

The background image shows a modern car manufacturing plant with blue cars on an assembly line. Overlaid on the left is a computer screen displaying a Siemens CAD software interface with a wireframe model of a car. The Siemens logo is in the top left corner.

**SIEMENS**

3<sup>rd</sup> SysInt Conference, Paderborn, June 13<sup>th</sup>, 2016

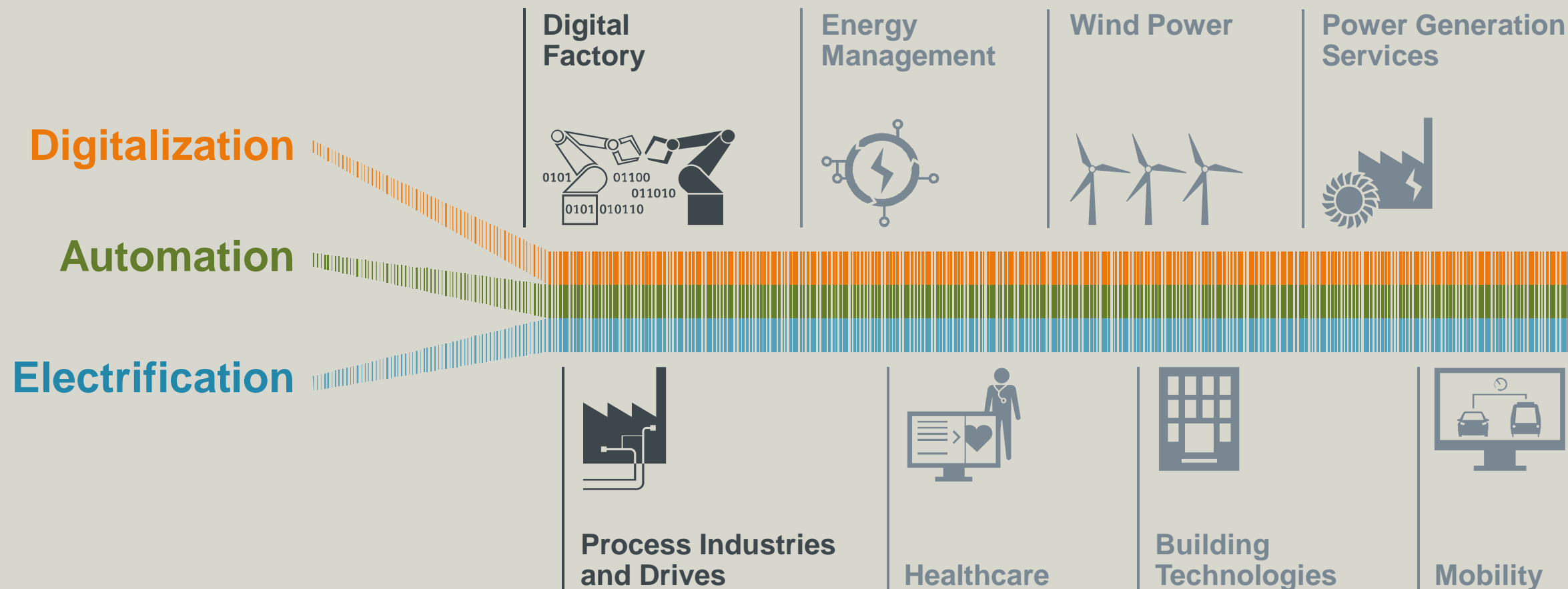
# Industrie 4.0 from both a user's and a vendor's perspective

Dr. Gerhard Volkwein | Director Digital Enterprise Architecture | Siemens AG

# Overview

- 1 A short introduction to Siemens ...**
- 2 Industrie 4.0 and Digitalization**
- 3 Best practice – Siemens Electronics Works Amberg**
- 4 Digital Enterprise – the answer of Siemens**

# Electrification, automation, digitalization – Siemens offers solutions along the entire value chain



**In order to remain competitive manufacturing companies need to achieve enormous improvements in their processes**

### Reducing the time to market



- Shorter innovation cycles
- More complex products
- Larger data volumes

**Product and production integrated**

### Enhancing flexibility



- Individualized mass production
- Volatile markets
- High productivity

**Flexible production**

### Increasing Quality



- Closed loop quality processes
- Traceability and integrated genealogy

**Full process transparency**

### Increasing efficiency



- Energy efficiency and resource efficiency as key competitive factors

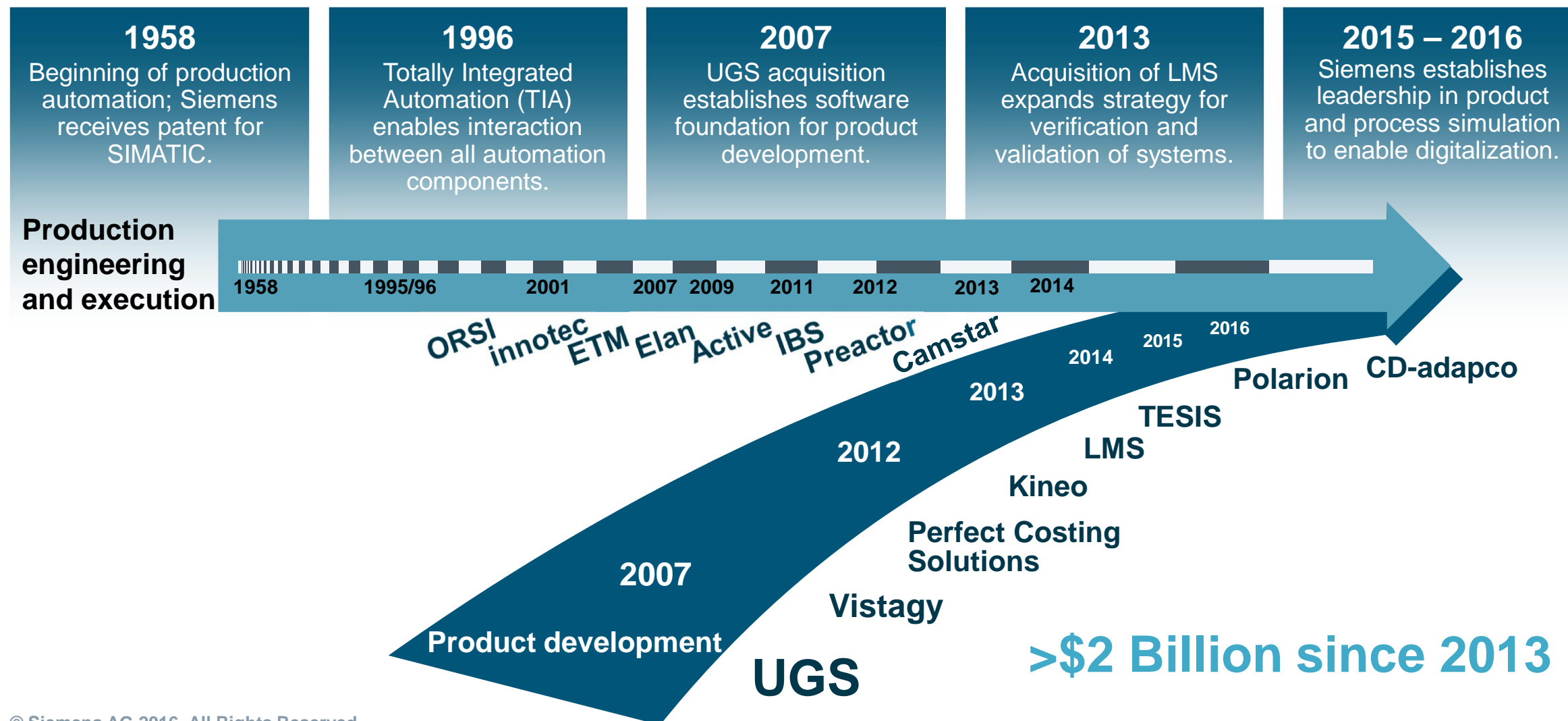
**Optimized production resources**

# Our Industry Software and Automation offering for the manufacturing industry

SIEMENS



# Continued investment to keep pace with digitalization



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## The good news ...

Industry is once again considered as the motor for growth and stability worldwide



### USA



#### "Manufacturing Renaissance"

- Formation of a "National Network for Manufacturing Innovation"
- Industrial Internet Consortium (IIC)

### Germany



#### Maintain leading industrial position

- Sustainable investment in innovative strength
- High level of exports
- **Industrie 4.0 as new guiding principle**

### China



#### Higher product quality by use of high-end- technology

- Rising wages
- Need for quality driven demand for automation
- Energy efficiency legislation
- Manufacturing 2025 Initiative

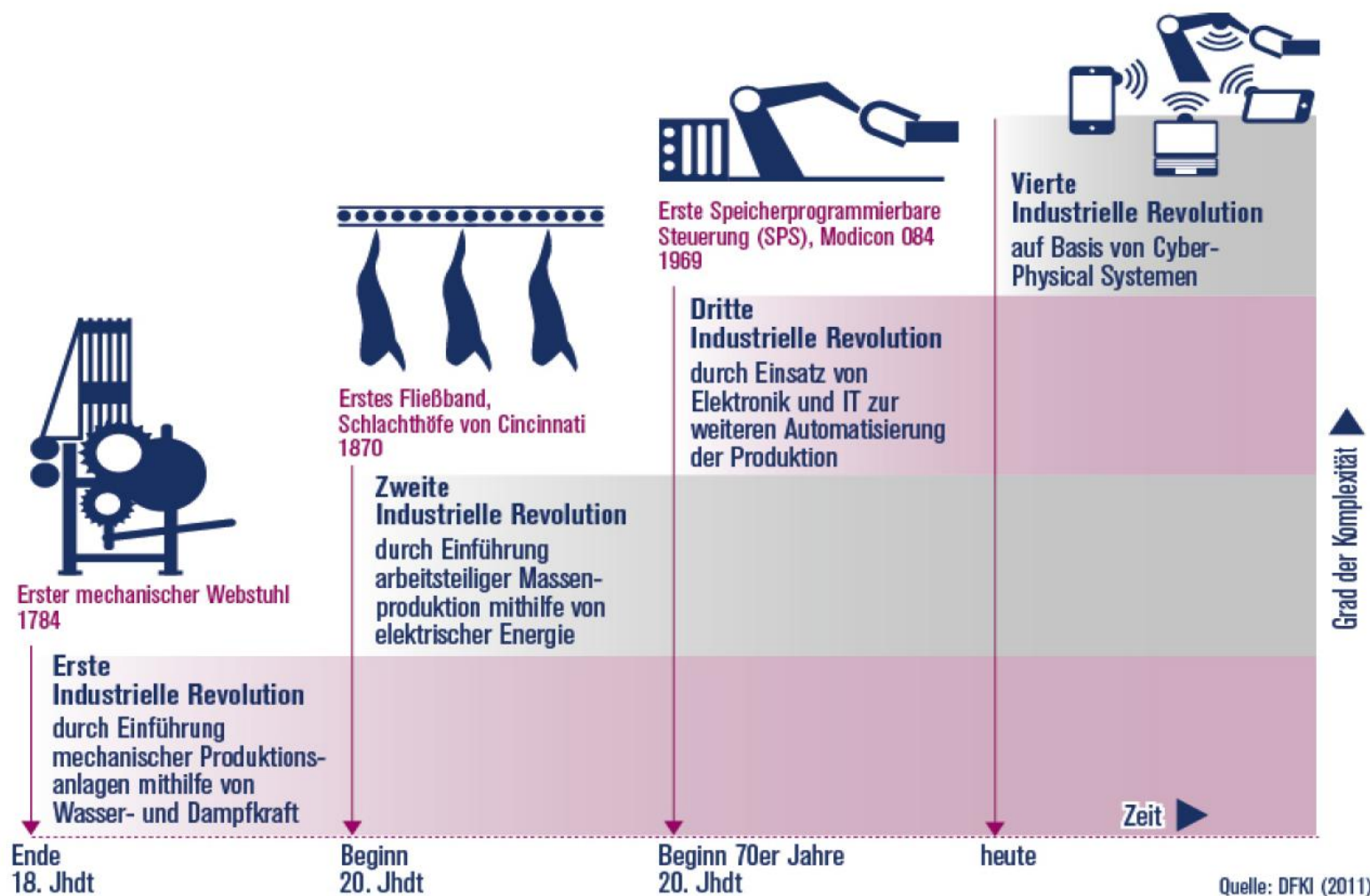
### Japan



#### Focus on growing exports

- Manufacturing industries generate about 20% of GDP
- Governmental activities to support export businesses
- Among the most innovative high-tech countries in the world

# The idea of the 4th industrial revolution ...



# Industrie 4.0

The German vision and research guideline of industrial production



## Industrie 4.0 ...

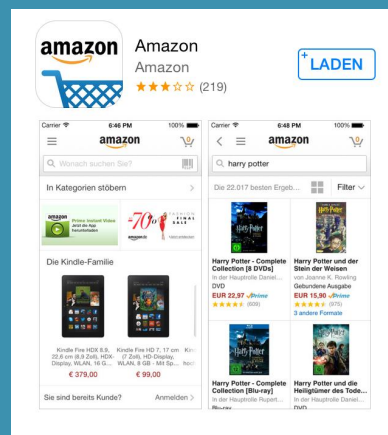
- Represents a new level of organization and control of the entire value chain, across the life cycle of products
- Is increasingly geared to individualized customer wishes
- Encompasses all phases from the idea and the order to development and production, delivery of a product to the end customer, even recycling and related services

## Central research areas

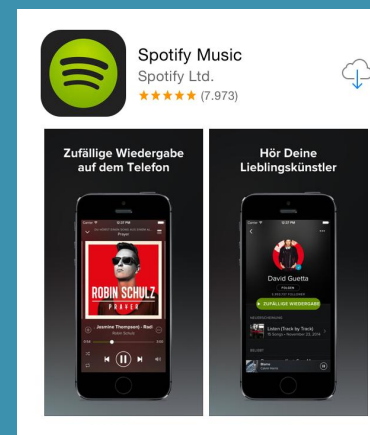
- Horizontal integration via value-added networks
- End-to-end engineering across the entire value chain
- Vertical integration and networked production systems

# The Internet is revolutionizing the business world and creates major challenges also for manufacturing companies

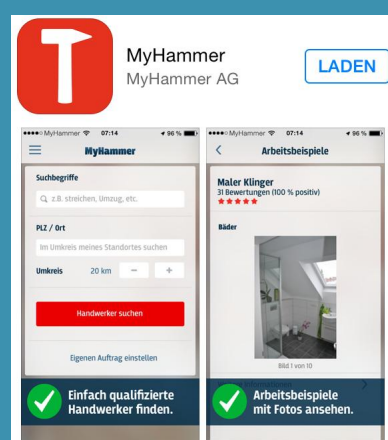
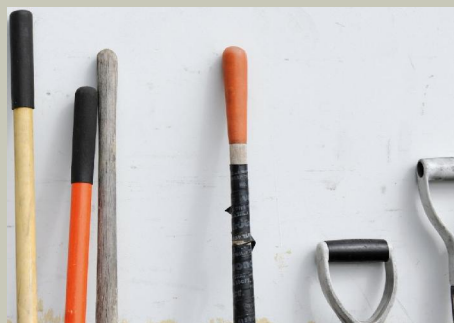
## From bookstore to e-book



## From record store to streaming



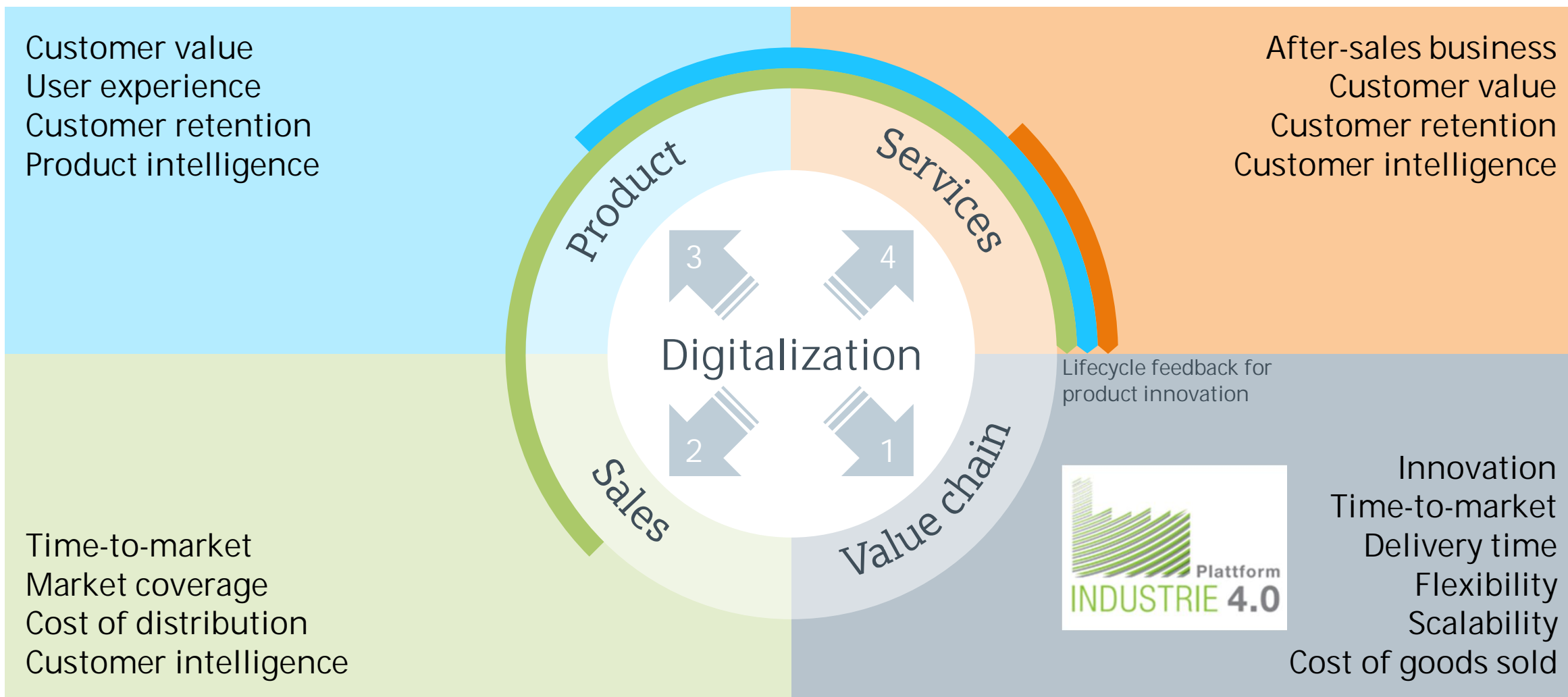
## From Yellow Pages to marketplace



## From taxi to ride-sharing

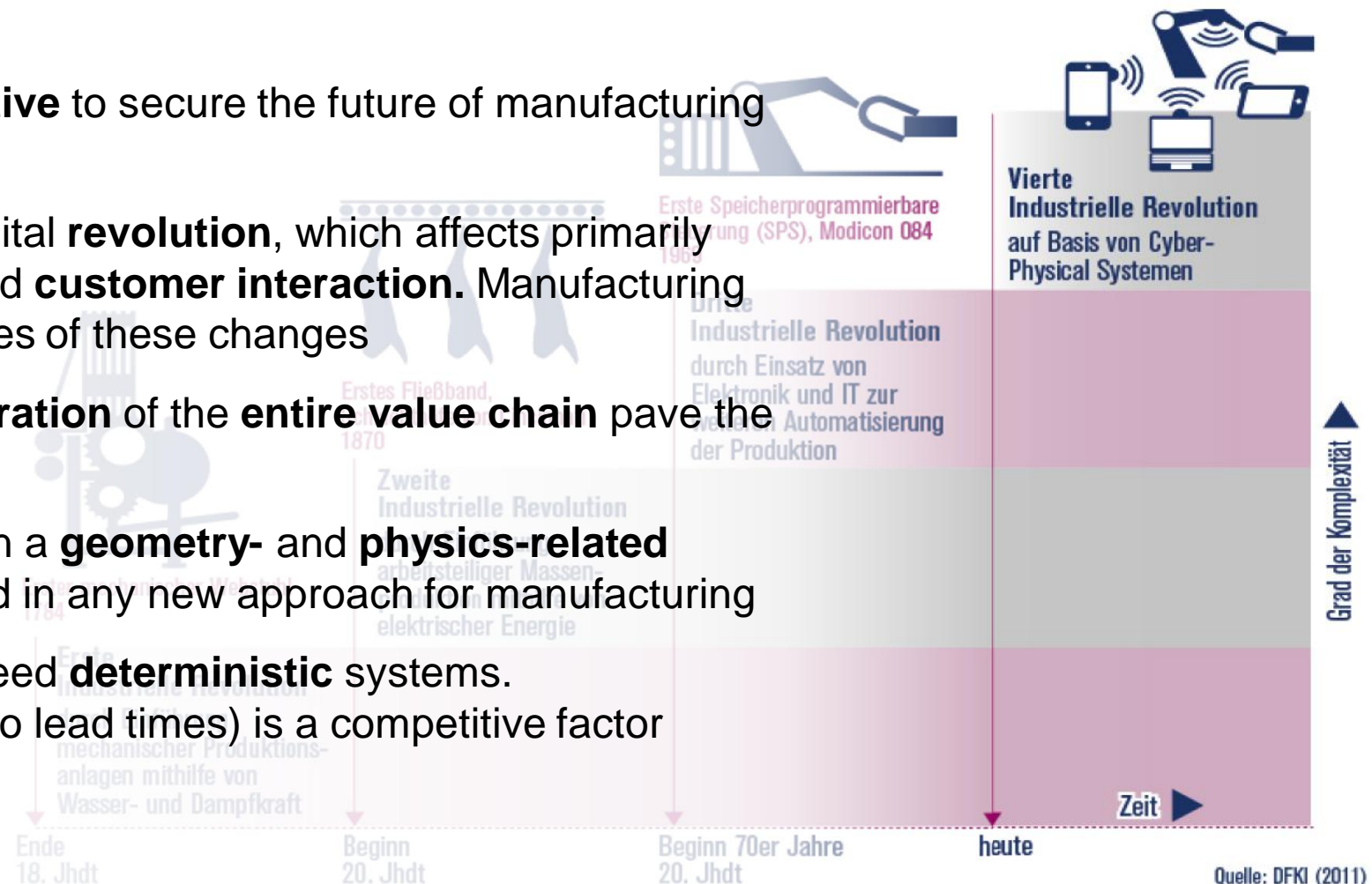


# Digitalization provides four different, yet mutually dependent levers to innovate business models in the manufacturing industry



## Conclusion

- § Industrie 4.0 is a **national initiative** to secure the future of manufacturing in Germany in the digital age
- § The Internet is the driver of a digital **revolution**, which affects primarily **products, business models** and **customer interaction**. Manufacturing has to **adapt** to the consequences of these changes
- § Further **digitalization** and **integration** of the **entire value chain** pave the way of this revolution
- § However, **production** will remain a **geometry-** and **physics-related** domain which has to be reflected in any new approach for manufacturing
- § Manufacturers will continue to need **deterministic** systems. **Predictability** (e.g. with regard to lead times) is a competitive factor



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### Positioning

#### **SIMATIC product families:**

- § Operator control and monitoring: **HMI**
- § Control: **S7, ET 200**

#### **Digital Factory**

#### **Lean Setup**



### Highlights

- § **24 h lead time**
- § **1 product /s**
- § **3 billion parts/ a**
  
- § **60.000 customers**
- § **10.000 m<sup>2</sup>**
- § **1.000 employees**

# Perfection and productivity through automation



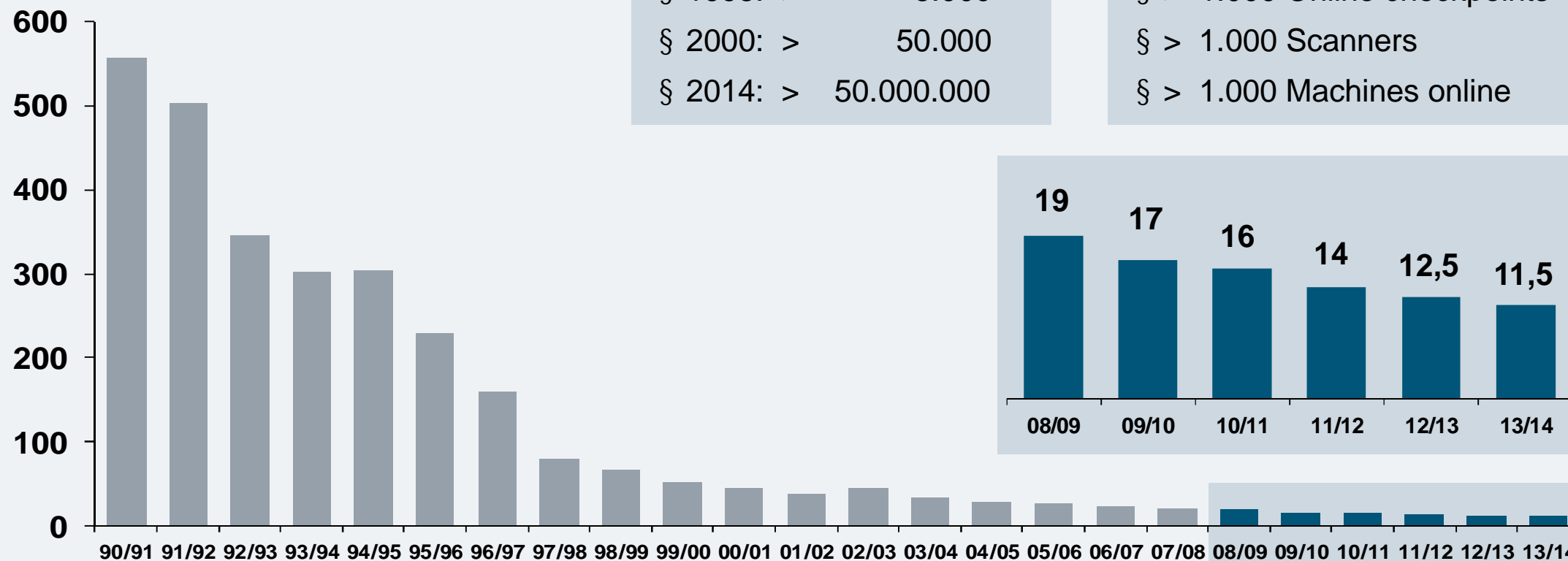
## More than 75% automation

- § In production
- § In material flow and
- § Information flow

## More than 1000 SIMATIC applications

# The result of striving for perfection in quality

dpm-A



## Process data per day

§ 1995: > 5.000  
 § 2000: > 50.000  
 § 2014: > 50.000.000

## Equipment

§ > 1.000 Online checkpoints  
 § > 1.000 Scanners  
 § > 1.000 Machines online

# The Digital Factory – Support by optimal transparency

## Collect Big Data and report Smart Data



### EWA standard label



### End-to-end identification of all objects:

- § All parts
- § All events in each process step
- § All products ...

### Collection of all process values:

- § Soldering temperatures
- § Production time
- § Torque ...

### Autonomous process analysis:

- § For all employees across all hierarchy levels
- § Intuitive detailing through drill-down-system
- § In real-time

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## On the way to Industrie 4.0 – driving the Digital Enterprise



**Siemens terms its approach to Digitalization in industry and its way towards Industrie 4.0 the “Digital Enterprise”**

# The Digital Enterprise

## Innovation



# Next generation design: Systems Driven Product Development

Innovation at the intersection of systems

Manage product complexity

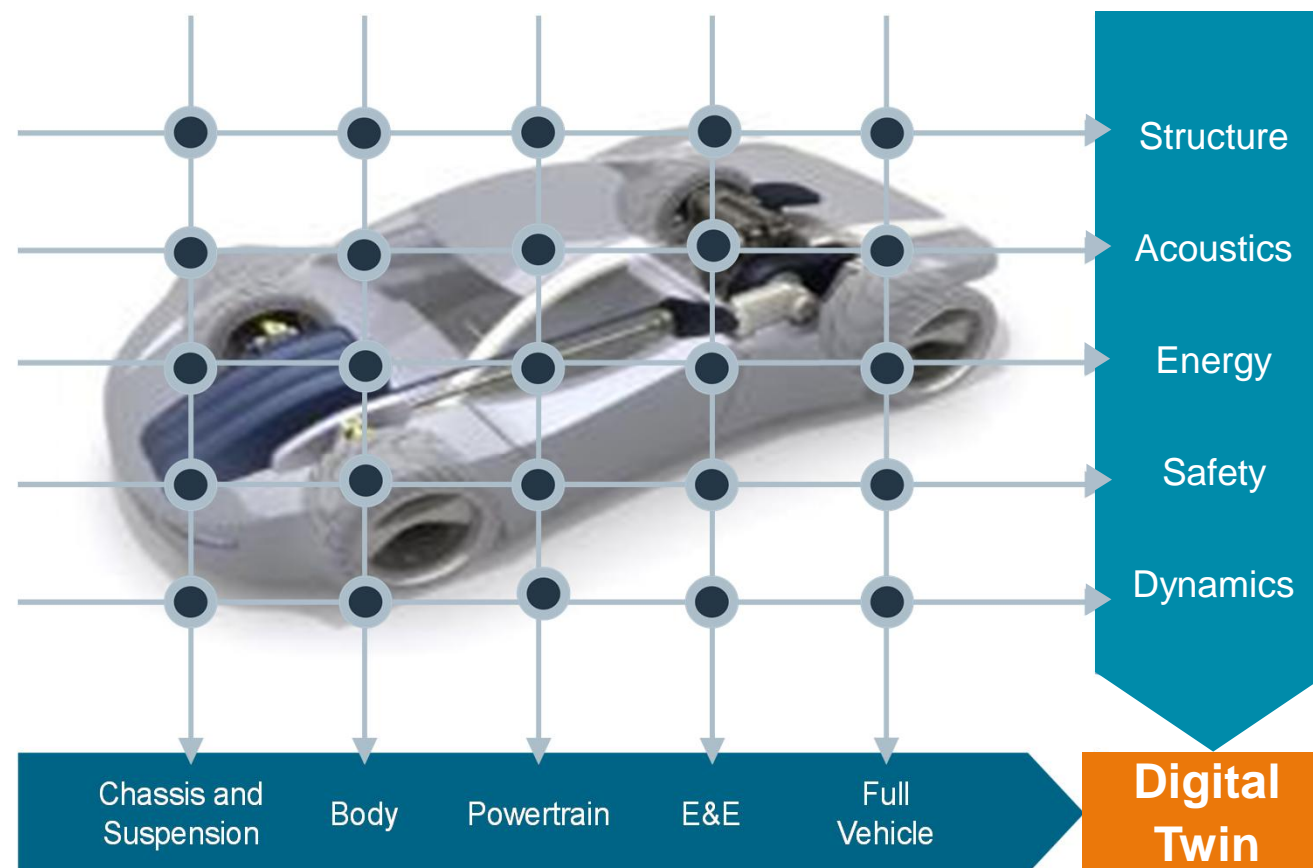
Optimize competing targets

Enable modularity and reuse

Balance performance and quality

Integrate and coordinate disciplines

Ideation



# Disrupting product development

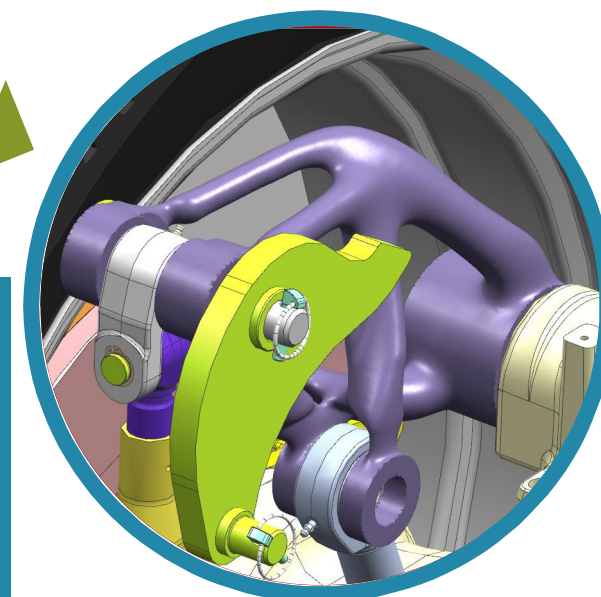
Optimized design for a new generation of products



**Conventional design**



**Optimized design**

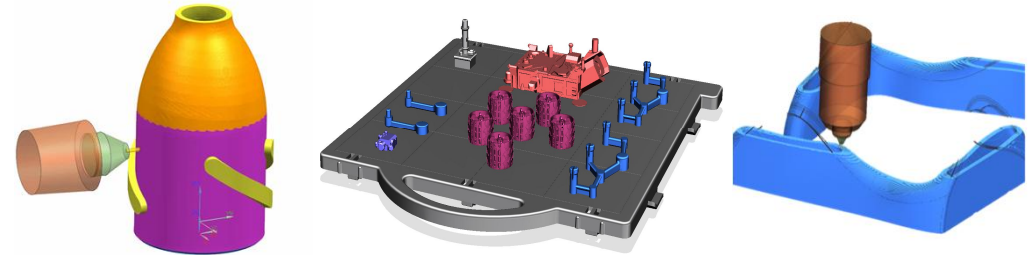


**Optimization benefits:**

- 28% weight reduction
- Less material
- Equal strength
- Fewer manufacturing setups

# Reimagine product design and engineering, production, distribution and service

NX for  
Manufacturing



Teamcenter + Manufacturing Operations Management

Additive  
manufacturing  
technologies



Directed Energy  
Deposition



Powder Bed  
Fusion

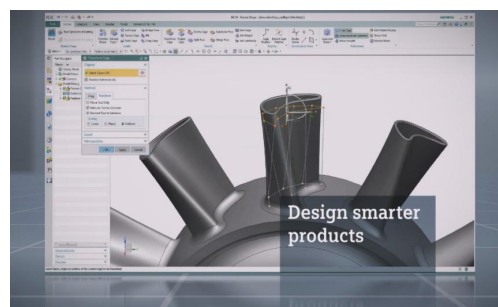


Material  
Extrusion

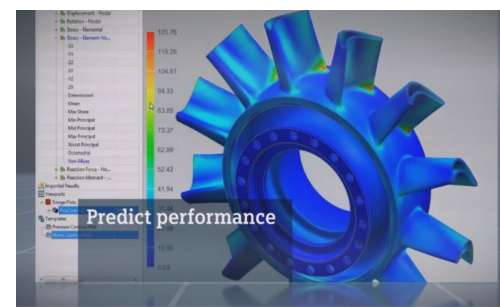
# NX Hybrid Additive Manufacturing

## 3D printing for real manufacturing

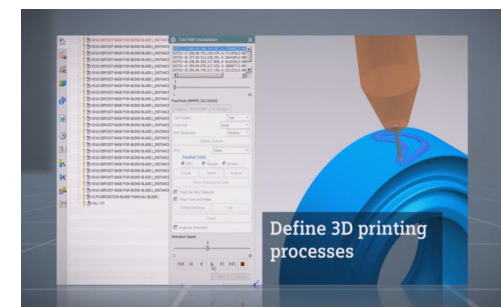
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2



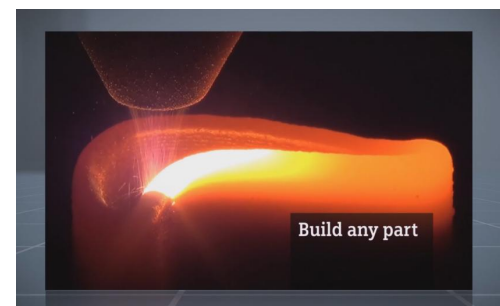
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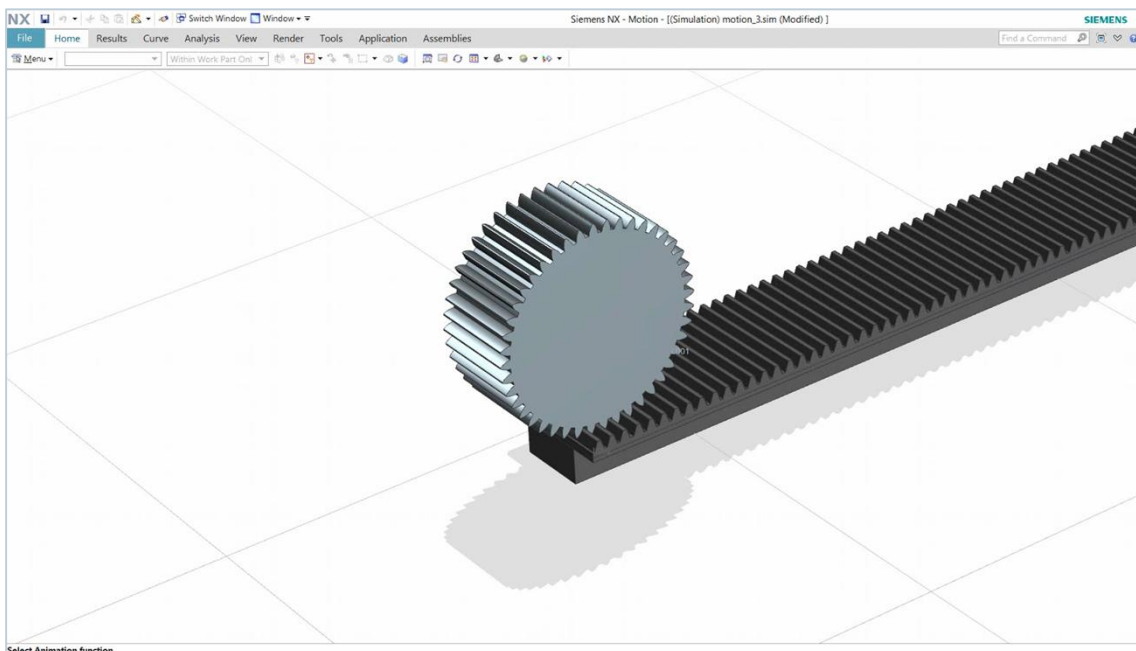
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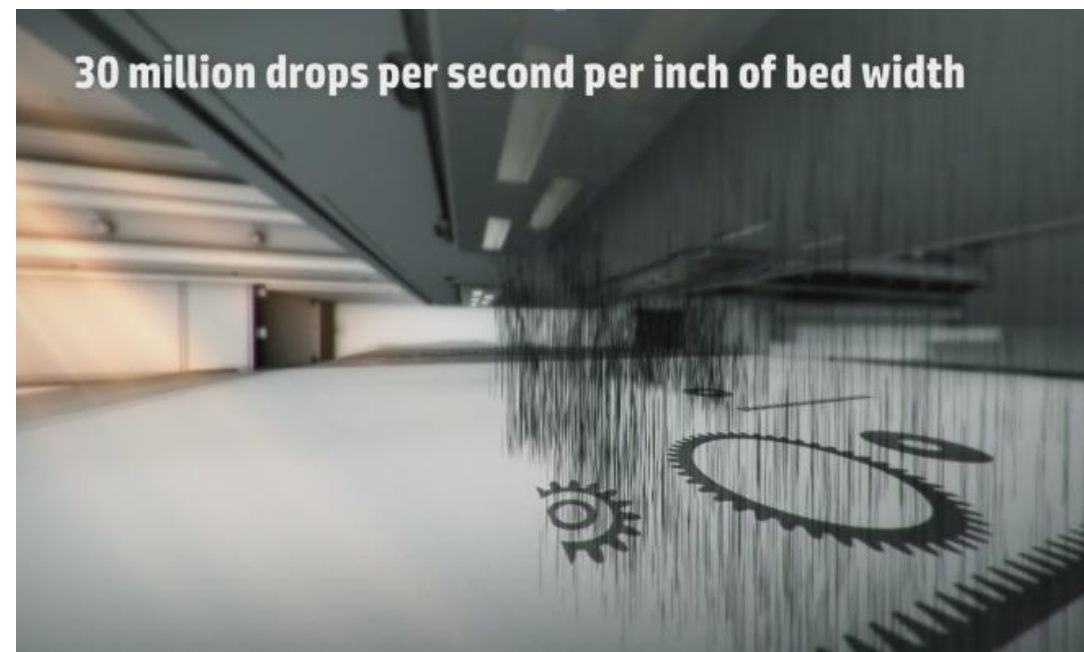


# Revolutionizing the future direction of 3D-printing



## Visual wear indication

Simulation of a functional design  
utilizing 3D printed multi-colored parts



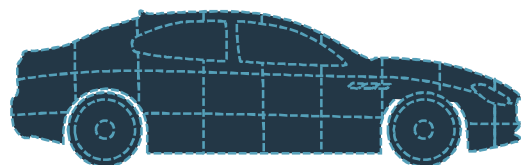
## HP Multi Jet Fusion technology

Changing the way products are realized

Accurately represent what is real and simulate what is possible



Digital Twin



Manufacturing Planning



Manufacturing Engineering

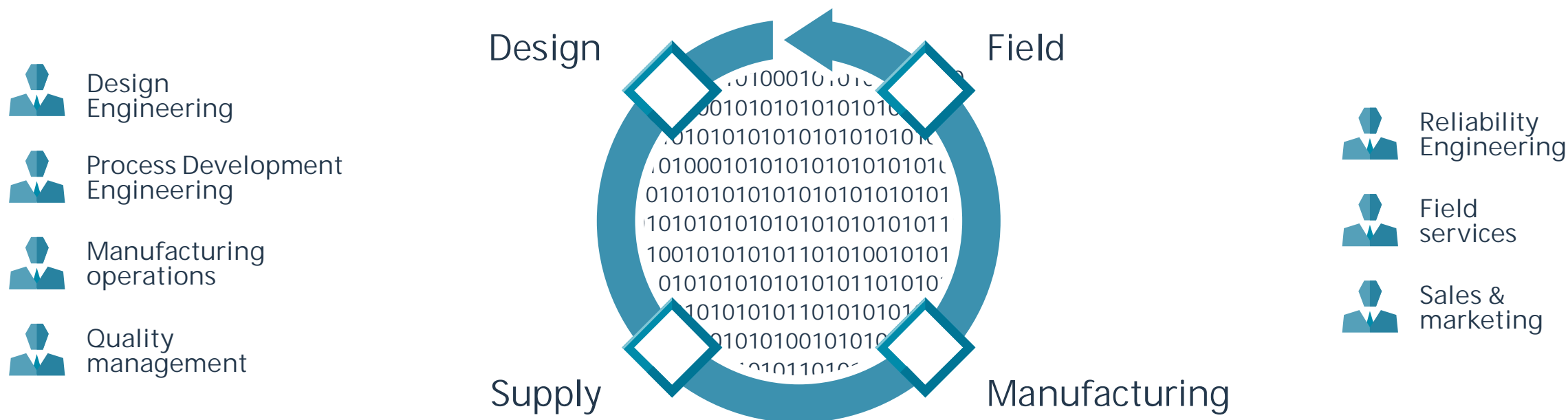


Physical production system



Manufacturing Execution

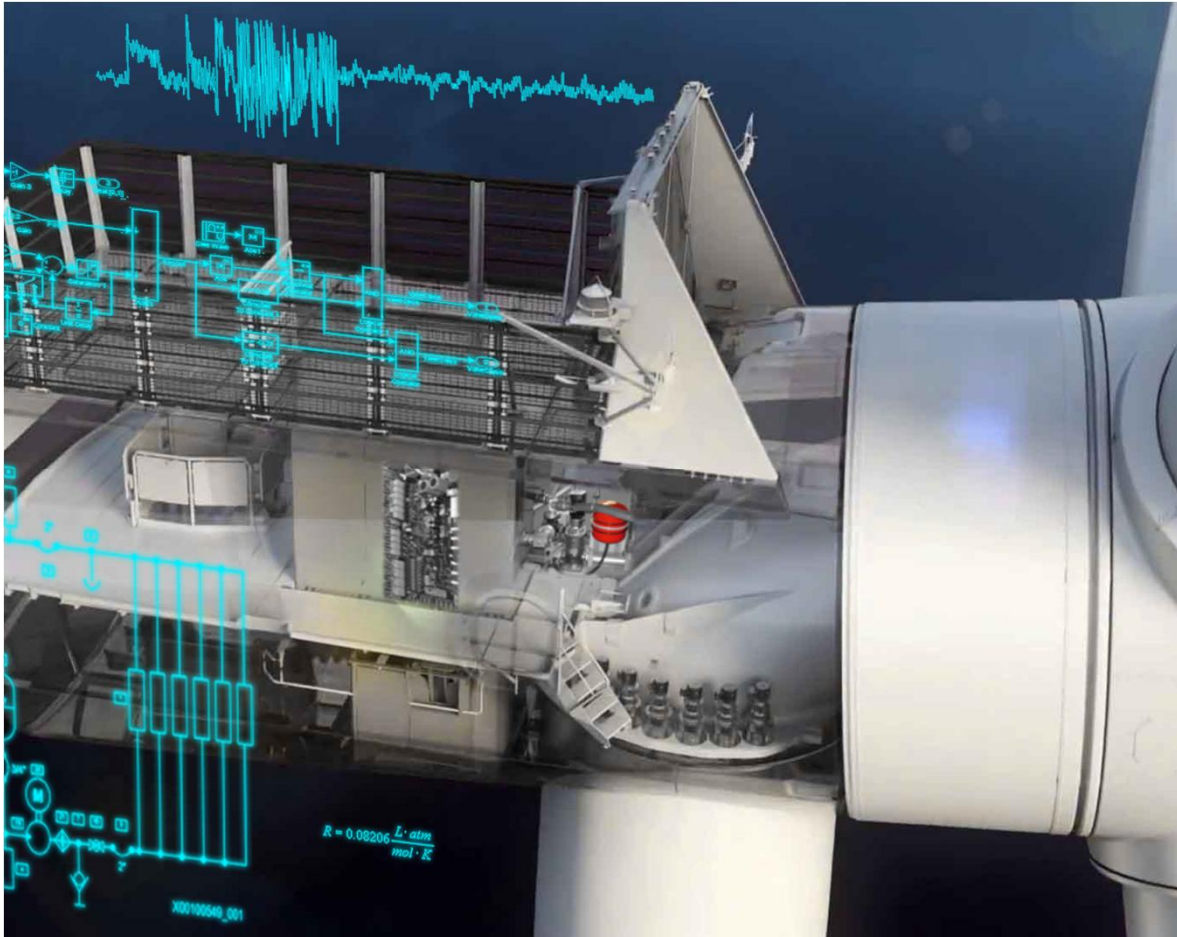
# Turning raw data into business value



# Siemens actively driving analytics

## Model based diagnostics

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**The value of  
Data analytics  
is unlocked  
with domain  
knowledge.**

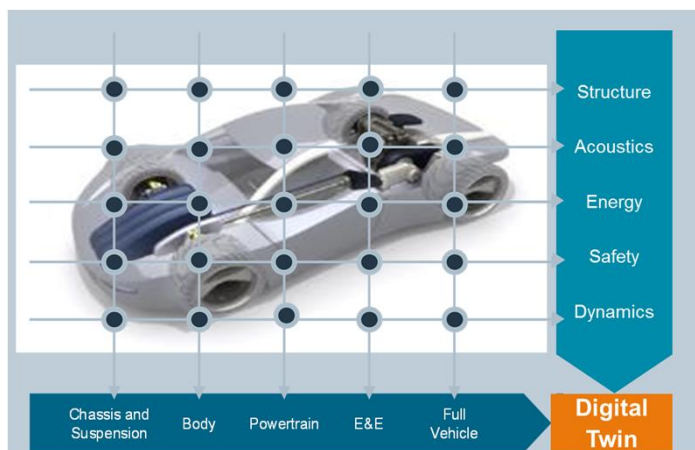
# Realizing the Digital Enterprise

## The Siemens digitalization strategy

### Ideation



Strengthening Product Development through Systems Engineering and Simulation



### Realization



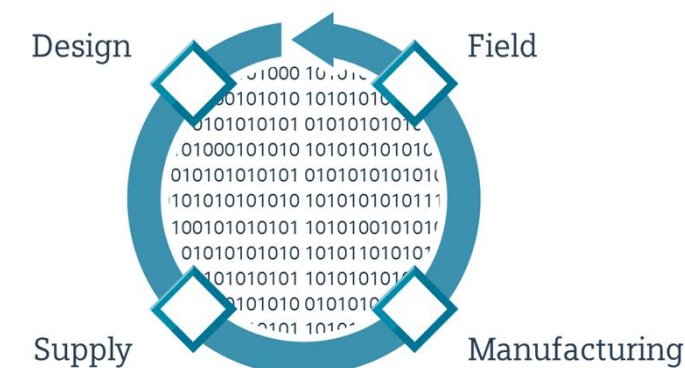
Integrating “Product” and “Production” for closed-loop manufacturing



### Utilization



Expanding analytics across the entire lifecycle leveraging the IoT

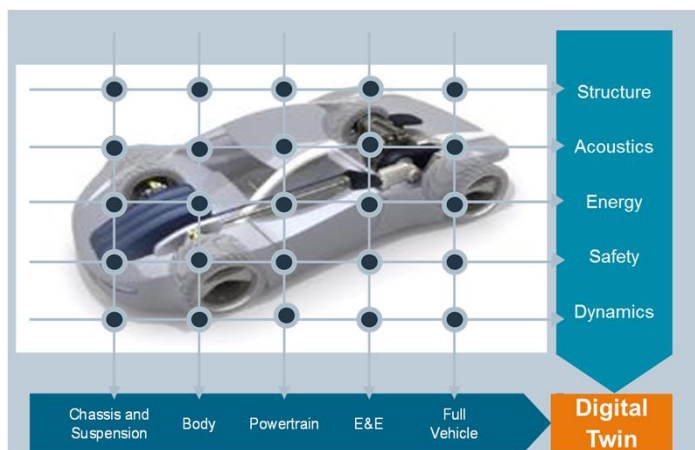


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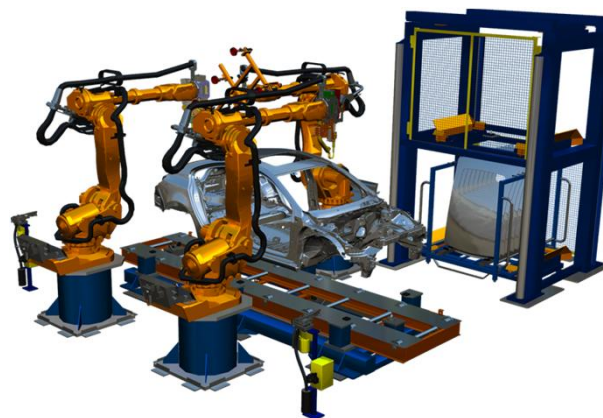
### Ideation

## Digital Product Twin



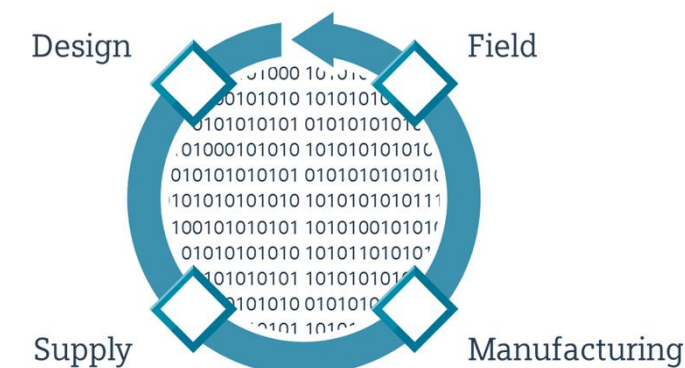
### Realization

## Digital Production Twin



### Utilization

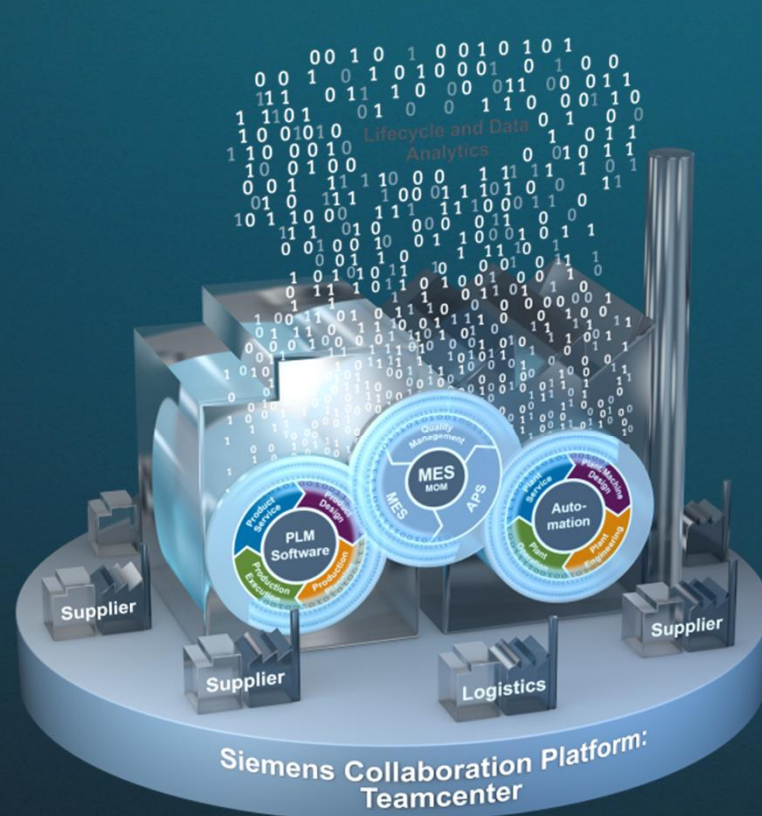
## Digital Performance Twin



# Digital Enterprise Software Suite

The answer of Siemens for the stepwise implementation of Industrie 4.0 ...

## Digital Enterprise Software Suite



Industrial Communication

+



Industrial Security



Industrial Services

**Thank you for your attention!**



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Answers to frequently asked questions on Industrie 4.0:  
[www.siemens.com/digital-enterprise](http://www.siemens.com/digital-enterprise)