ManufacturingUSA®

Building the Partnership-Manufacturing USA Program Progress

ASEE Public Policy Colloquium

February 6, 2018

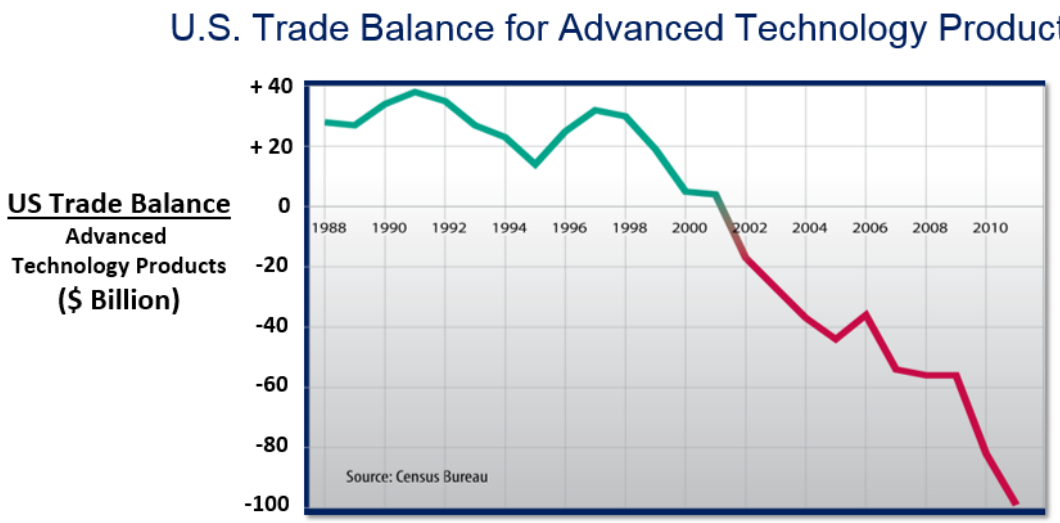
Mike Molnar
Advanced Manufacturing National Program Office

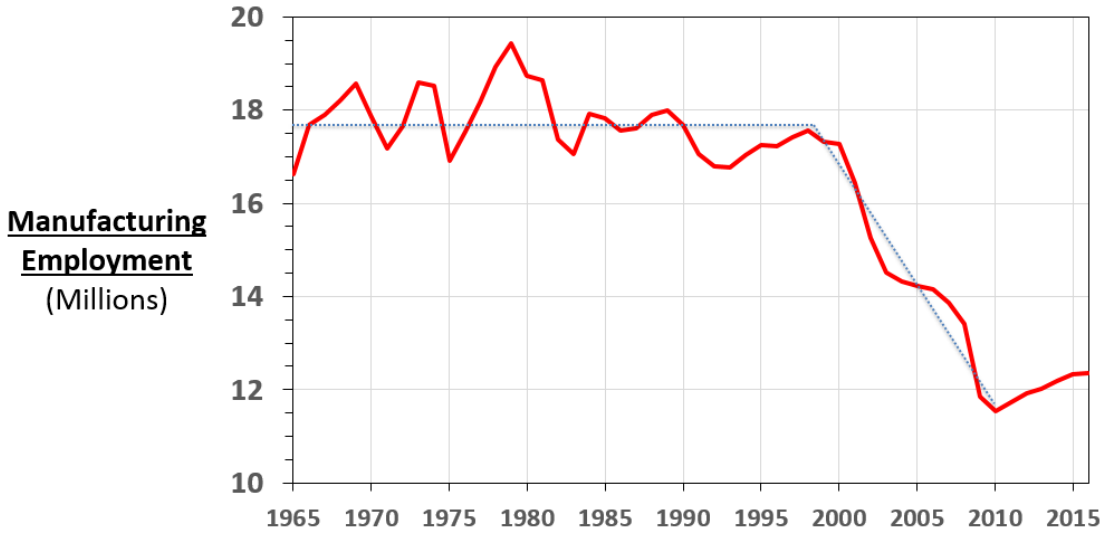
An interagency team building partnerships
with U.S. Industry and Academia

Agenda

- Overview
- How an Institute Works
- Program Results
- Developments
- NSTC Announcement

Manufacturing USA





President's Council of Advisors on Science and Technology

Advanced Manufacturing Partnership - 2011-2012

Advanced Manufacturing Partnership 2.0 - 2013-2014

Revitalize American Manufacturing and Innovation Act

118 bipartisan co-sponsors!

signed into law December 16, 2014

MFG USA®

National Network for Manufacturing Innovation

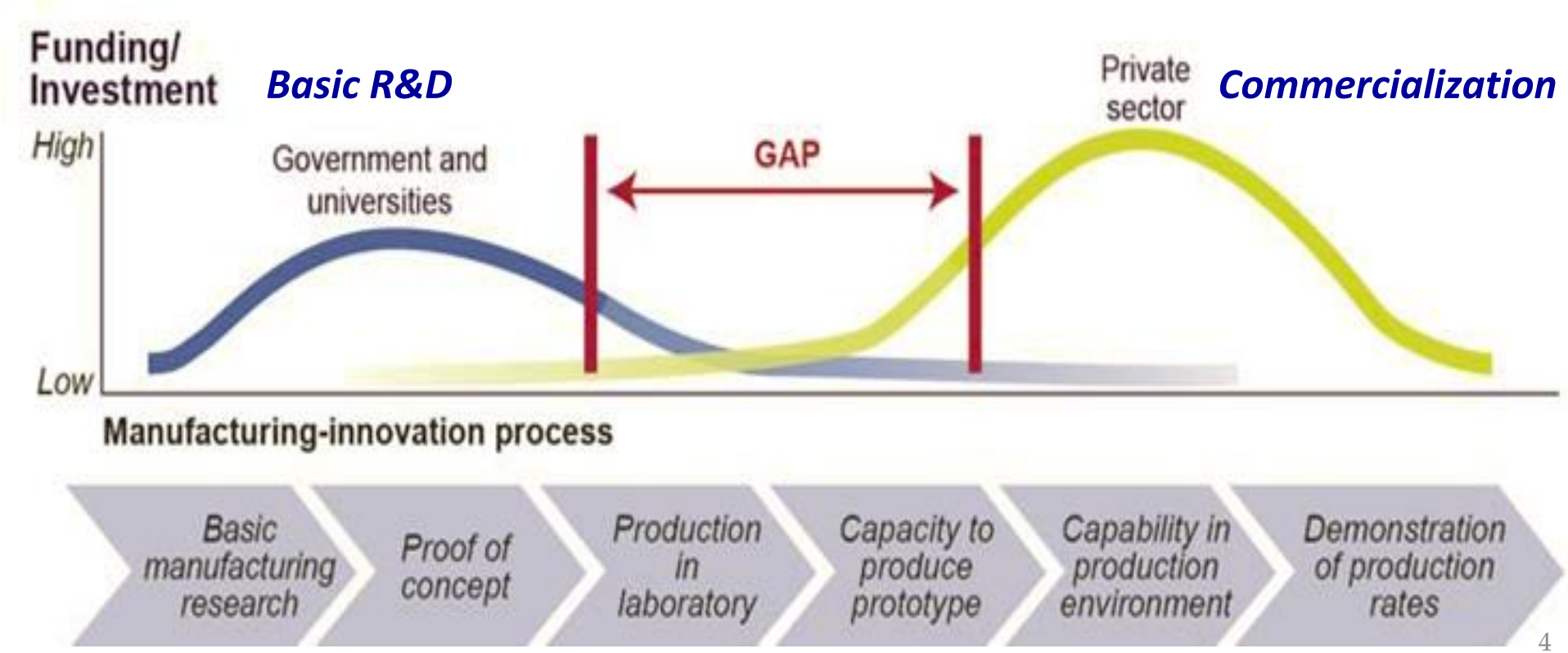
Enhancing American Competitiveness by

- Manufacturing technology
- Education & Workforce Development

PCAST: Manufacturing USA Institutes
Addressing the "Scale-up" Gap

Focus: *address market failure of insufficient industry R&D in the "missing middle" or "industrial commons" to de-risk promising new technologies*

Approach: *bring private sector investment back to the gap*



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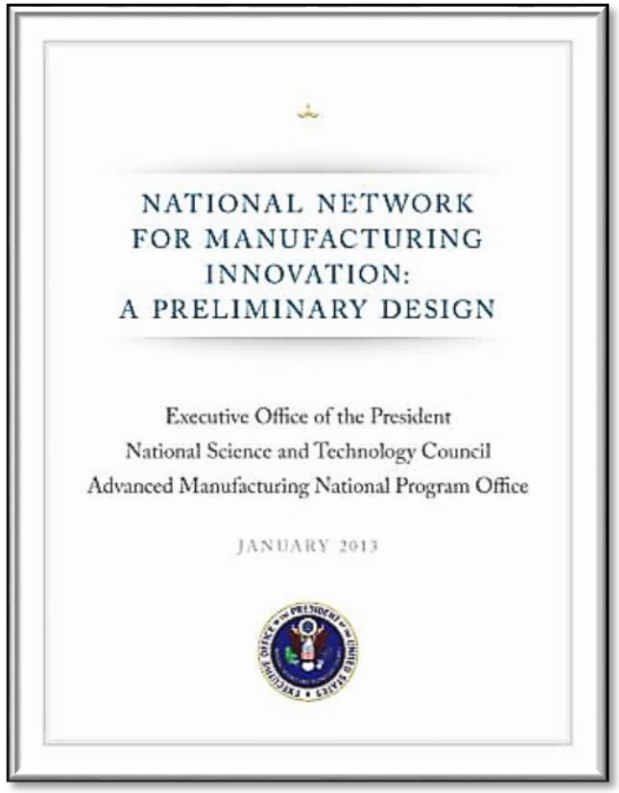
The Institute Design

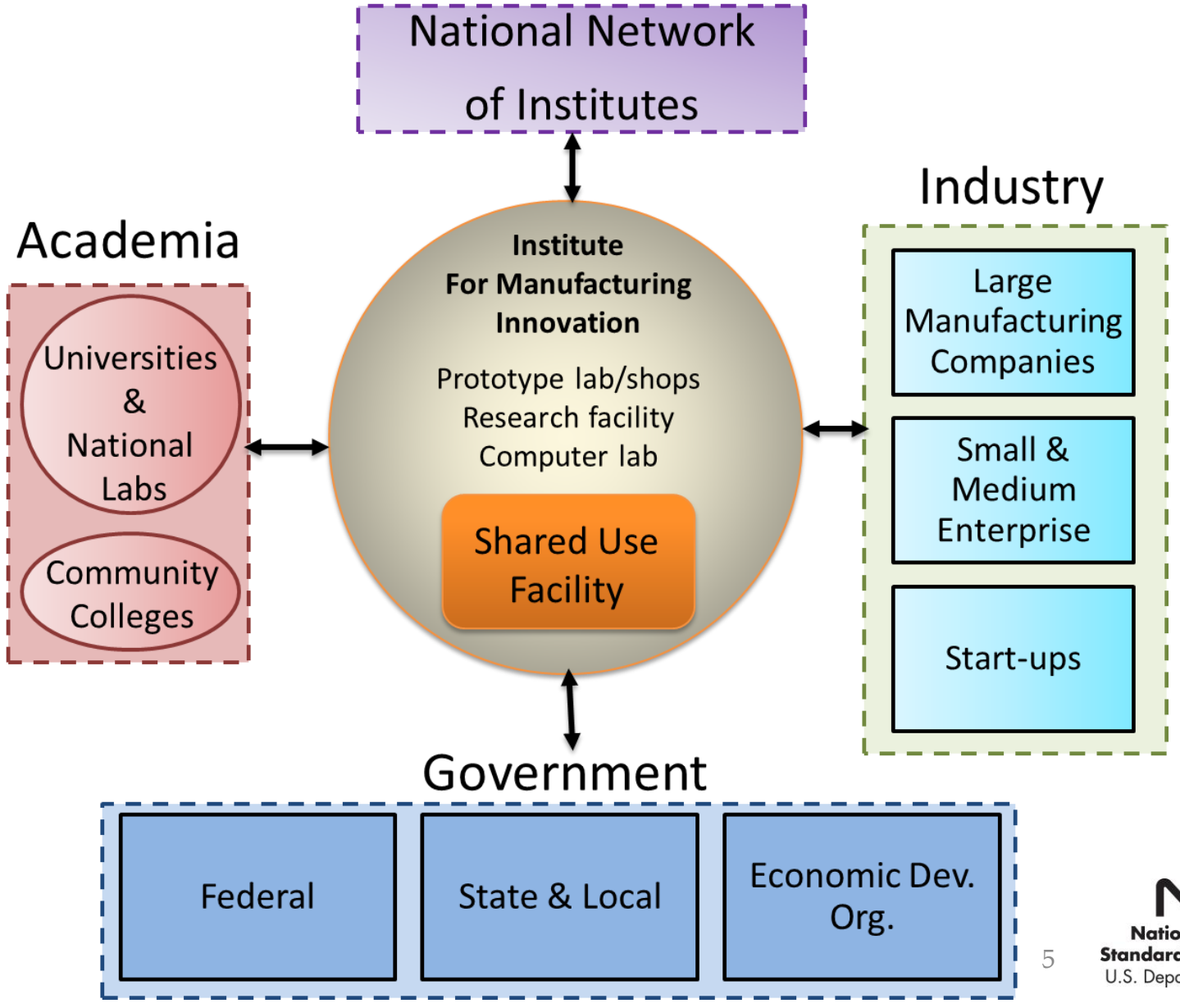
Creating the space for Industry & Academia to collaborate

Institute Framework Design published 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



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Manufacturing USA Strategic Goals

VISION

U.S. global leadership in advanced manufacturing

MISSION

Connecting people, ideas, and technology to solve industry-relevant advanced manufacturing challenges, thereby enhancing industrial competitiveness and economic growth and strengthening our national security.

PROGRAM GOALS

Competitiveness

Technology Advancement	Workforce Development	Technology Sustainability

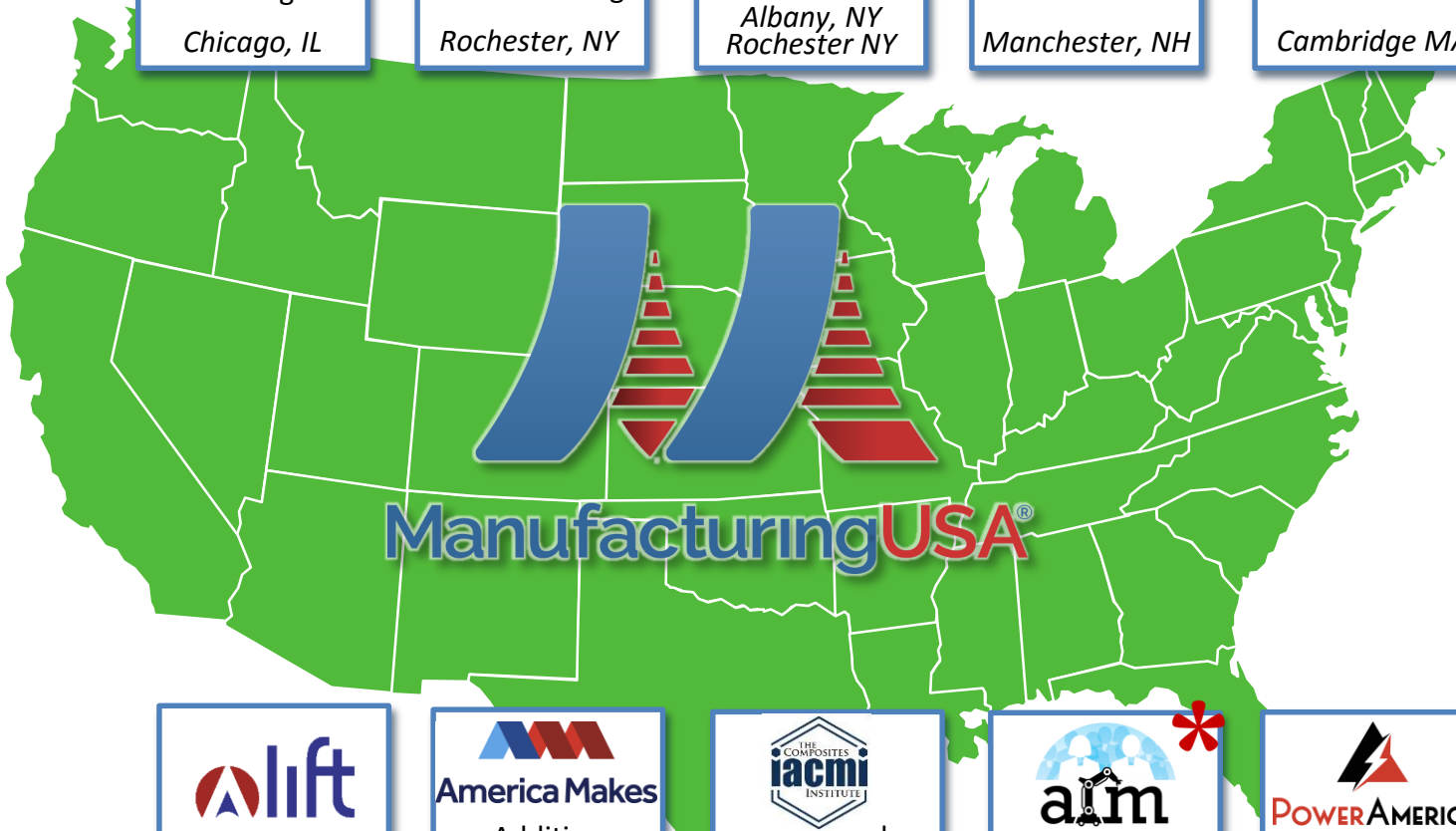
NATIONAL NETWORK FOR MANUFACTURING INNOVATION PROGRAM STRATEGIC PLAN

Executive Office of the President
National Science and Technology Council
Advanced Manufacturing National Program Office

February 2016

Manufacturing USA Institutes

Regional Hubs with National Impact



DMDII
a UI LABS Collaboration
Digital Manufacturing & Design
Chicago, IL

REMADE INSTITUTE *
Sustainable Manufacturing
Rochester, NY

AIM photonics
Integrated Photonics
Albany, NY
Rochester NY

biofabusa *
Regenerative Manufacturing
Manchester, NH

affoa
Advanced Fibers and Textiles
Cambridge MA

* New in FY 2017

NEXTFLEX
Flexible Hybrid Electronics
San Jose, CA

CLEAN ENERGY SMART MANUFACTURING INNOVATION INSTITUTE *
Smart Sensors and Digital Process Control
Los Angeles, CA

RAPID Transforming Process Industries *
Modular Chemical Process Intensification
New York, NY

NIMBL *
Bio-pharmaceutical Manufacturing
Newark, DE

lift
Lightweight Metals
Detroit, MI

America Makes
Additive Manufacturing
Youngstown, OH
El Paso TX

THE COMPOSITES iacmi INSTITUTE
Advanced Composites
Knoxville, TN
Detroit MI

aim *
Advanced Robotics
Pittsburgh, PA

PowerAmerica
Wide Bandgap Semiconductors
Raleigh, NC

NIST National Institute of Standards and Technology
U.S. Department of Commerce

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Example Institute: NIIMBL

NIIMBL

The National Institute for Innovation in Manufacturing Biopharmaceuticals

NIST
National Institute of Standards and Technology
U.S. Department of Commerce

140+ Partners

A public-private partnership of industry, academic, non-profits and government entities.

NIIMBL

Drug Substance

Upstream processing

Downstream processing

Manufacturing & purification of the active biotherapeutic ingredient

Drug Product

Formulation & packaging of the active ingredient into final dosage form

Process Control

Novel analytics for process & product characterization & control. Regulatory science to assess safety, efficacy, & quality

AMERICAN INNOVATION AT WORK

1) Each Institute has a clear mission based on a critical Industry need

2) Each Institute creates value for industry participation and funding

A place where industry, academic, state, and U.S. federal resources synergize to

- meet industry's needs
- de-risk and streamline process development
- train a growing workforce spanning the full supply chain

- De-risked technology development in a highly regulated industry that is facilitated by collective action and collaboration with NIST and FDA
- Participate in collaborative projects.
  - For deployment of technology, scale-up and regulatory science
  - For applied RD&D to de-risk process development
- Opportunity to share in IP addressing shared challenges.
- Partnership to train a workforce for producing, testing, and regulating products at scale.

NIMBL

AMERICAN INNOVATION AT WORK

3) Each Institute creates an effective collaboration space for pre-competitive applied R&D

A place where industry, academic, state, and U.S. federal resources synergize to

- meet industry's needs
- de-risk and streamline process development & manufacturing
- train a growing workforce

Regulatory advancement is streamlined

Enhanced process robustness is obtained

Major manufacturers work with suppliers to develop new technologies

Standardization of interfaces, assays, parts, and certifications is achieved

New methods, technologies, and best practices are achieved collaboratively with health authorities

Workforce creation matches industry needs

4) Each Institute is operated by an industry-led consortium

Members span entire biopharmaceutical manufacturing ecosystem. Over 150 members in process of joining along with over 40 academic partners and 25 states

Industry + | **Academia +** | **Non-profits +** | **Government =** | **NIIMBL**

SOME PARTNERS NOTIONAL, PENDING SIGNED MEMBERSHIP AGREEMENT

5) Federal start-up funding for each Institute must catalyze at least 100% co-investment

Funding

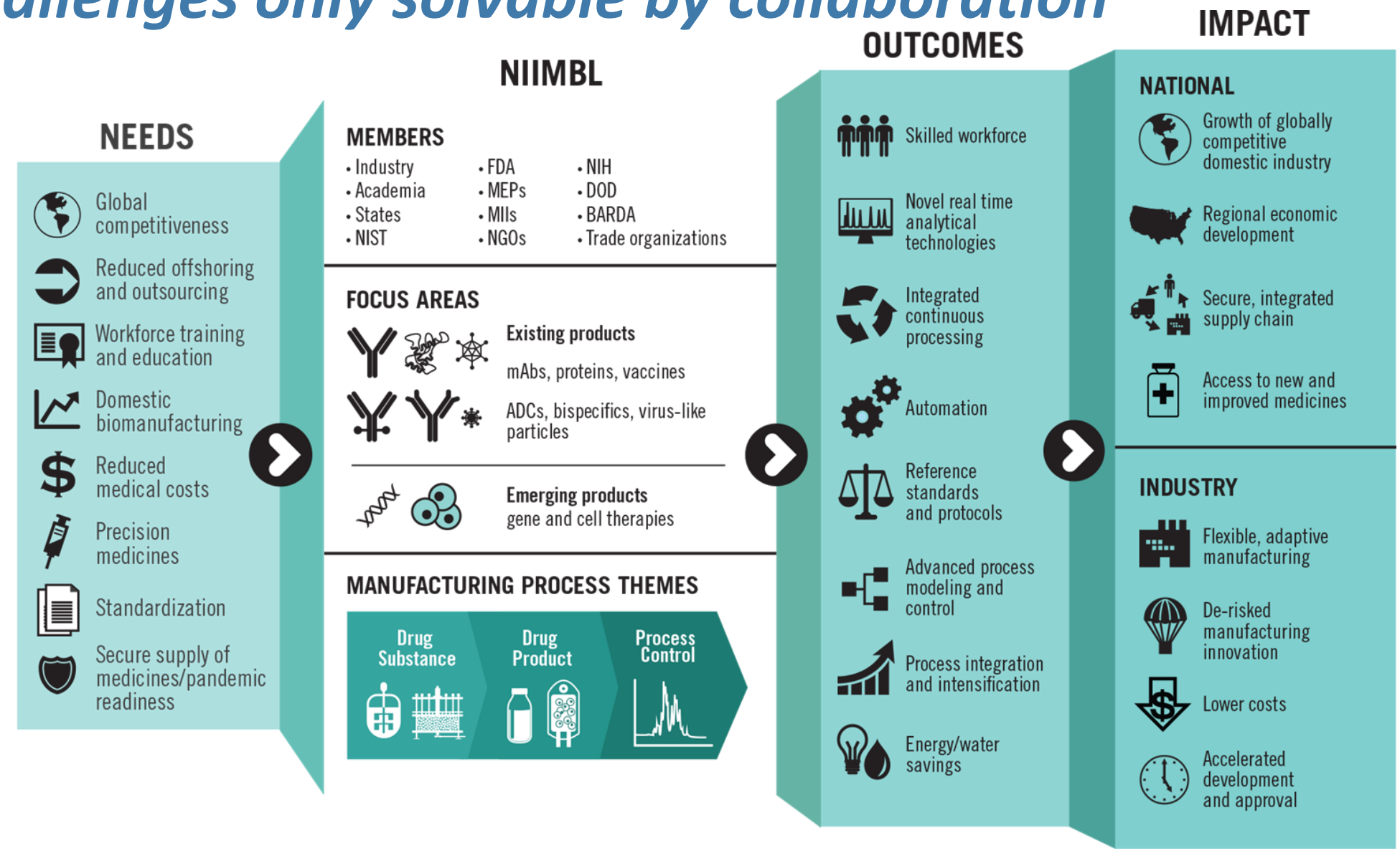
$70,000,000
National Institute of Standards and Technology

$180,000,000
Other Commitments

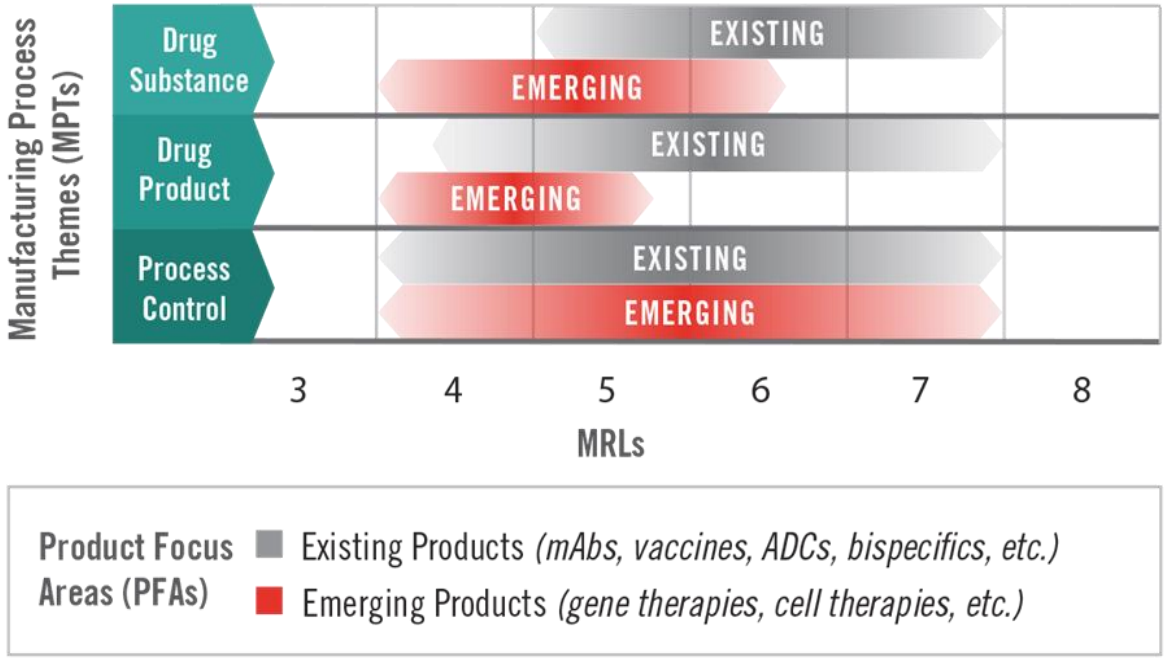
NIIMBL is funded by a five year $70,000,000 cooperative agreement from the National Institute of Standards and Technology and leverages >$180,000,000 in other commitments.

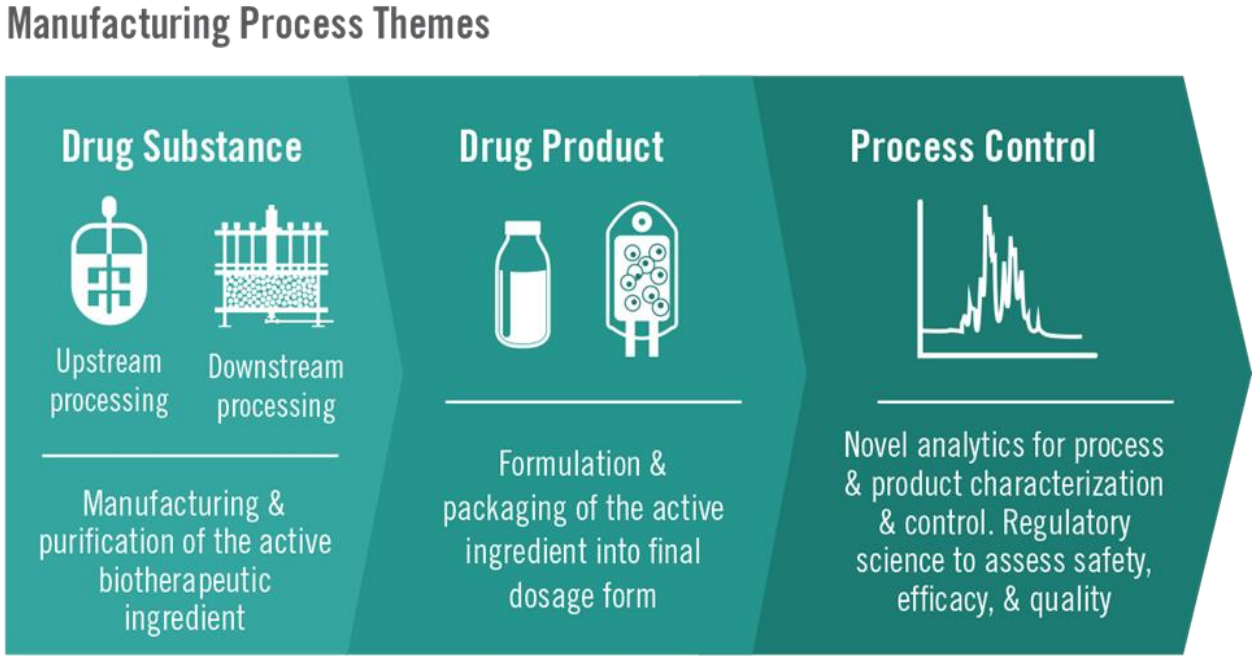
NIST is a non-regulatory federal agency within the U.S. Department of Commerce. NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

6) Each Institute works on the industry priorities and big challenges only solvable by collaboration



7) Each Institute manages a balanced portfolio of real projects for industry

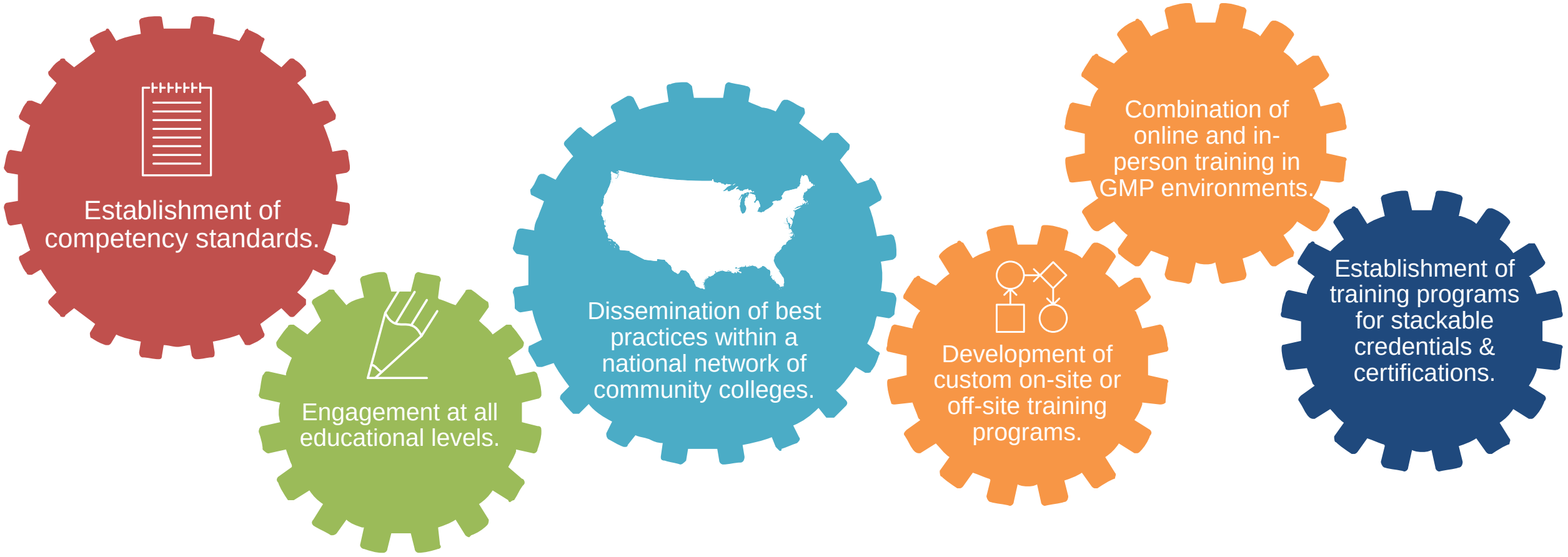




NIIMBL

- NIIMBL plans two project calls per year in ongoing operations,.
- 'Quick Start' project calls will be issued at close of the start-up phase.
- A regulatory coordination committee may issue special project calls at any time.

8) *Each Institute addresses the skills gap on education and workforce skills for their technology space*



October 23, 2017 - New Facility Groundbreaking (opening Jan 2020)

Funded by the University of Delaware & private philanthropy
NIIMBL will lease space for headquarters and shared laboratory space
Facility will also be home to synergistic research activities at University of Delaware

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Manufacturing USA Annual Report

Following Congressional reporting, now publicly released December 1 2017

- Review of program, network and performance measures to national objectives
- Detailed profiles of each institute
- Includes results of / responses to the external assessments completed in 2017

Free download at
www.ManufacturingUSA.com

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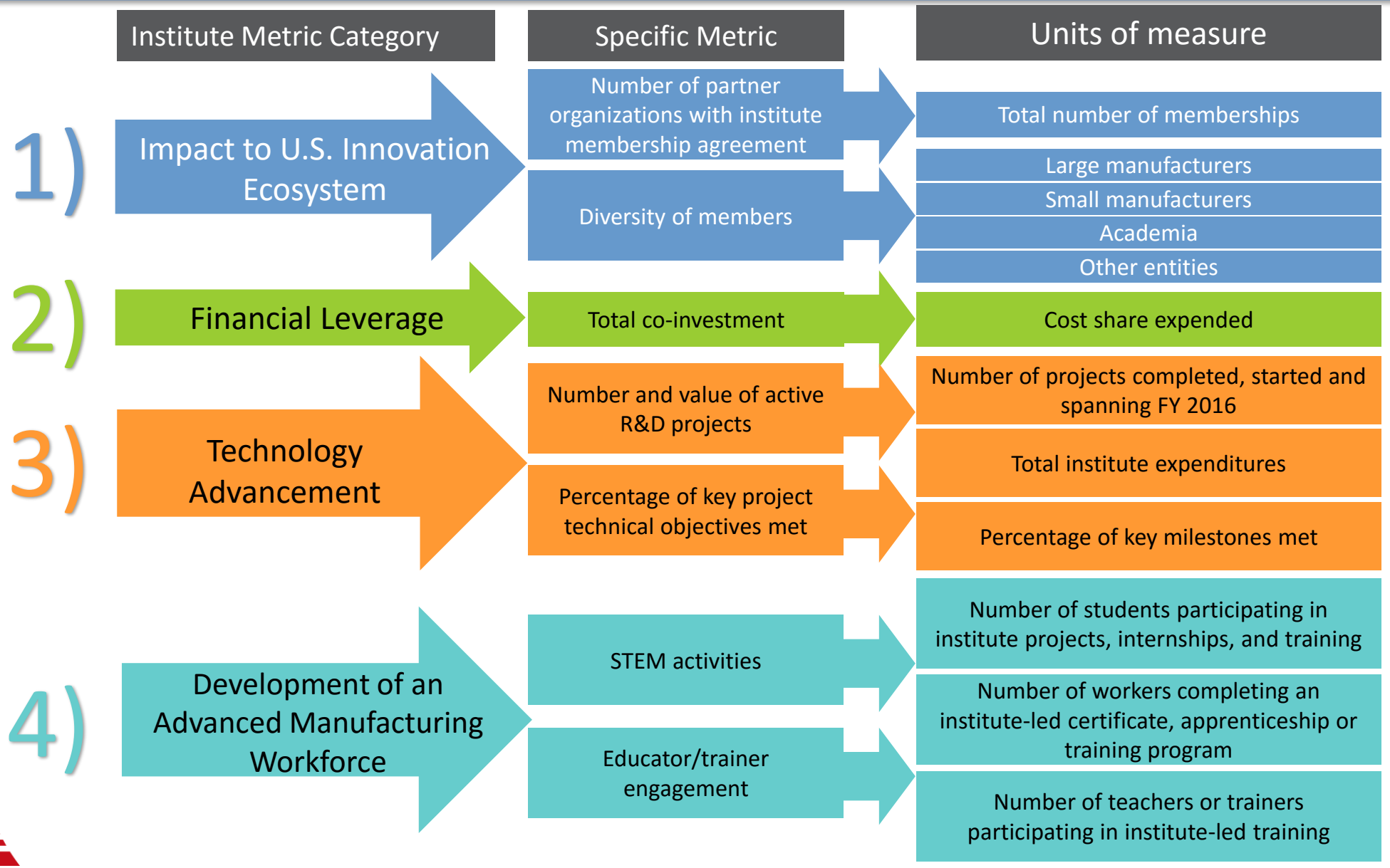
Measuring Performance – Top Level Metrics



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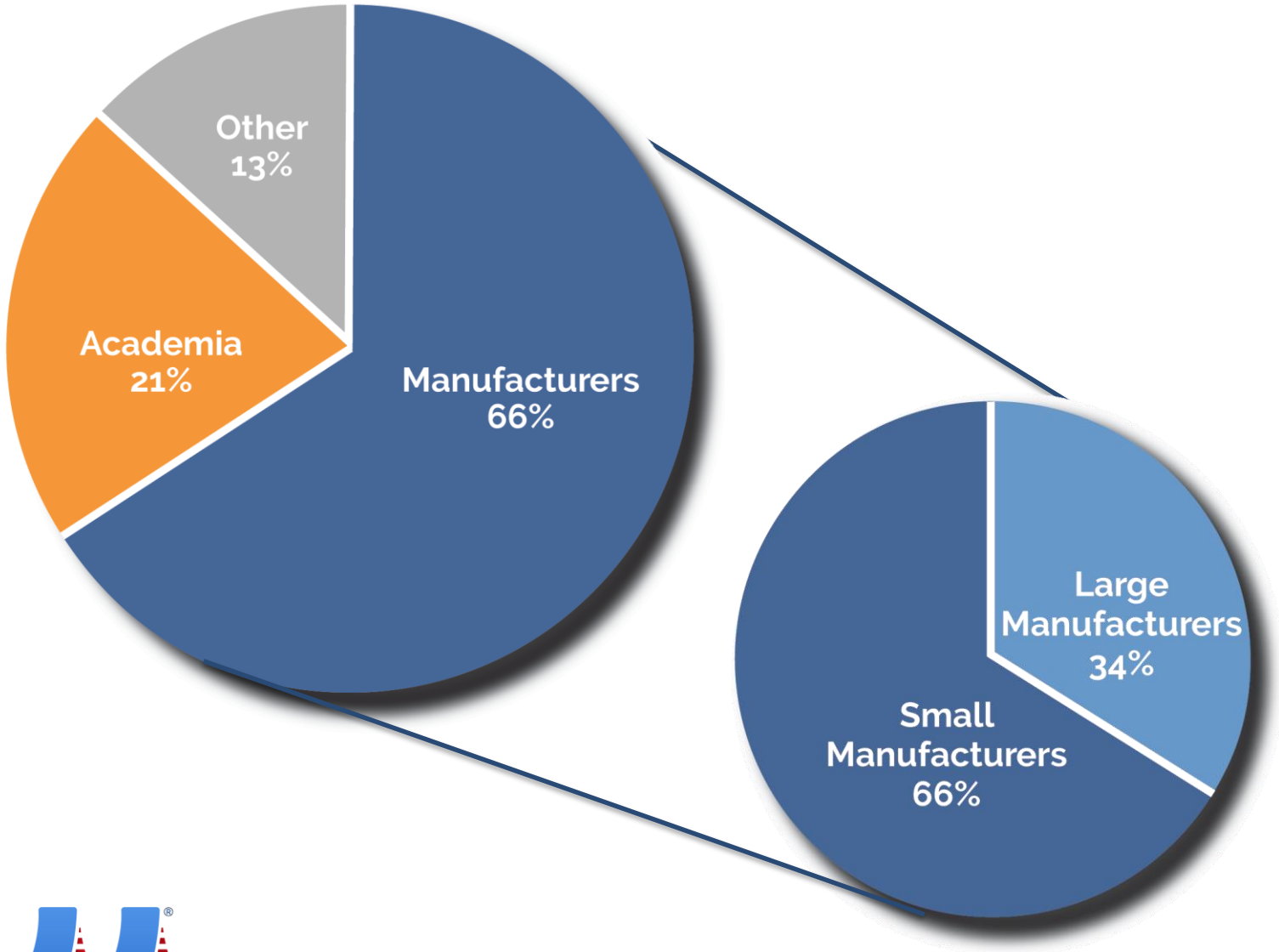
1) Impact to U.S. Innovation Ecosystem - Membership



Membership breakdown of 8 institutes in FY 2016

- The eight 2016 institutes have **830** Members – 66 % are manufacturers
- 66 % of manufacturers (341) were small manufacturers.
- Other participants included:
  - **177** universities, community colleges, and other academic institutions
  - **105** other entities, including federal, state, and local government agencies, federal laboratories, and not-for-profit organizations.

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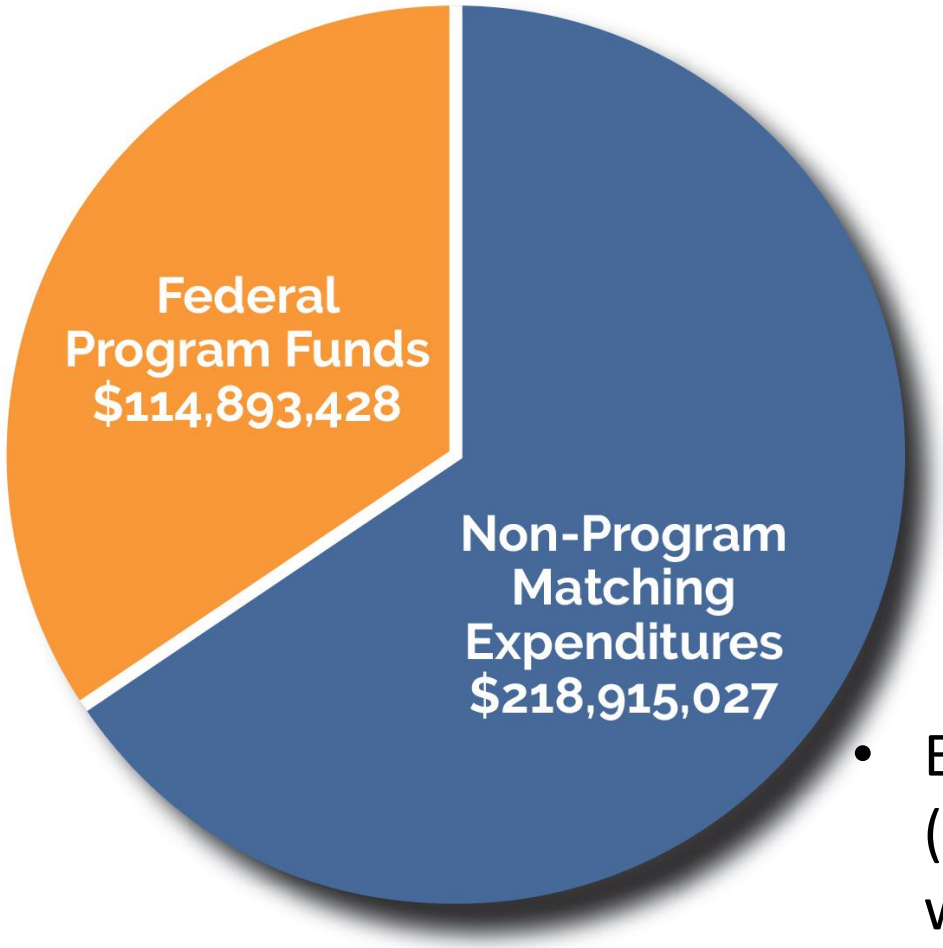
2) Financial Leverage



- FY 2016 matching was nearly 2 to 1
- Of $333,808,455 in total institute expenditures
  - 66 % of Institute support came from non-federal matching funds
  - 34 % came from non-program matching expenditures

- Expenditures funded all aspects of institute operation (e.g. technology advancement projects, education and workforce training efforts, and capital equipment)

3) Technology Advancement: Innovation Leads to U.S. Jobs

FY 2016: 191 active research and development projects at institutes.

Example Project at PowerAmerica

In under a year, researchers from John Deere and the Department of Energy National Renewable Energy Laboratory developed a prototype high power inverter for hybrid motors in heavy duty construction vehicles and trucks.

- Higher efficiency and lower heat-related breakdowns compared with traditional transformer-based inverters.
- Deere plans to hire American production workers in Fargo, ND, to manufacture and sell inverters starting in 2019.

Credit: John Deere and PowerAmerica

"Through our collaboration with PowerAmerica, we believe our silicon carbide technology work has been advanced by five years." **— Brij Singh, John Deere**

3) Technology Advancement: Collaboration Improves Efficiency

Example Project at the Digital Manufacturing Institute

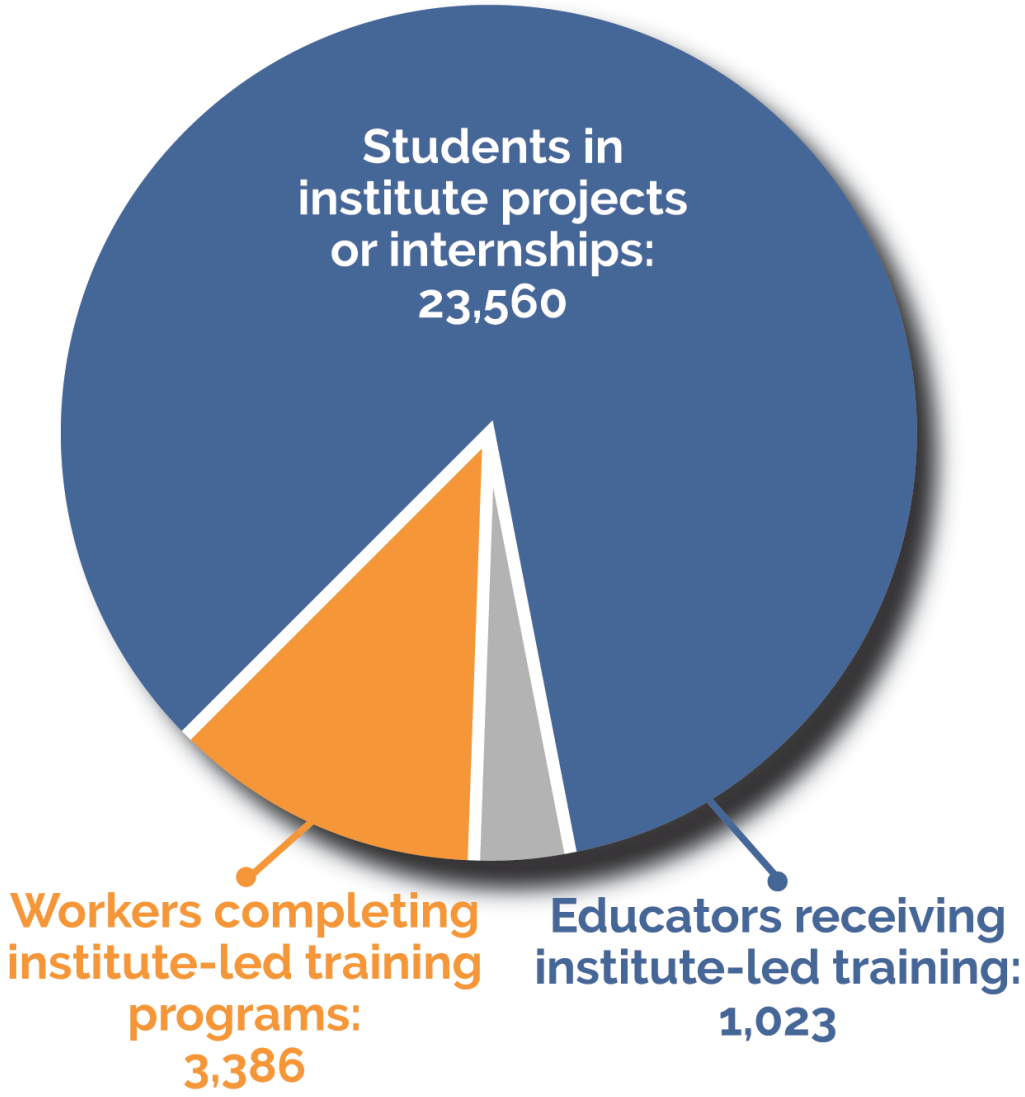
DMDII
a UI LABS Collaboration

- Digital Manufacturing Commons Hackathon
  - Participants developed and tested Digital Manufacturing Commons apps using 4.5 years worth of real-world factory floor data from Indiana-based ITAMCO
  - ITAMCO benefits from community analysis of their data, suggesting ways to optimize utilization, improve energy usage and manage machine health

Credit: DMDII

"To develop new ideas and remain competitive, we need to break out of our silos - and that's exactly what we're able to do by working with DMDII. The DMDII network connects us with people we wouldn't have been able to access otherwise - from large OEMs to entrepreneurs and hackers," **Joel Neidig, ITAMCO**

4) Development of an Advanced Manufacturing Workforce



- Nearly 28,000 participated in institute-led workforce programs, including
  - **23,560 students** in institute research and development projects, internships, or training
  - **3,386 workers** completed institute-led certificate, apprenticeship, or training programs
  - **1,023 teachers** and trainers in institute-led training for instructors

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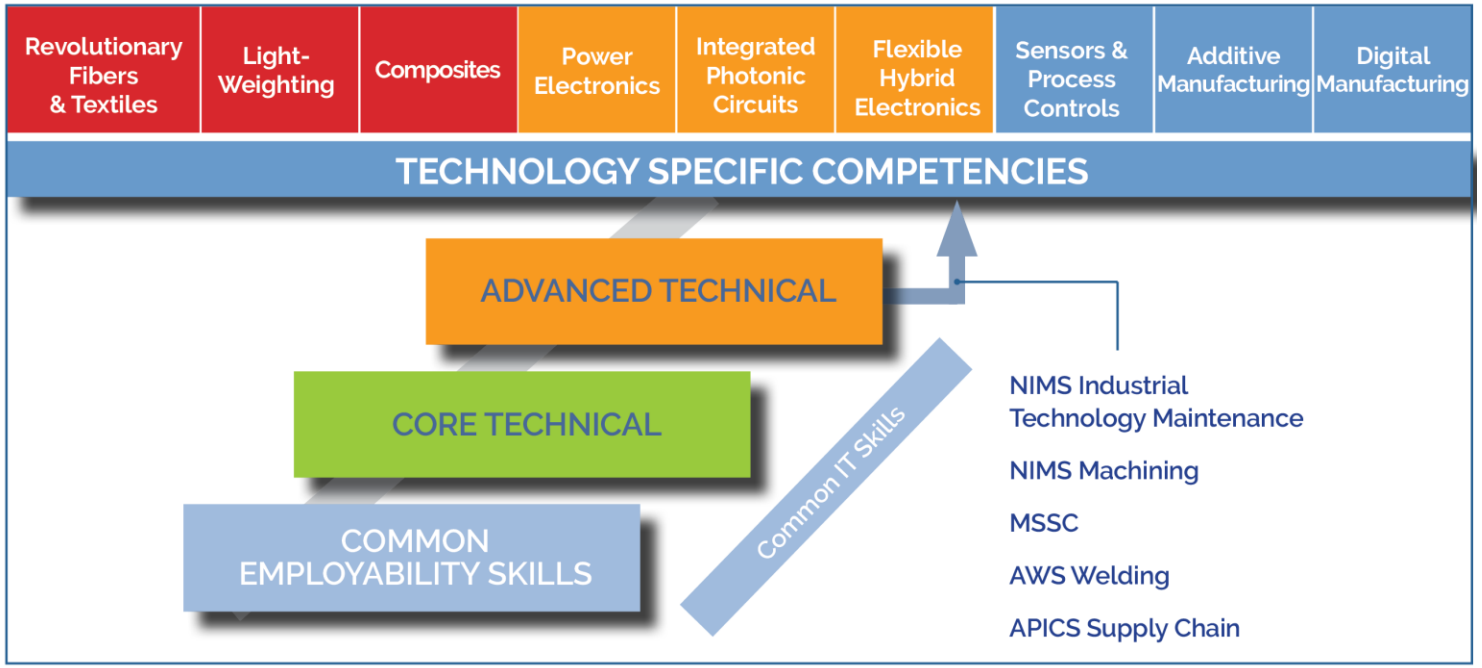
4) Workforce: The Role of the Network



- The Education and Workforce Development team
  - Identified common skills needed across advanced manufacturing technologies
  - Developed a common training model, built around those core competencies
- Institutes
  - Adopt, refine, or develop technology-specific modules to meet each industry's needs.
- The common training model evolves as institutes improve and share materials across the network

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Today a Network of Fourteen Institutes

PILOT INSTITUTE

IN YEARS 3 OR 4 OF FEDERAL FUNDING

NEW INSTITUTES

America Makes
Additive Manufacturing
Youngstown, OH

DMDII
a UI LABS Collaboration
Digital Manufacturing & Design
Chicago, IL

lift
Lightweight Metals
Detroit, MI

NEXTFLEX
Sustainable Manufacturing
Rochester, NY

AIM photonics
Integrated Photonics
Albany, NY

iacmi The Institute for Advanced Composites Manufacturing Innovation
THE COMPOSITES INSTITUTE
Advanced Composites
Knoxville, TN

PowerAmerica
Next Generation Power Electronics
Raleigh, North Carolina

biofabusa
Regenerative Manufacturing
Manchester, NH

NIMBL
Bio-pharmaceutical Manufacturing
Newark, DE

RAPID Transforming Process Industries
Modular Chemical Process Intensification
New York, NY

Clean Energy Smart Manufacturing Innovation Institute
Smart **Sensors** and Digital Process Control
Los Angeles, CA

REMADE INSTITUTE
Flexible Hybrid Electronics
San Jose, CA

affoa
Advanced Fibers and Textiles
Cambridge MA

aim
Advanced Robotics
Pittsburgh, PA

2012 | 2013 | 2014 | 2015 | 2016 | 2017

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Unique Institute Charters spanning a range of technologies

Electronics

AIM Photonics
Integrated Photonics
Albany, NY
Rochester, NY

NextFlex
Flexible Hybrid Electronics
San Jose, CA

PowerAmerica
Wide Bandgap Semiconductors
Raleigh, NC

Materials

lift
Lightweight Metals
Detroit, MI

IACMI
Advanced Composites
Knoxville, TN

AFFOA
Advanced Fibers and Textiles
Cambridge MA

Bio-Manufacturing

biofabusa
Regenerative Manufacturing
Manchester, NH

NIIMBL
Bio-pharmaceutical Manufacturing
Newark, DE

Energy Usage / Environmental Impact

RAPID
Transforming Process Industries
Modular Chemical Process Intensification
New York, NY

Clean Energy Smart Manufacturing Innovation Institute
Smart Sensors and Digital Process Control
Los Angeles, CA

REMADE Institute
Sustainable Manufacturing
Rochester, NY

Digital Automation

DMDII
a UI LABS Collaboration
Digital Manufacturing & Design
Chicago, IL

America Makes
Additive Manufacturing
Youngstown, OH

aim
Advanced Robotics
Pittsburgh, PA

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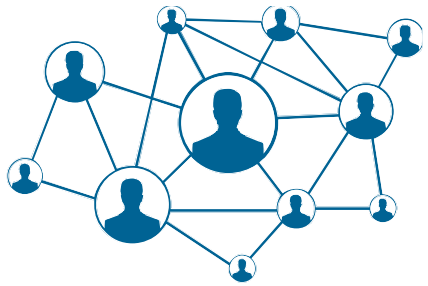
NIST Manufacturing Extension Partnership (MEP)

PROGRAM MISSION

To enhance the productivity and technological performance of U.S. Manufacturing



National Network

- MEP Center in all 50 U.S. states, Puerto Rico
- System-wide non-Federal staff of over 1,200 individuals in ~600 service locations assisting U.S. manufacturers.
- Contracting with >2,500 3rd party service providers

Local ➡ National Connection

System of Centers providing localized service to manufacturers in each State – with National reach and resources

Partnership Model

- Federal, State, Industry
- Managed by NIST at Federal level
- Well aligned with state and local economic development strategies

MEP Budget & Business Model

$130M FY17 Federal Budget with Cost Share Requirements for Centers

MEP Strategy: Global Competitiveness and Growth

Provide direct, hands-on technical and business assistance as trusted advisors to domestic manufacturers to help them compete and grow

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Manufacturing USA – MEP Embedding Initiative

Manufacturing USA - Conclusions

- Manufacturing USA is successfully achieving its program goals
- Manufacturing USA institutes are convening a diverse array of members and coordinating project activities
- Small business engaged and is especially benefitting
- Leveraging and collaboration improve effectiveness of institutes and provide multiplier effect for members

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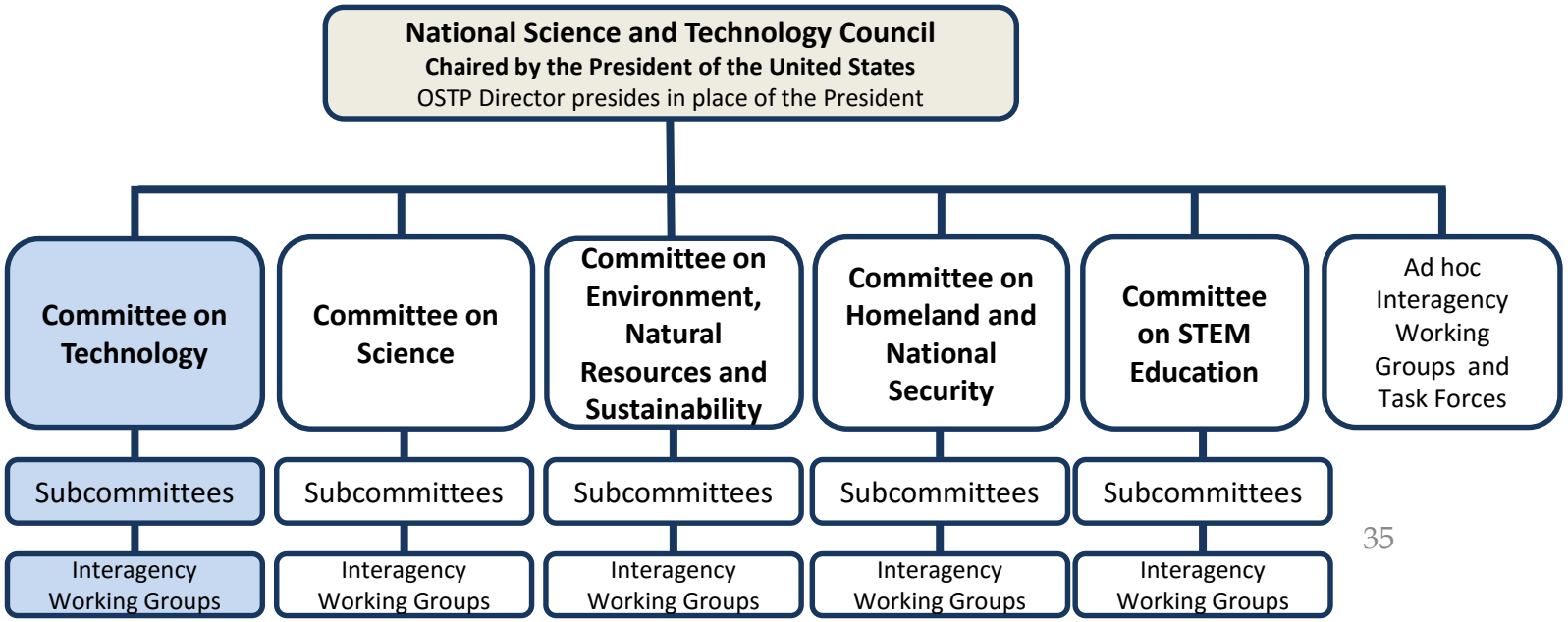
National Science and Technology Council – interagency mechanism for Policy Development and S&T coordination

- The National Science and Technology Council is the cabinet-level council of advisers to the President on science and technology
  - The President chairs the NSTC. Membership consists of the Vice President, cabinet secretaries, agency heads with significant science and technology responsibilities, and other White House officials
- NSTC is principal means to coordinate science and technology within the Federal research and development enterprise, used to establish clear national goals for Federal science and technology investments



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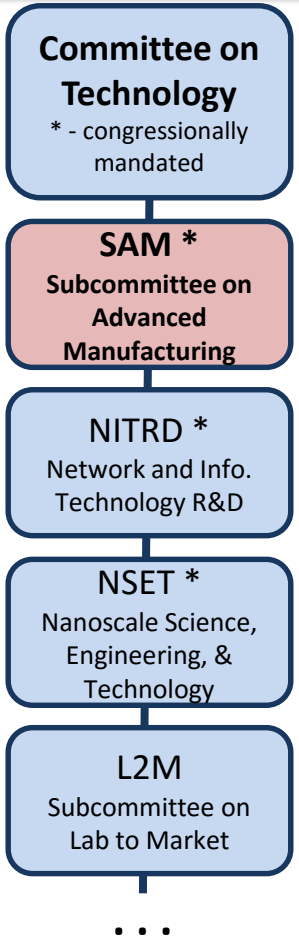
Subcommittee on Advanced Manufacturing is Reactivated
– RFI on National Strategic Plan for Advanced Manufacturing



- Subcommittee on Advanced Manufacturing (SAM)
  - Composed of leaders from the Department of Commerce, Defense, Education, Energy, Homeland Security, Health and Human Services, and Labor along with the National Aeronautics and Space Administration, National Science Foundation, Small Business Administration, and the White House Office of Science and Technology Policy, White House Office of Management and Budget, and White House National Economic Council
  - Commerce, OSTP and NEC are the co-chairs
- Mission: **develop the National Strategic Plan for Advanced Manufacturing**
  - Goal: Improve government coordination and provide long-term guidance for federal programs and activities in support of United States manufacturing competitiveness, including advanced manufacturing research and development over the next five to ten years.
  - Members of the public, including stakeholders from industry, academia, and nonprofits active in advanced manufacturing, are invited to provide input to support development of the National Strategic Plan for Advanced Manufacturing.
- **Announcement: Public Request for Information is now live**
  - For information see www.manufacturing.gov
  - A user-friendly electronic input form is available at www.nist.gov/oam/rfi-response

All tables, figures, and photos in this document were produced by the Advanced Manufacturing National Program Office Interagency Working Team, unless otherwise noted.

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