Future of Automation

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The future will be different.
Future of Automation is a key enabler for the vision of future factories

The digital transformation have new requirements
• more flexibility
• shorter time-to-market
• increased quality and efficiency
• new business models

Now and in the future new technologies will further enhance the Digital Enterprise and enable smart factories

To handle increased complexity in a smart factory Siemens will utilize the best of both: automation and digitalization

Envisioning the future of factories must first begin with a vision for the future of automation, an approach that has been relatively less explored in the industry today.
Future of Automation trend technologies that can strongly influence automation

In particular, the three trends of artificial intelligence, edge computing, and augmented reality have been identified as factors that can strongly influence automation in the following ways:

1. **Artificial intelligence** has the potential to transform human-centered engineering models into automated systems, facilitating continuous operational learning and resulting in productivity gains that can exceed existing human-led approaches.

2. **Industrial Edge** or computing at the edge can help expand PLC functionalities with additional computing power and personalized operational needs without sweeping changes to production architecture.

3. **Augmented reality** will be the HMI of the future, enabling operators with high transparency and superior insights into controllers, machines, and production processes.
Now and in the future new technologies will further enhance the Digital Enterprise and enable autonomous cyber-physical systems.

### Existing
- TIA in the Digital Enterprise

### Current Innovations
- First portfolio elements
  - SIMATIC S7-1500/ET 200MP TM NPU

### Upcoming Innovations
- Automation of Engineering
  - Industrial Artificial Intelligence
  - Industrial Edge
  - Industrial Augmented Reality

- Step by step new IT technologies will be utilized for industrial automation and will materialize in the form of further innovative products, applications and software.

### Big Picture
- Automation of Automation
  - Edge meets AI
  - Autonomous Machines
  - Cognitive Engineering
  - Modularization

- A digital holistically integrated value chain, leveraging AI will enable autonomous systems and model-based engineering. This is the major lever towards zero engineering.

- Joint innovations based on cutting-edge IT technology will further increase productivity.

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**Zero Engineering**
Artificial Intelligence (AI) can use new data to learn continuously.

This vision that is driving us is that of an autonamation which is capable optimizing itself and even automating itself.

Why AI?
Artificial Intelligence with all its different facets will reduce programming and engineering efforts, make control logic more agile and flexible towards changes in the environment and production processes more flexible and precise.
Collaborative robots working with Artificial Intelligence

These robots independently perform part of the control panel assembly.

The interesting thing is that the robots only get the instruction about **what is to be manufactured** and **no longer how** it is to be manufactured. This means robots **no longer need to be programmed in detail**. Moreover, the robots’ wrists are equipped with cameras to locate the parts around them and monitor their surroundings.
Using new visualization methods to maintain control over increasingly complex production methods.

Augmented reality (AR) extends the view of the real production, plant and machines with virtual components.

Why AR?

From the planning stage of new machines or plants right up to the operation of complete plants, AR enables an high degree of planning security, extended transparency on machine KPI and analysis possibility for production optimization.
Augmented Reality enables a view of the most important machines KPIs exactly at the place where they are created.

Presentation of virtual HMI panels & KPIs

Information is shown dependent on the viewing angle and the role of the user – need for action is detected faster, support provided where required. Dashboards are used to automatically provide a quick overview of the current situation and are adapted to the role of the user.
With Augmented Reality we combine the digital twin with the production data in real time for full digital transparency

Virtual view of concealed production information

Maintenance personnel are guided exactly to the location of fault, see all the relevant information about the fault displayed, and can possibly use the digital twin for additional virtual views of the plant. Experts situated anywhere in the world can communicate with the engineers on site, share their view of the real plant and work jointly on solving problems.
Industrial Edge is the next generation of digital automation. Use the *intelligence and performance of the cloud directly in your production* with industrial edge.

**Why Industrial Edge?**

Edge computing brings cloud technology into the field level. It allows functional upgrades of the field level from a central backend, preprocessing of data and thus a more efficient way of smart data usage.
What is Edge Computing?
Edge Computing combines both local and cloud computing

Local computing

- Device Installed once – never or seldom updated
- Data transferred per USB stick or local network

Cloud computing

- App installation & deployment on-demand
- Central data and global intelligence
- Quick updates in the cloud
- Low frequency data/high latency of decisions
- Cloud dependency

Edge computing

- App installation & deployment on-demand
- Local data and global data (if wanted)
- Shift from global to local intelligence
- Quick software update cycles for edge devices
- High volume data and low latency decisions
Siemens Industrial Edge
Enhanced shop floor functionality with full data control

Edge Management
- Device Management
- Edge-App-Management
- Edge-App-Store

Edge Apps
Siemens-, Partner (OEM)-, 3rd-party- and own developed Edge-Apps

Edge-Devices
Secure and decoupled edge runtime infrastructure for edge apps

Application Examples:

Workpiece Analytics App for machine tool system
Intelligent workpiece analysis based on its digital twin

Inventory App
Inventory listing of connected automation components

Benefits
- Converting big data to smart data
- Enhanced data analysis in the shopfloor
- Full data control
Digital Enterprise is our portfolio of solutions for the digital transformation – in both discrete and process industries

Digital Enterprise

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**Industrial Software and Automation for process industries**

- Industrial Communication
- Industrial Security
- Industrial Services

**Industrial Software and Automation for discrete industries**

**Digital Enterprise Suite**
Digital Twin
Holistic approach for machine builders

Product manufacturer perspective

1. Product design
2. Production planning
3. Production engineering
4. Production execution
5. Services

Machine builder perspective

1. Machine concept
2. Machine engineering
3. Machine commissioning
4. Machine operation
5. Machine services
Machine concept

Design and simulate the machine concept

NX Mechatronics Concept Designer
Machine engineering and PLC code generation for TIA Portal

Automation Designer
Validate the PLC code in the virtual world

NX Mechatronics Concept Designer, PLCSim Advanced, TIA Portal

1 2 3 4 5
Machine commissioning

Fast and efficient engineering and commissioning

Totally Integrated Automation Portal

SIMATIC S7-1500
Let your machine speak to you

MindSphere – the cloud-based, open IoT operating system
What kind of engineers do the industry need?
Thank you
Frank Bråthen
Managing Director – Siemens Digital Industry, Norway