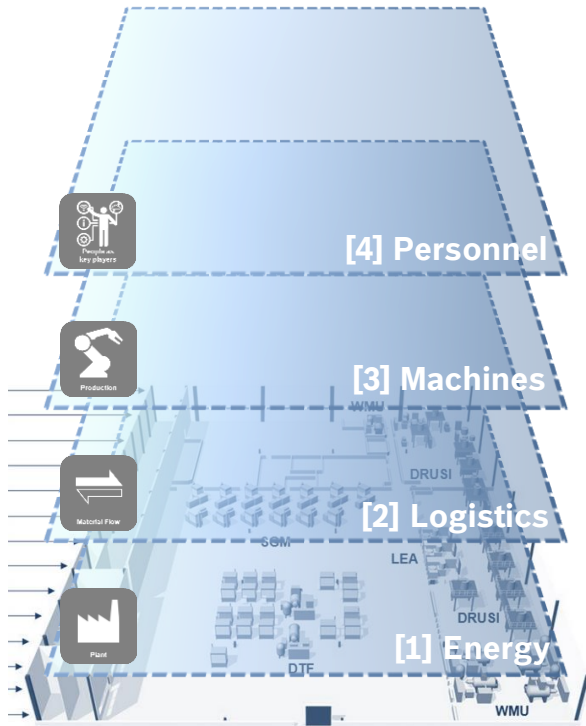
Evacuation support (Safety)



Example Blaichach: I4.0 in a whole plant

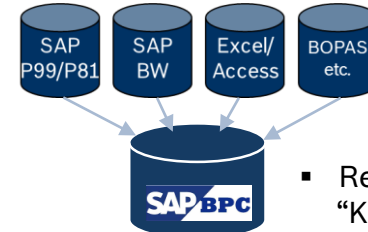


Intelligent data acquisition ...



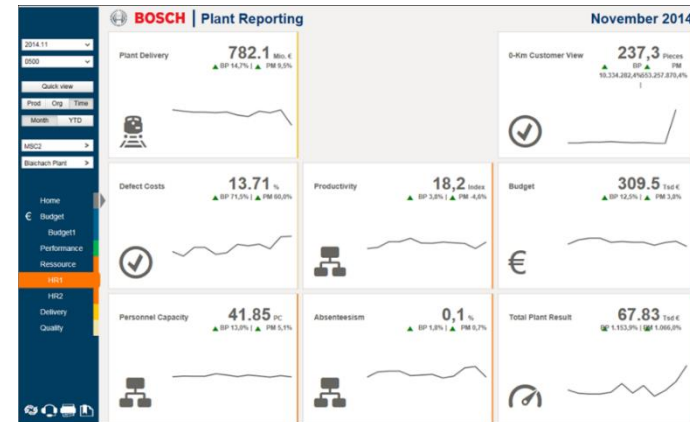
Real-time processing of multi-layer input

... to support people



- Real time data access “KPI under control”
- Target group specific visualization (“cockpit”)

KPI Dashboard



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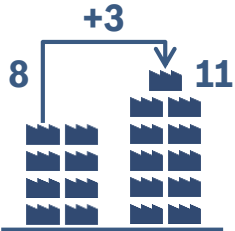
Example ABS & ESP: I4.0 in a whole IPN ¹⁾

1) IPN = International Production Network

Ausgezeichnete Orte
im Land der Ideen



IPN facts & figures



2014 2015
of plants



15
Years of experience



5174

Machines connected worldwide

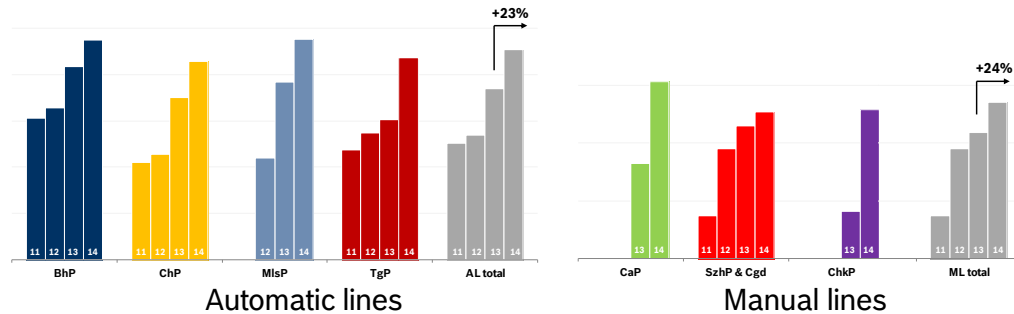
Enabler

- Worldwide plant benchmarking, based on daily MES reports



Results

- Up to 24% productivity increase



ABS



ESP®



We have excellent prerequisites to be successful ...

Lead Provider

System manufacturer/
Production resource view

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With external business


Enabler technology or
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 **Rexroth**
Bosch Group Drive and Control
Technology

 **Industrial Sensor
Solutions**


 **Bosch Software
Innovations**

 **Bosch Sensortec**

 **Packaging Technology**

 **Innovations-
management Logistik**


 **ATMO**
Assembly Systems
and Special Machinery

 **Machine Platforms**

 **Bosch Connected
Devices & Solutions**

 **Data Mining, Big Data**

 **Bosch
Service Solutions**

 **Center of Competence
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projects for connected industry

... because we play together like an orchestra!

Symphony-Orchestra...
= *efficient, accurate, standardized*



... and Jazz-Band
= *agile, creative, extemporized / jammed*

The Bosch Orchestra for Connected Industry!

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