Changes in Industrial Landscape: Challenges, Drivers and Policies

JOINT WORKSHOP ON THE NEXT INDUSTRIAL REVOLUTION
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"You see things; and you say, 'Why?'
But I dream things that never were; and I say, "Why not?"

George Bernard Shaw
### Table 3b: Global CEO Survey: Global drivers of manufacturing competitiveness index ranking

Executives rank key drivers that impact a country’s ability to compete in manufacturing

<table>
<thead>
<tr>
<th>Overall rank (1–10)</th>
<th>Overall index score</th>
<th>Main driver</th>
<th>Most important sub-components</th>
<th>Sub-component rank (1–40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.00</td>
<td>Talent-driven innovation</td>
<td>Quality and availability of researchers, scientists, and engineers</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quality and availability of skilled labor</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>8.42</td>
<td>Economic, trade, financial and tax system</td>
<td>Tax rate burden and system complexity</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Clarity and stability of regulatory, tax and economic policies</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>8.07</td>
<td>Cost and availability of labor and materials</td>
<td>Cost competitiveness of materials</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Availability of raw materials</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>7.76</td>
<td>Supplier network</td>
<td>Cost competitiveness of local suppliers</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ability of supply base to innovate in products and processes</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>7.60</td>
<td>Legal and regulatory system</td>
<td>Stability and clarity in legal and regulatory policies</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Labor laws and regulations</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>6.47</td>
<td>Physical infrastructure</td>
<td>Quality and efficiency of electricity grid, IT and telecommunications network</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quality and efficiency of roads, airports, ports, and railroad networks</td>
<td>16</td>
</tr>
<tr>
<td>7</td>
<td>6.25</td>
<td>Energy cost &amp; policies</td>
<td>Cost competitiveness of energy</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ongoing investments to improve and modernize energy infrastructure</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>3.99</td>
<td>Local market attractiveness</td>
<td>Size and access of the local market</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Intensity of local competition</td>
<td>36</td>
</tr>
<tr>
<td>9</td>
<td>2.48</td>
<td>Healthcare system</td>
<td>Cost of quality healthcare for employee and society</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Regulatory policies (e.g., pollution, food safety, etc.) that are enforced to protect public health</td>
<td>33</td>
</tr>
<tr>
<td>10</td>
<td>1.00</td>
<td>Government investments in manufacturing and innovation</td>
<td>Government investments in R&amp;D: science, technology, engineering and manufacturing</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Private and public sector collaboration for long-term investments in R&amp;D: science, technology, engineering and manufacturing</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index

Note: See Appendix B1 for full list of 40 sub-components and associated ranking
### Table 4: China’s transformation reveals itself through key competitiveness drivers

*Country level ratings for key drivers of competitiveness*

<table>
<thead>
<tr>
<th>Selected Country/Manufacturing Competitiveness Drivers</th>
<th>Germany</th>
<th>U.S.</th>
<th>Japan</th>
<th>China</th>
<th>Brazil</th>
<th>India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talent-driven innovation</td>
<td>9.47</td>
<td>8.94</td>
<td>8.14</td>
<td>5.89</td>
<td>4.28</td>
<td>5.82</td>
</tr>
<tr>
<td>Economic trade, financial and tax system</td>
<td>7.12</td>
<td>6.83</td>
<td>6.19</td>
<td>5.87</td>
<td>4.84</td>
<td>4.01</td>
</tr>
<tr>
<td>Cost of labor and materials</td>
<td>3.29</td>
<td>3.97</td>
<td>2.59</td>
<td>10.00</td>
<td>6.70</td>
<td>9.41</td>
</tr>
<tr>
<td>Supplier network</td>
<td>8.96</td>
<td>8.64</td>
<td>8.03</td>
<td>8.25</td>
<td>4.95</td>
<td>4.82</td>
</tr>
<tr>
<td>Legal and regulatory system</td>
<td>9.06</td>
<td>8.46</td>
<td>7.93</td>
<td>3.09</td>
<td>3.80</td>
<td>2.75</td>
</tr>
<tr>
<td>Physical infrastructure</td>
<td>9.82</td>
<td>9.15</td>
<td>9.07</td>
<td>6.47</td>
<td>4.23</td>
<td>1.78</td>
</tr>
<tr>
<td>Energy cost and policies</td>
<td>4.81</td>
<td>6.03</td>
<td>4.21</td>
<td>7.16</td>
<td>5.88</td>
<td>5.31</td>
</tr>
<tr>
<td>Local market attractiveness</td>
<td>7.26</td>
<td>7.60</td>
<td>5.72</td>
<td>8.16</td>
<td>6.28</td>
<td>5.90</td>
</tr>
<tr>
<td>Healthcare system</td>
<td>9.28</td>
<td>7.07</td>
<td>8.56</td>
<td>2.18</td>
<td>3.33</td>
<td>1.00</td>
</tr>
<tr>
<td>Government investments in manufacturing and innovation</td>
<td>7.57</td>
<td>6.34</td>
<td>6.80</td>
<td>8.42</td>
<td>4.93</td>
<td>5.09</td>
</tr>
</tbody>
</table>

Scores on a 10 point scale, where 1 being “Least competitive” and 10 being “Most competitive” — adjusted for country, size, and industry

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index
Challenges on Next Industrial Revolution

Manufacturing the products of the future

- Digital Manufacturing (FAB Lab)

Economic sustainability of manufacturing

- *Addressing economic performance across the supply chain*
- *Realising reconfigurable, adaptive and evolving factories capable of small-scale production*
- *Resource efficiency in manufacturing — including addressing the end-of-life of products*

Social sustainability of manufacturing

- *Achieving human capabilities in the factory of the Future*
- *Cultural acceptance of Factories (i.e. NIMBY Not In My Back-Yard or BANANA Build Absolutely Nothing Anywhere Near Anything)*
- *Attractive talents by making Manufacturing appealing*
- *Creating sustainable, safe and attractive workplaces for 2020.*

Environmental sustainability of manufacturing

- *Reducing the consumption of energy, water, materials and other processes resources*
- *Near-to-zero emissions, including noise, in manufacturing processes*
- *End-of-life product Management (i.e. Re-use, Re-Manufacturing, Re-Cycling, Disposal)*
- *Co-evolution of products–processes–production systems*

Adapted from EFFRA Roadmap
Manufacturing challenges can only properly be addressed if the manufacturing community understands the mechanisms that create value. New approaches are needed.

The strategies of the future are:

• **From delocalisation to ‘Globalisation 2.0’ (Re-shoring)**
• Urban Factory
• Industrial Symbiosis
• Fab Lab
• From product/services systems (product-centred approach) to services through product (solution-orientated approach)
• From user-centred design to user-well being design
• Innovation as a business model itself
Reshoring

The transfer of business operation back to its country of origin

“We expect net labor costs for manufacturing in China and the U.S. to converge by around 2015”
“Take a hard look at the total costs”

Source: BCG group press release 5/5/11

“End the practice of awarding business on the basis of price tag. Instead, minimize total cost”

Source: “4th key principle for management,” Out of the Crisis, W. Edwards Deming
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- Innovation as a business model itself
Urban Factory

- Cleaner and greener
- Transparent Factory
- Local and Small
- Living and Working
- Vertical and Dense
Manufacturing challenges can only properly be addressed if the manufacturing community understands the mechanisms that create value. New approaches are needed.

The strategies of the future are:

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• **Industrial Symbiosis**
• Fab Lab
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• From user-centred design to user-well being design
• Innovation as a business model itself
Industrial Symbiosis

- Co-evolution of products–processes–production systems
- Physical exchanges of materials, energy, water, and/or by-products
- Optimised interaction of manufacturing with transport and critical infrastructures
Manufacturing challenges can only properly be addressed if the manufacturing community understands the mechanisms that create value. New approaches are needed.

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Advanced manufacturing processes that will be focused on by the ‘Factories of the Future’ partnership are:

- Additive manufacturing (i.e. 3D Printing)
- Photonics-based materials processing tech.
- Shaping technology
- High productivity & ‘self-assembly’ technologies
- Methods for the handling parts, metrology & inspection
- Flexible sheet-to-sheet & roll-to-roll
- Innovative physical, chemical & physiochemical processes
- Replication equipment for flexible, scalable production
- Integration of non-convention tech.
ICT Megatrends - Technology Push Perspective

Collaboration
- OEM – subcontractor collaboration through cloud paradigm
- Trends of contract manufacturing and ‘product as a service’
- Customer involvement in product design

Mobility
- Proliferation of mobile devices
- ‘On-the-go’ and ‘Always-on’ users
- New businesses (manufacturing apps & manufacturing app store)

Connectivity
- Sensors, controllers, embedded devices a commonplace
- ‘Intranet of Things’ to ‘Internet of Things’
- Bidirectional interaction with real-world objects

Intelligence
- Data analytics and forecasting on-the-fly
- Leveraging cheaper storage and low cost processors
- Better visualization & intelligence on manufacturing data

Human–centric Manufacturing
Factories of the future are expected to create a large amount of employment opportunities for citizens. Factory workers are key to competitiveness but challenges such as changing demographics & new skills must be addressed.

Policies should address the following items:

- New approaches to accommodate different demographics
- New technical, educational & organisational ways to increase attractiveness of factory work
- New approaches to development of skills & competences
- New ways to organise factories: Human-centred work environments
- Ways to integrate future factory work into social patterns
They are coming!
## Chinese CEOs

### Figure 20: Global CEO Survey: The impact of public policy

Executives thoughts on policy advantages and disadvantages (percent indicating competitive advantage or disadvantage due to current government policies and regulations in their home country)

<table>
<thead>
<tr>
<th>Competitive DISADVANTAGES</th>
<th>Competitive ADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>China</strong></td>
<td></td>
</tr>
<tr>
<td>Antitrust laws and regulations</td>
<td>Policies in science, technology, and innovation (84%)</td>
</tr>
<tr>
<td>Government financial intervention/ownership in companies</td>
<td>Infrastructure development (77%)</td>
</tr>
<tr>
<td>Foreign direct investment policies</td>
<td>Employee educational training and assistance (77%)</td>
</tr>
<tr>
<td>Immigration policies</td>
<td>Safety and health regulations (73%)</td>
</tr>
<tr>
<td>Corporate tax policies</td>
<td>Sustainability policies (71%)</td>
</tr>
</tbody>
</table>

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index
Figure 20: Global CEO Survey: The impact of public policy
Executives thoughts on policy advantages and disadvantages (percent indicating competitive advantage or disadvantage due to current government policies and regulations in their home country)

Europe

- Intellectual property protection laws: 90%
- Government financial intervention/ownership in companies: 28%
- Immigration policies: 30%
- Labor policies: 48%

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index
Figure 20: Global CEO Survey: The impact of public policy

Executives thoughts on policy advantages and disadvantages (percent indicating competitive advantage or disadvantage due to current government policies and regulations in their home country)

United States

- Intellectual property protection laws: 79%
- Technology transfer, adoption and integration policy: 77%
- Environment policies: 57%
- Energy policies: 65%
- Corporate tax policies: 68%
- Healthcare policies: 73%

Source: Deloitte Touche Tohmatsu Limited and U.S. Council on Competitiveness, 2013 Global Manufacturing Competitiveness Index
Policy recommendation: my view

1. Prioritize the development of talented and skilled citizens/workers/customers
2. Manufacturing is the strongest enabler for job creation acting also as multiplier: country investment in infrastructure is needed
3. Support the RD&I on the identified key technologies
4. Enable the virtuous circle among all the above listed recommendations
Policy recommendation: the Next Industrial Revolution Loop

High Performing Industry

High Talended People

Attraction of FDI

Increase in the export of High Added Value Products

High level of innovation in Product/Services

Multiplication effect on related sectors
Who I am

- Professor of Advanced and Sustainable Manufacturing @ Politecnico di Milano
- Leader of a 40-people group on Manufacturing Engineering and Management
- Member of the European Factory of the Future Research Association
- Technology Foresight expert
  - Coordination of 3 Technological Foresight Roadmaps on Manufacturing over the last 10 years
- 22 EU Funded projects for a total amount of 10,9M€ funding since Jan 2009
- Scientific Chairman of the World Manufacturing Forum

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