ON THE WAY TO INDUSTRY 4.0: DIGITAL ENTERPRISE
HISTORY?
FIRST INDUSTRIAL REVOLUTION

- Mechanical Steam Power

First mechanical loom
Doncaster England, 1784

Photograph Source: http://etc.usf.edu/clipart/79800/79831/79831_powerloom.htm
SECOND INDUSTRIAL REVOLUTION

- Electrical Energy

First assembly line
Cincinnati USA, 1870

Photograph Source: http://www.thinglink.com/scene/477884074095017986
THIRD INDUSTRIAL REVOLUTION

• Electronic and IT Systems

Programmable Logic Controller (PLC) 1969

Photograph Source: http://electrical-engineering-portal.com/when-we-started-to-use-plcs-after-all
WHY 4th?
### Industrial products sales

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU (27)</td>
<td>550</td>
<td>620</td>
</tr>
<tr>
<td>China</td>
<td>170</td>
<td>580</td>
</tr>
<tr>
<td>USA</td>
<td>280</td>
<td>280</td>
</tr>
<tr>
<td>Germany</td>
<td>190</td>
<td>220</td>
</tr>
<tr>
<td>Russia</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: VDMA
SHORTEN TIME TO MARKET

- Shorter innovation cycles
- More complex products
- Smaller lots
INCREASE FLEXIBILITY

- Individualized production
- Volatile markets
- Max. automation
• More with less
• Energy efficiency
• Robots for redundant actions
• More flexible and coherent processes
WHEN?
• 2011 Hannover Fair
• 2012 German Federal Government
• 2013 April German Country Strategy
• 2014 February Siemens Turkey Press Launch
• 2015 Hannover Fair motto
• 2016 Davos WEF motto
HOW?
• Bits and atoms
• Digital 3D simulation of factories, manufacturing lines and human
• All on PLM-Product Lifecycle Management systems
• Digital 3D simulation of products
VERTICAL & HORIZONTAL INTEGRATION

- **Vertical:** Marketing, Sales, Planning, Production (PLM, ERP, MES/MOM)

- **Horizontal:** Raw Material, Suppliers, Producers, Logistics, Distributers, Customers, Recycling

  *No hierarchy, all distributed*
• Unique ID for every material, machine, product and human
• End-to-end digital process info from raw material to recycle
• Communicating, analyzing data, predict failure, configure trouble shooting
• Adapt to changes

Connected “things” will double to 28 billion by 2020, human to 7,7 billion
AUTONOMOUS ROBOTS

- Learning from other robots and humans
- Multi programmable
- Great capabilities
- H2M, M2H, New:M2M
- Self-testing and repairing
• Data created only in 2000 was more than in 25 million years

• Many different sources (robots, automation software, even unfinished products)

• Must for real-time decision making

50-fold increase of data from 2010 to 2020
THE CLOUD

- 35% of data in Cloud by 2020
- Cloud based solutions
- Smart applications
AUGMENTED REALITY

- Manufacturing instructions
- Real-time reports, messages
- Quality checks with camera
- Emergency directives
CYBER-SECURITY

- More comprehensive security framework
- Increased communication can cause access problems
- Vulnerable to cyberattacks
- Data privacy is critical
WHAT @WORLD?
GERMANY: SIEMENS AMBERG FACILITY

- 1000+ product variants
- 1 Million products monthly
- Only 25% performed by humans
- Quality 99.9988%
CHINA

- 20 % of the world's
- Made in China 2025
- Goal:
  - 40% by 2020
  - 70% by 2025
• Industrial Internet

• Advanced IT and communication sector is advantage

• Advanced Manufacturing National Program of the US Department of Commerce
• Silicon Valley of: Industry 4.0
• Internet in manufacturing: 44%
• Employment in high-tech: 8%
WHAT@TURKEY
• Between 2.0-3.0
• Ministry of Science, Industry and Technology meeting on Dec. 09, 2015
• Workshop on Jan. 16-17, 2016
• Science and Technology High Council’s decision on Feb. 23, 2016
• Government: “Ready for I 4.0” in Autumn 2016
• Turkey’s Platform for:
  • Information
  • Discussion
  • Library
  • Events
  • Best Practice
  • Know-how exchange

• Come and be a partner
TOMORROW

- Industry 4.0 Turkey Platform
- Industry 4.0 Country Strategy
- Eurasia Hub of Manufacturing
- From “technology user“ to “innovator”
- Middle Income Trap
INVESTMENT

- Germany: € 40 B
- Europe: € 140 B p.a till 2020
- 3.3% of sales

Source: pwc
• New complex products

• New customized products

• Growth of 2-3% sales

Germany : € 30 B
Europe : € 110 B  p.a

Source : pwc
EMPLOYMENT

- 6% increase
- Highly skilled people needed
- IT and Mechatronics experts replacing low skilled laborers

Source: BCG
GOVERNMENTS

- Establish a Country Platform
- Workout, approve and launch Country Strategy
- Review school curricula, university programs
- Incentivize R&D programs, high-tech manufacturing
- Provide a good technology infrastructure
• Work on int’l standards

• Focus on university – industry collaboration models

• Mentoring students about cross discipline studies like mechatronics
• Concentrate on future-tech

• Inform about Industry 4.0

• Collaborate with each other

• Implement new business models, organizational structures fit to digital world
MANUFACTURERS

• Need to fully understand customer requirements

• Develop a strategy for technological improvement

• Implement new business models, organizational structures fit to digital world
- Open Innovation
- Open Design
- Open Software
- Open Hardware
- Open Organization
- Open Production
- Open Capital
MAKERS MOVEMENT

- At home
- Ingeneunity, Sharing, Self Learning
- Production instead consuming
- Self proto-typing
ADDITIVE MANUFACTURING

- 3D scanning and 3D printing
- First 3D printer borned in 2015
- Skull and vane already in use
- 10 houses in 3 days
- Siemens TR & Darüşşafaka Robots Club - 2015 NASA Award
DISRUPTIVE INNOVATION

- Today cars: 5% at work
  Google car: 95%
- Robots are producing robots
- Highly automated robots
- No need for light, food etc.
- Somewhere in desert
- Controlled remotely
LET’S GET READY FOR THEM

NOW!
THANK YOU...