Building the Future of Work in the Age of AI

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Policy Analyst, ITIF

February 3, 2021
Today’s Presentation

1. Digitalization Transforming Manufacturing
2. How AI Will Transform the Manufacturing Workforce
3. Developing and Acquiring AI Talent
4. Policy Recommendations
Manufacturing Digitalization Becoming a Priority Worldwide

Manufacturing USA
Made Smarter
Industria Conectada 4.0
Industrie du Futur
ABII - Associação Brasileira de Internet Industrial
Prime Minister’s Industry 4.0 Taskforce
Industrial Value Chain Initiative (IVI) in China 2025
Made in China 2025
ABII - Associação Brasileira de Internet Industrial

Netherlands: Smart Industry
Belgium: Made Different
Portugal: Industria 4.0
Denmark: M.A.D.E.
Mexico: Industry 4.0 Roadmap
Slovakia: Smart Industry
Wallonia: Marshall 4.0

Manufacturing Innovation 3.0
Produktion 2030
Průmysl Industry 4.0
IPAR 4.0
Industria 4.0
Piano Industria 4.0
Make in India

Courtesy: Dave Vasko, Rockwell Automation
## Countries Aggressively Implementing Policies to Achieve Digital Manufacturing Leadership

<table>
<thead>
<tr>
<th>Year Launched</th>
<th>Policy Name</th>
<th>Declared Funding US Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Industry 4.0</td>
<td>$550</td>
</tr>
<tr>
<td>2010</td>
<td>Industry 4.0</td>
<td>$280</td>
</tr>
<tr>
<td>2011</td>
<td>Manufacturing USA</td>
<td>$700</td>
</tr>
<tr>
<td>2011</td>
<td>Catapult centers</td>
<td>$430</td>
</tr>
<tr>
<td>2012</td>
<td>Intelligent Factories Program</td>
<td>$48</td>
</tr>
<tr>
<td>2013</td>
<td>Factories of the Future</td>
<td>$1,120</td>
</tr>
<tr>
<td>2014</td>
<td>Revitalization/Robots Strategy</td>
<td>$916</td>
</tr>
<tr>
<td>2015</td>
<td>Industrie du futur</td>
<td>$1,800</td>
</tr>
<tr>
<td>2015</td>
<td>Manufacturing Innovation 3.0</td>
<td>$1,160</td>
</tr>
<tr>
<td>2015</td>
<td>Productivity 4.0</td>
<td>$1,000</td>
</tr>
<tr>
<td>2016</td>
<td>Research Innovation and Enterprise 2020</td>
<td>$2,300</td>
</tr>
<tr>
<td>2017</td>
<td>Made in China 2025</td>
<td>$3,000</td>
</tr>
</tbody>
</table>

Source: Roland Berger; ITIF Analysis
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ITIF/MAPI “The Manufacturing Evolution” Report

- Surveyed AI adoption/workforce implications for 70 MAPI members.
**AI Deployment Levels Vary By Application**

<table>
<thead>
<tr>
<th>Application</th>
<th>Currently</th>
<th>Over the next 5 years</th>
<th>Not currently or planning to use it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial robotics</td>
<td>66%</td>
<td>23%</td>
<td>11%</td>
</tr>
<tr>
<td>Machine vision learning</td>
<td>41%</td>
<td>36%</td>
<td>23%</td>
</tr>
<tr>
<td>Intelligent products</td>
<td>28%</td>
<td>44%</td>
<td>28%</td>
</tr>
<tr>
<td>Machine learning</td>
<td>26%</td>
<td>49%</td>
<td>25%</td>
</tr>
<tr>
<td>Cobots</td>
<td>25%</td>
<td>33%</td>
<td>42%</td>
</tr>
<tr>
<td>Predictive systems</td>
<td>21%</td>
<td>69%</td>
<td>10%</td>
</tr>
<tr>
<td>Algorithmic generative design software</td>
<td>16%</td>
<td>39%</td>
<td>46%</td>
</tr>
<tr>
<td>Expert systems</td>
<td>10%</td>
<td>48%</td>
<td>41%</td>
</tr>
<tr>
<td>Intelligent supply chains</td>
<td>10%</td>
<td>64%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Most common apps in 5 years:

- Industrial robotics
- Machine vision/learning
- Predictive systems
- Intelligent products
- Intelligent supply chains
Leading Barriers to AI Adoption Among Manufacturers

- Lack of data resources needed to enable AI solutions: 58%
- Uncertainty about how to implement AI solutions to solve specific challenges: 52%
- Lack of sufficient workforce digital skills to develop and/or implement AI solutions: 47%
- Lack of interoperability between equipment that precludes data integration needed to support AI applications: 47%
- Skepticism about achieving sufficient ROI from investments in AI solutions: 40%
- Unaware of how to define what AI skills we need: 34%
- Lack of sufficient financial resources to support requisite investments: 31%
- Lack of senior leadership buy-in for AI solutions: 21%
- Concerns pertaining to cybersecurity risks: 21%

Why Has Digital Manufacturing Progress Been So Slow?

Supply
- Suite of technologies not yet fully mature.
- Fragmented providers/lack of interoperable standards.

Demand
- Underinvestment in capital equipment.
- Lagging employee skills and competencies.
- SMEs unclear how to proceed/understand value proposition.

Source: Stephen Ezell, ITIF, “U.S. Manufacturing Digitalization - Extent of Adoption and Recommendations for Increasing Penetration”
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AI Skill Gaps Appear Across All Levels of Mfg. Workforce

### Barriers In Finding Employees with Requisite AI Skills

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional high schools, universities, community colleges failing to produce graduates with needed AI knowledge and skills</td>
<td>38%</td>
</tr>
<tr>
<td>Difficulty in attracting AI-skilled workers due to reputational issues (i.e., attractiveness of jobs in manufacturing compared to other industries)</td>
<td>36%</td>
</tr>
<tr>
<td>Lack of mechanisms (e.g., access to community college classes) to retrain existing workers with needed AI skills</td>
<td>35%</td>
</tr>
<tr>
<td>Difficulty in attracting AI-skilled workers because of company’s geographically remote location</td>
<td>27%</td>
</tr>
<tr>
<td>Difficulty in affording AI-skilled workers</td>
<td>24%</td>
</tr>
<tr>
<td>Other</td>
<td>16%</td>
</tr>
</tbody>
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AI Policy Recommendations

- Support the development industry-led, market-driven global standards for AI-enabled manufacturing products and technologies.

- Ensure the future workforce has the skills it needs by establishing incentive programs for universities to expand their offerings in computer science.

- Ensure firms are incentivized to train the workforce.
Thank You!

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