Industry 4.0 – Challenge for the F&B industry in Turkey, advantage or competitive disadvantage?

Siemens Digitalization in Food & Beverage Presentation
Dr. Kai-Stefan Schober

Istanbul, May 24, 2017
Roland Berger is the only strategic consultancy of European origin – We provide strategic advice to the world's top decision makers

Roland Berger: Company overview – Top global management consulting

Founded in **1967** in Germany by Roland Berger

- **50** offices in **36** countries, with approximately **2,400** employees
- **220** RB Partners currently serving
- **~1,000** international clients

Source: Roland Berger

Austria, Vienna; Bahrain, Manama; Belgium, Brussels; Brazil, São Paulo; Canada, Montreal; Croatia, Zagreb; Czech Republic, Prague; France, Paris; Germany, Berlin, Düsseldorf, Frankfurt, Hamburg, Munich, Stuttgart; Greater China, Beijing, Guangzhou, Hong Kong, Shanghai, Taipei; Hungary, Budapest; India, Mumbai, New Delhi, Pune; Indonesia, Jakarta, Italy, Milan; Japan, Tokyo; Lebanon, Beirut; Malaysia, Kuala Lumpur; Morocco, Casablanca; Netherlands, Amsterdam; Nigeria, Lagos; Poland, Warsaw; Portugal, Lisbon; Qatar, Doha; Romania, Bucharest; Russia, Moscow; Singapore; South Korea, Seoul; Spain, Madrid; Sweden, Gothenburg, Stockholm; Switzerland, Zurich; Thailand, Bangkok; Turkey, Istanbul; Ukraine, Kyiv; United Arab Emirates, Dubai; United Kingdom, London; USA, Boston, Chicago, Detroit
Content

A. Industry 4.0: from global buzz to reality

B. Industry 4.0 readiness of F&B in Turkey

C. Turkey to prepare for Industry 4.0 – Next steps

Source: Roland Berger
The global manufacturing industry is gearing up for the next level of industrial revolution - Industry 4.0

Development stages of industrial manufacturing

**First industrial revolution**
- **1784**
  - Mechanical weaving loom
  - Introduction of mechanical production assets based on water and steam power

**Second industrial revolution**
- **1923**
  - Introduction of a "moving" assembly line at Ford Motors

**Third industrial revolution**
- **1969**
  - First programmable logic controller (PLC)
  - Introduction of mass production based on division of labor and electrical energy

**Fourth industrial revolution?**
- **2014**
  - Real time, self optimizing connected systems
  - Introduction of intelligent machines, embedded cyber-physical sensors, collaborative technologies, and networked processes

Drivers of this development:
- Large amount of data available
- Rising demand for (mass) customized products
- Advanced algorithms allowing better real-time and large data analysis
- More affordable sensor/actor technologies
- Increasing prevalence of communication including wireless technology in the factory

Source: Bitkom/Fraunhofer, DFKI, Roland Berger
Industry 4.0 can be understood as the full integration and digitalization of the industrial value creation

Definition of Industry 4.0 (not exhaustive)

Digital transformation refers to the changes associated with the application of digital technologies in all aspects of human society.

Industry 4.0 is the industrial application of the concepts applied in the digital transformation, key elements are:

- Complete connectivity with real-time ability
- Decentralized, intelligent and self-optimizing / organizing
- Modular and reconfigurable

Assessment of Industry 4.0 impact needs to take analogies from digital transformation and specifics of the manufacturing industry into account.

The digital transformation in the consumer goods sector is much more advanced than the industrial application.
Interlinking of real (physical) and virtual (cyber) world will lead to so called cyber-physical systems that determine Industry 4.0 solutions

Schematic interlinking of physical and virtual world - Examples

### Physical world
- Robotics
- Automation equipment
- Traditional machinery
- Traditional & semiconductor based sensors
- RFID
- Camera & imaging systems
- Visual sensors
- Traditional sensors

### Cyber world
- Advanced algorithms
- Machine learning
- High-performance hardware
- Advanced data analytics
- Database mgmt. systems
- Cloud computing
- Embedded systems
- Real-time image processing (e.g. OCR)
- Data storage hardware
- Real-time image processing
- Advanced data analytics
- Advanced algorithms

### Industry 4.0 solutions
- Self-learning robots
- Predictive maintenance
- Self-reconfiguring machines
- Smart environment recognition

### Characteristics/Goals
- Connectivity as the key factor is linking both worlds in each solution
- Enable
  - Individualized or mass customized products
  - Highly flexible production
  - Integration of customers and value adding partner into value creation
  - Coupling of production and high-value services
  - Cost and efficiency benefits and quality improvements

Source: Roland Berger
Industry 4.0 combines a wide set of technologies becoming well known.

1. Monitoring, command
   - Interconnected machines & plants
   - Per piece RFID tracking
   - Automated internal logistic
   - "Smart" machine (self-correction)

2. Traceability
   - Automated logistics / Internet of Things
   - "Smart" machine (self-correction)

3. Flow management
   - Precision
   - Additive manufacturing
   - Multi-support and multiple-operation machines

4. MANUFACTURING OPERATIONS
   - Precision
   - Additive manufacturing
   - Multi-support and multiple-operation machines

5. WORK ORGANIZATION
   - Machine installation
   - Task specialization
   - Lean Manufacturing

Source: Roland Berger
Most industrial players have launched Industry 4.0 pilots to test those solutions in legacy plants – F&B industry is catching up

**MOST INDUSTRY 4.0 TECHNOLOGY BRICKS ARE EXISTING**

- Intelligent logistic bins
- 3D food printing
- Conditional maintenance
- Humanoid robotic
- Traceability
- Augmented reality

**Source:** press review, companies websites, Roland Berger
The goal of 'Industry 4.0' is the intelligent factory which is characterized by adaptability, efficiency and a full digital integration.
Data and communication will be the backbone of Industry 4.0 – Some players with already wide offering and new players entering

Positioning of different players for Industry 4.0 – Factory view

Source: Roland Berger
## Industry 4.0 – Characteristics

<table>
<thead>
<tr>
<th></th>
<th>From mass production to mass customization</th>
<th>Flexible production, short production lead time enabling new business models emergence and affordable customization</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>From volume scale effect to localized &amp; flexible units</td>
<td>From large factories specialized per product in LCC to smart factories with high technological equipment enabling to produce at competitive cost everywhere</td>
</tr>
<tr>
<td>3</td>
<td>From planned make to stock to dynamic make to order</td>
<td>From an organized production, based on planning and forecast and supported by stocks, to dynamic production and yield management, on demand</td>
</tr>
<tr>
<td>4</td>
<td>From product to usage</td>
<td>Integrated conception, services being a key element of the business model/decision factor</td>
</tr>
<tr>
<td>5</td>
<td>From cost driven to ROCE driven</td>
<td>Higher ROCE for lower Capital employed as complexity is transferred on numeric</td>
</tr>
<tr>
<td>6</td>
<td>From taylorism to flexible work organization</td>
<td>Remote work (augmented reality, permanent connectivity), Tasks parallelism, flexible organization and management</td>
</tr>
<tr>
<td>7</td>
<td>From hard working conditions to attractive work space</td>
<td>Development of complex artisanal production, with clean/highly connected work space, white collars intensive</td>
</tr>
</tbody>
</table>

Source: Roland Berger
Industry 4.0 will significantly change business rules; It offers enormous opportunities to new winners but kills non-innovators…

Industry 4.0 – Expected benefits

1. **Design and manufacture better products** – Industry 4.0 will enable adaptation of manufacturing methods by region e.g. automated zero defect manufacturing.

2. **Improve process efficiency and save costs** – It would connect digital and real processes to identify and address manufacturing issues in advance, e.g. a quality issue.

3. **Create new business models** – Industry 4.0 would disintermediate value chains or change the business rules itself e.g. Value chain will become more visible and need for intermediaries might be eliminated.

4. **Generate additional business** – New ‘Industry 4.0’ comers would be the future game changers e.g. 3D bio-printing for fabricating biological constructs to produce soft tissues and artificial bones would help in generating additional business.

5. **Unleash innovation** – It would free up additional creativity to fully leverage digital potential e.g. demand for business-model innovation is currently rising.

6. **Rethink organizations** – Industry 4.0 would make organizations more responsive and flexible e.g. R&D teams would be able to leverage on global expertise at a faster rate.

Source: Roland Berger
Countries have prioritized Industry 4.0 in their future plans – Turkey also identified smart production as a key enabler for future growth.

Selected initiatives supporting advanced manufacturing and ICT in Europe

<table>
<thead>
<tr>
<th>Issuer</th>
<th>Program (content, funding volume)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BMBF1)</td>
<td>Future Project Industry 4.0</td>
<td>Support German industry for future challenges</td>
</tr>
<tr>
<td>Fund for Digital Society</td>
<td>Future Inventions</td>
<td>Monetary support for R&amp;D on embedded systems, big data and integrated objects</td>
</tr>
<tr>
<td>University of Warwick</td>
<td>Warwick Manufacturing Group</td>
<td>Different research initiatives focused on automotive &amp; ICT</td>
</tr>
<tr>
<td>Innovate UK</td>
<td>Catapult Centers</td>
<td>Double manufacturing contribution to GDP</td>
</tr>
<tr>
<td>Cleantech Vlaanderen</td>
<td>MIP</td>
<td>Innovative cleantech and transition economy projects</td>
</tr>
<tr>
<td>Made different</td>
<td>Factories of the Future 4.0</td>
<td>Support the development of &quot;Factories of the future&quot;</td>
</tr>
<tr>
<td>CFI</td>
<td>Intelligent factories clusters</td>
<td>Structure Italian manufacturing community to develop &amp; leverage research, with 4 projects</td>
</tr>
<tr>
<td>Min. of Science, Ind. &amp; Techn. + TÜBİTAK</td>
<td>Industry 4.0 (Decree 2016/101)</td>
<td>Drive the shift to intelligent.smart production systems &amp; increase the share of high-tech production of the Turkish industry</td>
</tr>
<tr>
<td>TÜBİTAK</td>
<td>Technology &amp; Innovation Grant Programs Directorate</td>
<td>Support project-based R&amp;D activities of Turkish firms</td>
</tr>
<tr>
<td>Min. of Science, Industry &amp; Techn.</td>
<td>SAN-TEZ program</td>
<td>Stimulate R&amp;D co-operation between firms &amp; universities by supporting graduate project on technology-based products</td>
</tr>
</tbody>
</table>

The 10th Development Plan (2014-18), the National Science, Technology, and Innovation Strategy (2011-16) and Industrial Policy Strategy (2011-14) build the foundation for promoting Industry 4.0 in Turkey by strengthening manufacturing to boost medium- and high-tech exports.

1) Federal Ministry of Education and Research

Source: European Commission, TÜBİTAK, Roland Berger
B. Industry 4.0 readiness of F&B in Turkey
Digital transformation is basis for implementing Industry 4.0 – the race in which Turkey needs to come from behind

Turkey's ranking in "Business Usage Index"

<table>
<thead>
<tr>
<th>Business Usage</th>
<th>&quot;Leader&quot;</th>
<th>&quot;Underperformer&quot;</th>
<th>Turkey's ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology absorption at company level</td>
<td></td>
<td>Turkey</td>
<td>#56</td>
</tr>
<tr>
<td>Innovation capability</td>
<td></td>
<td>Turkey</td>
<td>#36</td>
</tr>
<tr>
<td>International patents, apps/million of people</td>
<td></td>
<td>Turkey</td>
<td>#83</td>
</tr>
<tr>
<td>Internet usage for B2B</td>
<td></td>
<td>Turkey</td>
<td>#40</td>
</tr>
<tr>
<td>Internet usage for B2C</td>
<td></td>
<td>Turkey</td>
<td>#47</td>
</tr>
<tr>
<td>Employee training and development</td>
<td></td>
<td>Turkey</td>
<td>#49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Turkey</td>
<td>#102</td>
</tr>
</tbody>
</table>

Source: WEF Global Information Technology Report 2016, Roland Berger
The manufacturing industry has lost importance due to the de-industrialization – Turkey's manufacturing share above global average

Manufacturing share of gross value added in selected countries, 2000 vs. 2014 [%]

Global Average
2000: 17%
2014: 16%
1) 2004 vs. 2014

Source: UNCTAD, Roland Berger
Initiatives to push manufacturing drive absolute growth of sector – F&B sector with potentials resulting from Industry 4.0

Sector-wise contribution to GVA and F&B production index [bn EUR, %, Index]

<table>
<thead>
<tr>
<th>Year</th>
<th>Agriculture</th>
<th>Other Industry (incl. Construction etc.)</th>
<th>Services</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>11%</td>
<td>59%</td>
<td>9%</td>
<td>250</td>
</tr>
<tr>
<td>2009</td>
<td>9%</td>
<td>66%</td>
<td>9%</td>
<td>558</td>
</tr>
<tr>
<td>2011</td>
<td>9%</td>
<td>64%</td>
<td>9%</td>
<td>687</td>
</tr>
<tr>
<td>2012</td>
<td>9%</td>
<td>64%</td>
<td>9%</td>
<td>703</td>
</tr>
<tr>
<td>2013</td>
<td>8%</td>
<td>65%</td>
<td>9%</td>
<td>729</td>
</tr>
<tr>
<td>2014</td>
<td>8%</td>
<td>65%</td>
<td>9%</td>
<td>710</td>
</tr>
</tbody>
</table>

GVA = Gross Value Added = GDP + subsidies – taxes on products
Source: UNCTAD, Roland Berger

Manufacturing GVA grew by 36%-pts. between 2009-2014

Food & Beverage Manufacturing Production Index, 2005-2015 [Index, 2010 = 100]

Production of food & beverages increased by around 25%-pts. between 2009-2015
Food & Beverages are a comparatively strong pillar of Turkey's export strategy – Growing export surplus despite large domestic market

Food exports as % of merchandise exports; Food imports and exports [bn EUR]

<table>
<thead>
<tr>
<th>Country</th>
<th>F&amp;B Exports 2015 as a % of merchandise</th>
<th>Imports 2010-2015 [bn USD]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>20.9</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>16.4</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>8.6</td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>5.6</td>
<td></td>
</tr>
</tbody>
</table>

1) Including food, beverages and tobacco

Source: WTO, Turkish Statistical Institute, Roland Berger
But Turkey with currently a very low Industry 4.0 readiness Index – Approach to increase readiness to be defined…

Industry 4.0 readiness – Positioning European countries for Industry 4.0

1) Based on industrial excellence (production process sophistication, degree of automation, readiness workforce and innovation intensity) and value network (focus on high value add, industry openness, innovation network, internet sophistication)

Source: Roland Berger
C. Turkey to prepare for Industry 4.0 – Next steps
Turkey will require an enhanced approach to prepare and increase its readiness for Industry 4.0 revolution – Increase manufacturing

**Approach for Turkey to take on Industry 4.0**

<table>
<thead>
<tr>
<th>1</th>
<th>Government/Regional support</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; The Government would need to support in <strong>creating a suitable ecosystem</strong> by investing in infrastructure, power, data connectivity</td>
<td></td>
</tr>
<tr>
<td>&gt; <strong>Turkish companies</strong> will have to <strong>show readiness</strong> to adopt new technologies</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Accelerate Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Public and private partners have to <strong>collaborate</strong> closely to boost innovation</td>
<td></td>
</tr>
<tr>
<td>&gt; <strong>Transfer R&amp;D knowledge to industry</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; In Turkey, <strong>industrial bodies need to take the lead in promoting innovation</strong> by providing avenues for stakeholders to come to a common forum</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Adoption of best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; <strong>Industries need to adopt the global best practices</strong> in four major domains:</td>
<td></td>
</tr>
<tr>
<td>&gt; 1. <strong>Business Model</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; 2. <strong>Value Chain</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; 3. <strong>Financial Base</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; 4. <strong>Knowledge base</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; <strong>Widespread adoption of global practices will ensure overall growth</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Establish Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; <strong>The digital aspect has become mission-critical</strong> for many products and services</td>
<td></td>
</tr>
<tr>
<td>&gt; Therefore, &quot;new&quot; industry needs a <strong>competitive environment</strong> that fosters dynamic telecommunications and Internet usage</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>Foster New Talent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; <em>Besides infrastructure, this dynamic digital environment also needs to foster new talent</em></td>
<td></td>
</tr>
<tr>
<td>&gt; Backward looking <strong>education policies and ancient content</strong> will need to be radically changed to enable <strong>adoption of Industry 4.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6</th>
<th>Develop a Roadmap</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Each company needs to <strong>identify the objective and potential of Industry 4.0 for their firm</strong> and develop a tailored strategy accordingly</td>
<td></td>
</tr>
<tr>
<td>&gt; <strong>Top down organization change</strong> is required to implement the strategy and generate buy in across all levels</td>
<td></td>
</tr>
</tbody>
</table>

Source: Roland Berger
Roland Berger suggests a 4-step approach to define Industry 4.0 vision, priorities and develop a tailor-made roadmap

1. **What is your company’s objective?**
   - Customer needs / differentiation
   - Internal performance diagnosis
   - Disruptive new technological solutions

2. **What are the opportunities for your company?**
   - Internal diagnosis of company current 4.0 performance
   - Review of current initiatives
   - Defined target for the company
   - Gap analyses to target

3. **What is the potential for your company?**
   - Prioritization of levers
     - Quantification of full potential (financial, skills …) & impacts
   - Mapping of building blocks
     - (regulations, technology, cyber security, standards, …)

4. **Which way to excellence?**
   - List of priority improvement levers
   - Financial target impact on CAPEX, WCR, Gross margin
   - Detail of impacts on job and skills
     - (resource shift, new skills to capture)
   - Operational roadmap including key milestones
   - Adjusted budget including program financial impacts
   - Governance structure

Key deliverables:
- Validated list of priority objectives to cover through the program
- Internal diagnosis of company current 4.0 performance
- Review of current initiatives
- Defined target for the company
- Gap analyses to target

Implementation roadmap and program governance

Source: Roland Berger
Industry 4.0 will improve Turkey F&B brand image as innovation driven, technologically advanced, high quality & safe manufacturing base

Impact on Turkey's F&B brand image

How Industry 4.0 will upgrade "Made in Turkey" brand

- Good quality
- Safe
- Innovative
- High-tech
- Cost effective

Source: Roland Berger
Your Roland Berger contact person – Looking forward to your call/questions

Dr. Kai-Stefan Schober
Senior Partner

Position

Core competencies

- Engineering
- Machinery
- Infrastructure/Construction
- Construction materials/chemicals
- Industrial services
- Strategy/market analysis
- Production
- Restructuring
- Marketing efficiency/Sales-Up
- Improvement programs

Contact details

kai-stefan.schober@rolandberger.com
Telephone: +49 160 7448 372

Source: Roland Berger