The Proposed Design: National Network for Manufacturing Innovation

Mike Molnar
Advanced Manufacturing National Program Office
Agenda

- NNMI Milestones and Vision
  - The Missing Middle Challenge – NNMI Positioning
  - NNMI Design Process
  - Institute Design
  - NNMI Characteristics
  - Next Steps
Policy Milestones

June 2011
REPORT TO THE PRESIDENT ON ENSURING AMERICAN LEADERSHIP IN ADVANCED MANUFACTURING
Executive Office of the President
President's Council of Advisors on Science and Technology
JUNE 2011

February 2012
A NATIONAL STRATEGIC PLAN FOR ADVANCED MANUFACTURING
Executive Office of the President
National Science and Technology Council
FEBRUARY 2012

July 2012
REPORT TO THE PRESIDENT ON CAPTURING DOMESTIC COMPETITIVE ADVANTAGE IN ADVANCED MANUFACTURING
Executive Office of the President
President's Council of Advisors on Science and Technology
JULY 2012

January 2013
NATIONAL NETWORK FOR MANUFACTURING INNOVATION: A PRELIMINARY DESIGN
Executive Office of the President
National Science and Technology Council
Advanced Manufacturing National Program Office
JANUARY 2013

Advanced Manufacturing National Program Office
2013 Engineering Deans Council
Public Policy Colloquium
Vision of the NNMI

$1 billion proposal:
“institutes of manufacturing excellence where some of our most advanced engineering schools and our most innovative manufacturers collaborate on new ideas, new technology, new methods, new processes.”

President Obama at Rolls-Royce Crosspointe
Petersburg, VA, March 9, 2012
Proposed NNMI Scope

- Up to 15 linked regional clusters of manufacturing innovation across the country, each with a unique focus
- Shared approaches to infrastructure, intellectual property, contract research, and performance metrics

As nodes of a network, the Institutes for Manufacturing Innovation complement each other’s capabilities.
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The Missing Middle - Valley of Death

Not about government spend in TRL 4-7 projects!
Focus on Scale Up – The Missing Middle

Basic science
Largely government funded

Commercialization
private sector owned/funded

Basic science

$100M
DOE Energy Innovation Hub

$10M
NSF Engineering Research Center

$1M
NSF I/UCRC Center

$100K
State or Regional Center

Applied science

Institute for Manufacturing Innovation

Commercialization
Manufacturing Extension Partnership Center

Manufacturing Maturity
NNMI Positioning: Creating a Partnership Space for Industry and Academia

The Federal investment in the National Network for Manufacturing Innovation (NNMI) serves to create an effective manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems. The NNMI will consist of linked Institutes for Manufacturing Innovation (IMIs) with common goals, but unique concentrations. In an IMI, industry, academia, and government partners leverage existing resources, collaborate, and co-invest to nurture manufacturing innovation and accelerate commercialization.

As sustainable manufacturing innovation hubs, IMIs will create, showcase, and deploy new capabilities, new products, and new processes that can impact commercial production. They will build workforce skills at all levels and enhance manufacturing capabilities in companies large and small. Institutes will draw together the best talents and capabilities from all the partners to build the proving grounds where innovations flourish and to help advance American domestic manufacturing.
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Crowdsourcing: Design for Impact Workshops & RFI

Rensselaer Polytechnic Institute
April 25, Troy, New York

Cuyahoga Community College
July 9, Cleveland, Ohio

National Academies Beckman Center
September 27, Irvine, California

Univ. Colorado
October 18, Boulder, Colorado

Participants

- Research & Non-profits: 85
- Econ. Dev.: 47
- Federal/State Governments: 141
- Academia: 282
- Industry: 264
- Other: 27

Advanced Manufacturing National Program Office
2013 Engineering Deans Council
Public Policy Colloquium
NNMI Design Authors: ~900 strong!
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Institute Structure

Institute for Manufacturing Innovation
- Applied Research
- Technology Development
- Prototype Labs/shops
- Mfg. Software Development
- Education and Workforce Development

Shared Use Facility
- Manufacturing Demonstrations
- Technology Workshops
- Mfg. Technology Services

Academia
- Universities & National Labs
- Community Colleges

Industry
- Large Manufacturing Companies
- Small & Medium Enterprises
- Start-ups

Government
- Federal Government
- State/Local Government
- Economic Development Organization
Detail: Industry Interactions

- Interactions are through funding (green), information (blue) and personnel (red).

- Institutes will have a low barrier to entry, and will interact with start-ups and SMEs.

- Information transfer is not limited to project results; an Industrial Commons promotes cross-talk.
Academia Interactions

- Interactions are through **funding (green)**, **information (blue)** and **personnel (red)**.

- Community colleges are essential for workforce development tasks.

- Academia interactions are facilitated by the IMI.

**Research Universities/Gov. Labs**
- In-Kind
  - IP, Research results
  - Faculty, students

- Project funding
  - Project definition, IP
  - Curriculum development
  - Industry Staff

**Community Colleges**
- In-kind
  - Workforce development
  - Students, staff

- Project funding, training
  - Curriculum development
  - Industry, University staff
Government and Network Interactions

- Each Institute will participate in the NNMI, web portal.
- Institutes will share resources.
- Institutes will direct projects to other institutes as appropriate.
- Government (federal and state) will provide funding and disseminate research results through manufacturing.gov.
IMI Key Characteristics

- Institutes will be the anchor to a regional innovation ecosystem, with a vision for national and international preeminence.
- Institutes will be partnerships between all stakeholders: industry, academia, government, industry development organizations. Collaboration is critical.
- Each institute will have its own unique focus area, one of:
  - Manufacturing process
  - Advanced Materials
  - Enabling Technology
  - Industry Sector
- Institutes should be proposed by an industry-based non-profit organization. Focus areas will be ideally be defined by proposing teams.
- Institutes will be self-sustaining after 7 years.
Suggested Technology Focus Areas from the RFI and Workshop

Flexible electronics, nano/micro, lightweight materials, personalized medicine, alternative energy, additive manufacturing, smart machining, pharmaceuticals, modeling and simulation, composite materials, coatings, energy storage, sensors, metal casting, advanced forming, advanced joining, robotics, peening, machining, other surface finishing, coal compact internal burning, convert truck fleets to natural gas, thermoplastic recycling, sensors for harsh conditions, machining, forming, molding, casting, assembly, forgings, joining, surface engineering, electro-optics, nanomanufacturing, miniaturized electronics, design tools and informatics, nanoelectronics, autonomy, superalloys, precision machining, rapid prototyping, organic electronics, nanocomposites, sensors, embedded technologies, remote sensing, renewable energy, strategy development, printed electronics, sustainable manufacturing, bioprocessing, nanomedicine, nanomaterials, micromanufacturing, stoichiometry in thin films and bulk materials, photonic integrated circuits, electro-optic materials and devices, polymeric-based web converting manufacturing platforms, sensors for diagnosis and control of manufacturing, renewable energy, biofuels, nano/bio manufacturing, digital model-based manufacturing, advanced materials, medical technology manufacturing, additive manufacturing, smart manufacturing, advanced/intelligent machining and fabrication, advanced metrology, digital manufacturing, advanced joining, near-net shape technologies, forging, extrusion, rolling, casting, powder, molding, hydroforming, composites manufacturing, advanced nanomaterials, next generation semiconductor technologies, MEMS/NEMS and embedded sensors, energy efficient technologies, dynamic machine tool management, Big Data, robotics, automation technologies, advanced magnets, joining technologies, in-situ metrology, powder metallurgy, electron beam, cryogenic techniques, coatings, repair welding, composites, maritime technologies, photovoltaics, biomimetic engineering (related to solar), materials characterization, laser-based processing, non-destructive evaluation, wafer fab and equipment, ceramics, sustainable manufacturing, digital manufacturing, mechatronics and cyberphysical manufacturing, optics and imaging, electronics assembly, IT systems, metamaterials, rapid prototyping via flexible manufacturing, wide bandgap manufacturing, advanced batteries...

All ideas are viable! Make the technical and business case...
IMI Proposal

• Proposing teams should demonstrate their focus area is:
  • Appropriate for an Institute
  • Has the potential to deliver regional and national improvements in advanced-manufacturing capabilities
  • Meets national needs

• IMIs should leverage existing regional or national innovation ecosystems or catalyze the formation and sustainability of new innovation clusters.

• IMIs will have a specific physical location and a clear lead organization; they will not be distributed or virtual.

• IMIs will have a regional focus with a plan for national and international preeminence.

• Activities will include
  • Applied research, development and demonstration projects
  • Education and training at all levels
  • Development of innovative methodologies and practices.
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NNMI Characteristics

• Promote collaboration between institutes
• Provide a forum for sharing best practices
• Establish common IMI Policies when appropriate
• Link activities through the Manufacturing Portal
Workforce Development and Education

• Each Institute will interact with academia (research universities and community colleges) to positively affect manufacturing curricula.

• Applied research, development, and demonstration projects will consider the potential to collaborate with educators as part of the design.

• Institutes will provide shared facilities to local industry, especially SMEs and startups, with the goal of scaling up laboratory demonstrations and making technologies ready for manufacture.

• To support education and training objectives of each IMI, facility sharing must include planning for the uses of facilities for education and training—both for advanced-knowledge workers and mid-level technicians.
Summary: Game Changing Characteristics

- Establish a presence, at scale, in the missing middle
- Partnering between all stakeholders
- An Industrial Commons
- Emphasizing/supporting longer-term investments by industry
- Combining R&D with workforce training
- A national network of Institutes
- Overarching mission: Create new U.S. manufacturing capabilities and industries - to grow high paying manufacturing jobs of the future
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Hold the Date

Blueprint for Action: Workshop on the Design of the National Network for Manufacturing Innovation (NNMI)

April 10, 2013
National Academy of Sciences Building
2101 Constitution Avenue, NW

- National Academy of Engineering,
- The National Academies’
  - Government-University-Industry Research Roundtable (GUIRR), and
  - University-Industry Demonstration Partnership (UIDP)