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Countries’ Policies to Support Advanced Manufacturing

NIST VCAT Meeting

Stephen J. Ezell, Senior Analyst, ITIF
Key Themes

1. Countries developing new industrial policies that unabashedly target leadership in advanced manufacturing industries.

2. Countries making significant investments behind those strategies and toward building their industrial ecosystems.

3. Increased focus on industry-university collaboration geared toward applied R&D and technology commercialization.

4. Increased focus and investment to support advanced manufacturing capacity of SMEs.

5. Countries improving policy environment to support advanced manufacturing.
### Modernized Industrial Policies Target Key Industries

<table>
<thead>
<tr>
<th><strong>China - Strategic and Emerging Industries (SEI)</strong></th>
<th><strong>UK Modern Industrial Strategy</strong></th>
<th><strong>2012 Swedish Innovation Strategy</strong></th>
<th><strong>2012 Finnish Innovation Strategy</strong></th>
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</thead>
<tbody>
<tr>
<td>High-end Equipment Manufacturing</td>
<td>Aerospace</td>
<td>Mining, Materials, Steel Life Sciences Manufacturing</td>
<td>Construction Mechanical Engineering Forestry Energy and the Environment</td>
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<tr>
<td>Clean-Energy Vehicles</td>
<td>Automotive</td>
<td>Life Sciences</td>
<td>ICT</td>
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<td>New Materials</td>
<td>Life Sciences</td>
<td>Manufacturing</td>
<td>Health Care</td>
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<td>Next-Generation Information Technology</td>
<td>Clean Energy</td>
<td>Sustainable Civil Engineering Forestry</td>
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<td>Biotechnology</td>
<td>Maritime Technologies</td>
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<td>New Energy</td>
<td>Agri-Tech</td>
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<td>Energy Conservation &amp; Environmental Protection</td>
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### China – Strategic and Emerging Industries Initiative

$1.7 trillion investment in seven SEI industries through 2020

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<tr>
<th>Industry</th>
<th>Subsectors</th>
<th>Estimated Investment</th>
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<tr>
<td>High-end equipment manufacturing</td>
<td>Intelligent equipment, advanced power equipment, aerospace, marine engineering, advanced transportation facilities</td>
<td>$245 billion (RMB 1.5 trillion)</td>
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<td>New-energy vehicles</td>
<td>Electric cars, hybrids, hydrogen-powered vehicles, battery charging equipment, lithium batteries, parts for new-energy automobiles</td>
<td>$163 billion (RMB 1 trillion)</td>
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<td>New materials</td>
<td>Materials with specific functions, high-performance composites, new chemical materials, nanomaterials</td>
<td>$122 billion (RMB 750 billion)</td>
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<tr>
<td>Biotechnology</td>
<td>New medicines, biomedical technology, advanced medical equipment, biological breeding, stem cells, genetic modification</td>
<td>$308 billion (RMB 1.8 trillion)</td>
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<td>Next-generation ICT</td>
<td>Integrated circuits, mobile communication, cloud computing, displays, high-end software/servers, networking equipment</td>
<td>$163 billion (RMB 1 trillion)</td>
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<td>New energy</td>
<td>Nuclear, wind, solar, clean coal, biomass energy, smart grid</td>
<td>$800 billion (RMB 5 trillion)</td>
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<td>Energy-saving technology and environmental protection</td>
<td>High-efficiency and energy-saving technology, advanced environmental protection, recycling usage, reusing waste products</td>
<td>$507 billion (RMB 3.1 trillion)</td>
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China Advanced Manufacturing Technology Roadmap

- Articulates long-range planning for developing S&T in each field of advanced manufacturing technology.

- Detailed technology roadmaps.

- SWOT analysis by specific advanced manufacturing sectors.
UK Modern Industrial Strategy

- Commits £4 billion ($6.57 billion) for UK “industrial strategy.”
  - £1.6B FY’13 “Industrial Strategy” Package for Aerospace, Automotive, and Agri-tech Sectors
  - £1B in new capital for a Business Bank
  - £245M for Advanced Manufacturing Supply Chain Initiative
  - £200M for UK Catapults

“Investments in core building blocks of skills, scientific research, and infrastructure.”
EU Horizon 2020 Builds on “Factories of the Future”

- EU Horizon 2020 allocates €17B ($23B) for “leadership in deploying six key enabling and industrial technologies.”

- Emphasis on technology development, industrial-scale pilots/test-beds, and prototyping/product validation.

- Builds on FY’13 Funding of €230M for “Factories of the Future” program

- Nanotechnologies
- Advanced Materials
- Micro- and nano-electronics
- Photonics
- Biotechnology
- Advanced Manufacturing
Global Competitors Increasing R&D Investments

Gross domestic spending on R&D as a % of GDP

Source: OECD STI Outlook 2012
Frameworks for Industrially Relevant, Applied R&D

**Fraunhofer-Gesellschaft**: Undertakes applied research of direct utility to private industry. Clustered approach with pilot production centers to close the gap between research and products.

**Research orientation**
- Technical prototypes
- Pilot plants
- Development
- Applied research
- Application-oriented fundamental research
- Fundamental research

**Sources of income**
- 100% Public
- 100% Private

**Fraunhofer**
- 59 Institutes, 17,000 employees
- Non-profit organisation
- Basic funding by government, public funded projects, direct contracts by industry
- Information and Communication Technology
- Life Sciences
- Microelectronics
- Light & Surfaces
- Production
- Materials and Components - MATERIALS
- Defense and Security
Frameworks for Industrially Relevant, Applied Research

- Germany’s Fraunhofer System & Allianz Industrie Forschung (AIF)
  - Fraunhofer: $2.5 billion investment; @70 Centers

- Japan’s New $117B Stimulus Package (January 2013)
  - $2 billion to promote university-industry collaboration, including $ to equip universities to conduct industrially relevant research

- UK Catapults (Launched January 2013)
  - The High-Value Manufacturing Catapult a “Catalyst that transforms brilliant manufacturing ideas into valuable products and services”

- Taiwan’s Industrial Technology Research Institute (ITRI)
Investment in Manufacturing Extension Services

Country Investment in National Technical Support and Product Development Programs, As Share GDP, 2012

Source: ITIF; GAO: Global Manufacturing: Foreign Government Programs Differ from the U.S. In Some Respects
Targeted Support for High Potential SMEs

- Canada IRAP – Direct “Innovation Support”, non-repayable grants up to $2 million for innovation activities including R&D, technical feasibility, & prototype and process development.

- Germany – Central Innovation Programme for SMEs (ZIM) - $687M (2013) to support individual and cooperative research projects of SMEs.

- **Tax Policies**
  - Enhanced R&D tax credit generosity.
  - Expanded collaborative R&D tax credits.
  - Patent boxes.

- **Talent Policies**
  - Germany: national system of vocational skills training and credentialing.
Conclusion: Smart Policies Matter

30% of all German companies attribute their innovations “to improved research and innovation policies at the federal level.”

The High-Tech Strategy for Germany

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<tr>
<th>Strengths</th>
<th>Opportunities</th>
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<tr>
<td>• Strong user industries: Automobile industry, medical technology, mechanical engineering and, increasingly, biotechnology, agriculture and logistics are technology drivers.</td>
<td>• New research fields: Enormous potential offered by polymer microsystems and micro/nano integration.</td>
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<td>• Materials and equipment suppliers: High level of expertise.</td>
<td>• Growth market: Large number of SMEs with above-average, often double-digit growth rates. High-volume markets for security technology, logistics and health monitoring.</td>
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<td>• Highly competitive: Operations are seldom relocated to other countries.</td>
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<td>• Skilled labour: Germany has a unique initial and continuing education and training system at both industrial and academic level.</td>
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<th>Weaknesses</th>
<th>Threats</th>
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<td>• Mass markets: There is no mass production in Germany except in the automobile sector.</td>
<td>• Shortage of skilled labour: Early action must be taken to prevent a possible shortage of new recruits.</td>
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<td>• Integration of microsystems technology in products: Many SMEs in potential user sectors lack the necessary expertise.</td>
<td>• Product-oriented R&amp;D infrastructure needed: Support on the basis of developed microsystems technologies needed, particularly for SMEs.</td>
</tr>
<tr>
<td>• Provision of capital: Technology companies – which are generally capital-intensive – have cautious, national-level financial backers.</td>
<td>• Establishment of more networks: Germany needs more collaborative, production-oriented networks between research units, suppliers and systems producers.</td>
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Thank You
Stephen Ezell
sezell@itif.org

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