Digital Enterprise – Implement now!

Klaus Helmrich | Member of the Managing Board Siemens AG | Hannover Messe 2018
At the Hannover Messe, Siemens demonstrates on-going development of the Digital Enterprise and the digital twin.

Our lead themes at the Hannover Messe:

- **2013**: acatech recommends actions for implementation of “Industrie 4.0” to Chancellor Merkel.
- **2015**: “On the way to Industrie 4.0: The Digital Enterprise”
- **2016**: “Driving the Digital Enterprise”
- **2017**: “Discover the Value of the Digital Enterprise”
- **2018**: Implement now!

“On the way to Industrie 4.0”

“Driving the Digital Enterprise”

“Discover the Value of the Digital Enterprise”

Implement now!
Implement now!

The Digital Enterprise portfolio for Industrie 4.0 is here –

→ For more flexible solutions in design, production processes and structures
→ For new data-based business models

- Greater flexibility
- Shorter time to market
- More efficiency
- Improved quality
Engineering is a cost driver in automation

Example: Cost structure in control technology

Source: Analysis of control technology and robot technology cost structure (Automation Initiative of the German Automotive Industry (AIDA), 2005)

1 Cost structure of a control technology project

Unrestricted © Siemens AG 2018

Klaus Helmrich, Member of the Managing Board Siemens AG
More flexible solutions in automation, design, production processes and structures

... 1990s

Automation
Manufacturing processes are automated

Design and engineering
First steps integrating automation and engineering

Digitalization
Digital twin of the entire value chain

2000s

Today

Hannover, April 23, 2018
Digital twin – a holistic virtual representation of the value chain for the discrete and process industries
Implement now! – Digital Enterprise in the automotive industry

**Before**

**Discrete industry**

**Product**

Vehicle development and simulation using a range of non-integrated solutions

**Production**

Adjustment of automation systems during on-site operation

**Performance**

Cost-intensive downtimes in production due to the occurrence of unexpected defects

**Now**

**Shorter time to market and fewer prototypes** due to simulation and end-to-end data management (Daimler, Nissan, VW)

**Programming** of automation systems and simulation of production processes takes place offline prior to start of construction (Volvo, VW)

**Analysis** of process data and preemptive fault detection in production lines

Klaus Helmrich, Member of the Managing Board Siemens AG
Implement now! – Digital Enterprise in the automotive industry

NX CAD

Team-center

TIA Portal

Tecnomatix

Predictive Services

>50%
less time to market due to shorter engineering time for vehicles with combustion engines and electric motors

>98%
of systems such as robots are programmed and simulated at the desk for significantly shorter commissioning times

>99%
prediction of faults before they would have a chance to occur
Implement now! – Digital Enterprise in the food and beverage industry

Hybrid industry

Product

Long product development times and low product diversity

Production

Long test phases for commissioning and laborious conversion of production lines

Performance

Quality fluctuations in the end product due to different production conditions (temperature etc.)

Before

Now

High level of flexibility coupled with wide product variant diversity to a consistently high standard of quality (San Miguel)

Holistic plant simulation creates greater flexibility and permits faster commissioning

New data transparency enables consistently high quality of the end product and filling process
Implement now! – Digital Enterprise in the food and beverage industry

>75% time savings in determining the bottle stacking load

Up to 100% monitoring of beer quality and ingredients

Simulation and testing of the complete production process even before plant construction has begun

Prevention of bottlenecks by creating transparency across production and filling lines
Implement now! – Digital Enterprise in the chemical industry

**Before**

Plants can only produce paint batches in large quantities (> 5,000 liters)

- Data documentation on paper, manual plant resetting and time-consuming test processes

**Now**

Greater flexibility in responding to demand for small batch sizes up to 100 liters using plant simulation and digital optimization (Dulux)

- Data documentation of formulas and production processes completely digitalized (digital twin) for flexible plant resetting (Dulux)

- Data analysis of process data and preemptive fault detection in production lines

**Process industry**

**Engineering**

- Retroactive repairs and maintenance after faults have occurred

**Operation**

**Service**
Implement now! – Digital Enterprise in the chemical industry

Greater customization
100 ltrs instead of >5,000 ltrs

>50%
less time from testing to paint production

8x
faster production process

Fewer downtimes
due to predictive maintenance

Simatic PCS 7
Simit
Comos Walkinside
Simatic IT eBR
Simatic PCS 7 Process Historian
With MindSphere, Siemens has provided a cloud-based open operating system for the industrial Internet of Things.

Applications
- Use of open interfaces (APIs) to generate OEM apps and services
- Marketing through the App Store
- Protection of externally developed OEM apps

MindSphere
- APIs for the development of customized apps
- Various cloud infrastructures: SAP, Amazon Web Services, Microsoft Azure, Atos, “public”, “private” or “on-premise” (planned)

MindConnect and Edge Computing
- Open standards for connectivity such as OPC UA, HTTP
- Plug-and-play connection to Siemens and third-party suppliers
- Secure encrypted data communication
- Edge computing concept

1 Free availability planned for the fourth quarter of calendar year 2018
Open cooperation fosters the positioning of MindSphere as a leading industrial IoT operating system

**Platform provider**
provides Platform as a Service, leveraging economies of scale

**OEMs**
utilize the platform to develop their own solutions, business models and apps

**Users**
integrate the apps into their digital value chain
The member companies of MindSphere | World support the worldwide application and positioning of MindSphere

Shared activities of the organization

- Recommendations for requirements imposed on IoT operating system MindSphere
- International rollout of activities (next step Italy, ...)
- Expansion of member companies and user groups (16 further requests approved)
- Support in opening up new digital markets for new data-based business models
Implement now! – MindSphere
New machine operator model from Heller

Heller:
Monitoring app
- Customer pays to use a machine tool rather than acquire his own (pay-per-use)
- Global access to machine data (connectivity over the cloud)
- Increased flexibility, quality and availability for the end user
- Stronger customer loyalty ties

»Heller for Use«
Round-the-clock maximum machine availability
Implement now! – MindSphere
Weinig tools for daily application in the woodworking industry

»Weinig AppSuite«
Machine monitoring at the press of a button

Weinig: AppSuite

• Machine monitor for worldwide monitoring of production in real time
• Direct wire to Weinig with overview of the Weinig machine fleet including contact partners
• Maintenance information directly to a smartphone as a push message
SIDRIVE IQ – new digital app for evaluation and utilization of drive data based on MindSphere

(R)Evolution in drive technology
- Digital application for drive systems along the entire life cycle
- More productivity, reliability and serviceability
- Based on networked drive systems from Siemens
- Pre-defined service packages for special customer requirements

Drive system + Connectivity + MindSphere + MindApps + Services

IQ-ready

SIDRIVE IQ

Detection of faults and root causes through data analysis

Optimization of operation and maintenance planning
MindSphere app for capacity balancing optimizes worldwide production plants

Creating transparent producing capacities

- Data link between predicted order load and installed capacity
- Less external sourcing
- Higher capacity utilization of the machine fleet
- More efficient personnel deployment
- Optimization of investment decisions

Load distribution across factories – example Siemens Large Drives

Cross-site optimization of machine capacity utilization
Implement now! – MindSphere
Smart Data at Spanish automotive supplier Gestamp

“Saving energy is a must.”
Pablo de la Puente, Corporate Information System Director, Gestamp

Continuous energy consumption monitoring

- Measuring and power quality devices as well as data analysis over MindSphere
- New analysis possibilities available
- 20,000 tons of saved CO₂ and 15% reduction in costs
- Connection to 15 production facilities worldwide to date, plans to connect a further eight

“Saving energy is a must.”
Pablo de la Puente, Corporate Information System Director, Gestamp
Outlook

Edge computing

New communication technology

Additive manufacturing
Siemens Industrial Edge concept for discrete manufacturing and process industries – on-site functionality plus full data control

Edge management
• Device management
• Edge app management
• Edge App Store

Edge apps
OEM, partner, customer and 3rd party Edge apps

Edge devices
Secure, decoupled Edge runtime infrastructure for Edge apps

Application examples
Workpiece analysis app for machine tools
Smart workpiece analysis based on a reconstructed digital twin
Inventory app for machine building
Overview of automation component inventory

Benefits
• High level of data security
• Conversion of Big Data into Smart Data
• On-site data analysis and evaluation
Additive Manufacturing – integrated portfolio from Siemens

Example
Burner fronts for Siemens gas turbines

Product design
Production planning
Production engineering
Production execution
Services

NX AM
Plant Simulation, NX CAM
Simcenter
TIA, Simatic, Sinumerik, Simotion
MindSphere

Simplification
13 → 1 part
Shorter production time
26 → 3 weeks
Lower weight
→ 22%

Unrestricted © Siemens AG 2018
Slide 23
Hannover, April 23, 2018

Klaus Helmrich, Member of the Managing Board Siemens AG
Additive Manufacturing Experience Center for our customers

Digital AM application demonstration and testing space for our customers

• Integrated software and automation solutions
• Development, simulation and testing of the seamlessly integrated AM value chain
• Highlighting the possibilities offered by industrial additive manufacturing, such as design freedom

Opened on 10 April 2018
Additive Manufacturing Experience Center in Erlangen
Siemens Additive Manufacturing Network creates a comprehensive eco system

1. Open eco system
2. Users can be customers or suppliers simultaneously
3. New ways in production
4. Secure and protected
5. Fully digitalized communication

https://siemens-pmp.firebaseapp.com/workspace

Launch July 2018
Time-Sensitive Networking (TSN) across all levels –
Industrielle kommunikation integriert zukünftige Technologien

For more robust, more reliable and
standardized Ethernet communication –
even under high network loads

- Gradual integration of TSN basic technology\(^1\) in
  PROFINET network infrastructures: Link-up of the
  field level
- Robotics trade fair model: OPC UA PubSub based
  on TSN\(^1\) on the control level between controllers
- Possible applications in fields such as machine
  building, automotive engineering or the food and
  beverage industry

---

1 Standardized basic technology (IEEE 802.1) on layer 2
Comprehensive portfolio of security products and services for current and future security challenges

Defense-in-Depth

- Protection against sabotage
- Secure cloud architecture
- Protection of know-how

Productivity increases, costs reduce

Cyber-security risks

Plant security

Network security

System integrity
Defense-in-Depth at Dow Chemical – Central protection of distributed systems

- Protection of critical data against cyber attack in the Simatic PCS 7 process control system
- Central server manages and distributes licensed security software of strategic Siemens partner McAfee (antivirus and whitelisting)
- Whitelisting software suitable for industrial applications blocks the start of unknown or unauthorized applications

Comprehensive security – over the entire life cycle

Source: The Dow Chemical Company
“Charter of Trust” forms the foundation for the joint advanced development of digitalization and cyber-security

10 principles of the Charter of Trust

1. Ownership of cyber/IT security
2. Responsibility throughout the digital supply chain
3. Security by default
4. User centricity
5. Innovation und co-creation
6. Education
7. Certification for critical infrastructures solutions
8. Transparency and response capability
9. Regulatory framework
10. Joint initiatives
Open Space – open, cooperative association with partners to develop ideas on the basis of MindSphere

**MindSphere Open Space Challenge**

- Support for and cultivation of expertise in the development of third-party apps based on MindSphere
- Developer contest to find the best customer solution at the show
- Creative approaches to the development of new business models for our customers

---

**SIEMENS**

*Ingenuity for life*

---

Unrestricted © Siemens AG 2018
Digitalization is set to change both the sales process and operation in the future.

From the physical showroom to the digital design and sales room.

From the on-site foreman's office to the digital simulation room in the factory.