‘Design, make and service in a digital world - A Siemens perspective on Industry 4.0’

Growing your Service Business in an age of digital disruption

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• The industrial digital transformation impacting design, manufacturing and service

• Industry 4.0 and the ideas it introduced

• The digital factory and our journey so far

• Making data work better for our service organisation
Digitalization changes everything.
Digitalization Changes Everything, Everywhere
The pace of technological advances is fueling digital transformation

The cost of key technologies is falling

<table>
<thead>
<tr>
<th>Technology</th>
<th>2007 Cost</th>
<th>2014 Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRONES</td>
<td>$100,000</td>
<td>$700</td>
</tr>
<tr>
<td>3D PRINTING</td>
<td>$40,000</td>
<td>$100</td>
</tr>
<tr>
<td>INDUSTRIAL ROBOTS</td>
<td>$550,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>SENSORS</td>
<td>$30,000</td>
<td>$80</td>
</tr>
<tr>
<td>SMART PHONES</td>
<td>$449</td>
<td>$10</td>
</tr>
</tbody>
</table>

Source: Accenture Technology Vision 2015

Implications of Moore's Law

Cost of technology vs. Transistor density

Source: Leading Technology Research Vendor
Manufacturers with the longest lead times and most complex products have the most to gain.

Digitalization is also a vehicle for newer, more agile companies to leap ahead of existing market leaders.
The Future of Manufacturing

*Industry 4.0*

**Increasing competitiveness**

1. **Increase efficiency**
   - Energy and resource efficiency are decisive factors of competitiveness

2. **Shorter time-to-market**
   - Shorter innovation cycles
   - More complex products
   - Larger data volumes

3. **Enhance flexibility**
   - Individualized mass production
   - Greater market volatility
   - High productivity

**From Industry 1.0 to Industry 4.0**

- **First Industrial Revolution**
  - Based on the introduction of mechanical production equipment driven by water and steam power
  - First mechanical loom, 1764

- **Second Industrial Revolution**
  - Based on mass production and division of labor concept and the use of electrical energy
  - First conveyor belt, Cincinnati slaughterhouse, 1870

- **Third Industrial Revolution**
  - Based on the use of microelectronics and IT to further automate production
  - First programmable logic controller (PLC), control, 1969

- **Fourth Industrial Revolution**
  - Based on the use of cyber-physical systems
  - Evolution of cyber-physical systems

**Production network**

- Flexible value chains with information available in realtime across company boundaries

**Fusion of virtual and real world**

- Integration of product design and production engineering for shorter time to market

**Cyber-physical systems**

- Modular production units with complete and consistent virtual image

**Cyber-physical system (CPS)**

- Contains all the information...
  - Software / Informatics
  - Mechanics
  - Electronics
  - Automation, HMI
  - Safety, security
  - Maintenance
  - Location, identity...
  - Status
  - SW Version
  - Interfaces

The digital model is always up-to-date and is extended over the entire lifecycle

**Design**

**Planning**

**Engineering**

**Production**

**Services**
1 Product design

Suppliers
Outdated design software limits product possibilities and hampers competitiveness.

SOLUTION
Convergent modeling for additive
1. Product design

Suppliers
System Driven Product Development
From disconnected models and data …
System Driven Product Development
...to a performance Digital Twin

3D SIMULATION

CFD SIMULATION

Simulation data

Test data

1D SIMULATION

TEST MODELING

Historical data

Customer Usage data
System Driven Product Development
… enabling Predictive Engineering Analytics

3D SIMULATION

Test data

CFD SIMULATION

Simulation data

Customer Usage data

TEST MODELING

Historical data

1D SIMULATION
Digital twin of the product
Production planning
Production planning
Production planning
Data, diagnostics, safety and security is fully integrated
3 Production engineering

4
Digital twin of the equipment
5. Services

- Maximize process efficiency
- Improve cybersecurity
- Optimize energy consumption
- Increase availability of components

Mindsphere

Plant Performance
“The UK’s OEM team connects the UK Machine builders to Siemens technology.

Our aim to help the customer reduce the design, development and machine build costs within their business, while producing world class machines to take to market.”

Marc Booth, OEM Business Development Manager
Innovative machine concepts

Define the requirement and performance criteria

Use our people, tools and products to reduce the customers development time and cost

Reduce the machine assembly time

Use our people, tools and products to reduce the customers development time and cost

Define the requirement and performance criteria

Machine Green Light State & Optimize machine performance

"We coach, mentor and up skill our customers around the Siemens technology so they own their machine process"
Reduced complexity…
… reduce our customers machine complexity through connectivity of technology

Reduced development costs…
…by creating a right first time culture and Utilizing our tools, apps and industry knowledge

Individualized production…
…use the technology to gain the technical edge in the market place
Asset finance from Siemens Financial Services helps foster growth and sustainability in retail Packaging.

TRAK-RAP

Lancashire based machine manufacturer TRAKRAP provides energy efficient packaging solutions to the retail sector. The firm’s patented wrapping system uses 90% less energy and 70% less wrapping film than traditional shrink wrapping by removing the requirement for heat tunnels.
Industrial Products Manufactured in Congleton

Today drives up to 22 kW are designed and manufactured at Congleton

- SINAMICS G110
- SINAMICS G120
- SINAMICS G110D
- SINAMICS G120C
- MM4 MICROMASTER 420/430/440
- SIMATIC ET200P
- SINAMICS G120D
- SINAMICS G120P
- SINAMICS G110M
Energy efficient manufacturing
Reducing energy costs at Pilkington

SIEMENS
Siemens Financial Services

Pilkington
Servitisation and Siemens