Advanced Manufacturing Partnership 2.0
Transformative Manufacturing Technologies
Working Team

AMP2.0 Regional Meeting at Rensselaer Polytechnic Institute
April 30, 2014
Troy, NY
## Transformative Manufacturing Technology Areas (MTAs)

### Led by Dow, Honeywell and MIT

### GOALS

- Understand and summarize the **drivers, landscape, and vision** for select MTAs
- Identify current **Gaps/Challenges** and provide actionable **Recommendations** to achieve this vision
- Submit letter reports recommending & implementing actions to improve US competitive advantage

### DECISIONS/DISCUSSION NEEDED

- Letter reports submitted or in progress for each MTA; **currently uncoupled to NNMI topic development**
- Addressing shared challenges, gaps, and solutions
- Collaboration with other Working Teams (e.g., workforce skill sets)
- Hand off for further analysis as needed and implementation of AMP2.0 recommendations
Which Manufacturing Technology Areas (MTAs) Are Being Considered?

Three MTAs were prioritized by AMP2.0 for study and action in 2014:
  • Advanced Materials Manufacturing (including Structural Composites, Biomanufacturing of Materials, & Critical Materials Reprocessing)
  • Advanced Sensing, Measurement, & Process Control
  • Visualization, Informatics, & Digital Manufacturing
1. Advanced Materials Manufacturing
   - Overview and definition of broad MTA
   - Recommendations applicable to several subsets
   - Serves as “cover letter” for specific MTAs below

2. Structural Composite Manufacturing
   - Pre-dated DOE announcement
   - Considers range of issues including some addressed by DOE NNMI solicitation

3. Biomanufacturing
   - Using biology to make materials, including pharma
   - Excludes lignocellulose processing
   - Anticipates potential NNMI solicitation

4. Critical Materials Reprocessing
   - High national security/competitiveness impact
   - Considers range of issues not emphasized by current federal funding or industry engagement
Advanced Sensing, Control and Platforms for Manufacturing (ASCPM)

Letter report submitted, summarizing the above challenges and recommendations.

Advanced Sensing and Measurement, Process Control and Optimization, Platforms and Shared Infrastructure for Manufacturing

**DRIVERS**
- Impact a $60 B legacy automation footprint in US across sectors, not including new manufacturing investments
- Opportunity to demonstrate value within 2-3 years, with a sustained economic impact

**SELECTED TECHNICAL GAPS**
- Low-power, resilient wireless sensors and sensor networks
- Noninvasive, real-time measurement solutions for factory environments
- Health management for manufacturing equipment and systems

**RECOMMENDATIONS**
- Interoperability
- Technology Agenda
- Platform Concepts

Leaders report submitted, summarizing the above challenges and recommendations.
Visualization, Informatics, and Digital Manufacturing (VIDM)

Integrating Digital Designs, Advanced Manufacturing technologies, and Diverse Data in end-to-end cross-cutting supply-chains to drive flexibility & agility in meeting Customer/Market demands.

**DRIVERS**
- Integrate across currently heterogeneous infrastructure to transform products
- Shorten product development cycle times, data analysis and integrated decision making, particularly for SMEs

**GAPS & CHALLENGES**
- Scarcity of workforce with interdisciplinary skills to design, manage, and sustain digital models
- Big Data – scarcity of scalable algorithms for processing (storing, visualizing, analyzing) unstructured manufacturing data in distributed databases and data streams across the supply-chains accounting for Volume, Velocity, Variety, Veracity, and Value for near real time integrated decision making.

**RECOMMENDATIONS**
1. Stand up a cross agency manufacturing big data and analytics institute to advance effective end to end supply chain decision making
2. DMDI already awarded → Does it address all the gaps?
### Advanced Materials Manufacturing (AMM)

**Letter reports submitted for Advanced Materials Manufacturing; Structural Composites Manufacturing; Biomanufacturing**

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<tr>
<th>Advanced Materials Design, Synthesis, &amp; Processing</th>
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<tr>
<td><strong>DRIVERS</strong></td>
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<tr>
<td>▪ Enabling of all major technology advances; can impact national security and competitiveness</td>
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<td>▪ Shared challenges related to databases, standards, and recycling/reprocessing</td>
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<tr>
<th><strong>TECHNICAL GAPS</strong></th>
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<td>▪ <strong>Advanced Materials Manufacturing</strong>: Lack of standards and qualifications, including reliability; slow transitions to TRL 4-9; labor-intensive processing</td>
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<tr>
<td>▪ <strong>Structural Composites</strong>: Low-cost/high-rate production; DOE NNMI target; Lack of standards; Joining &amp; bonding; Recycling; Capital investment; Sector-specific</td>
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<td>▪ <strong>Biomanufacturing</strong>: Starting in AMP2.0 with biologic therapeutics as area of high strength and competitive threat; Lack of skilled workforce scale-up/scale-down technologies</td>
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### RECOMMENDATIONS

1. **Advanced Materials Manufacturing**: Create network of materials manufacturing centers of excellence; Continually engage Materials Manufacturing Innovation Board
2. **Structural Composites**: Establish standardization consortium; Incentivize sponsored applications from each sector;
3. **Biomanufacturing**: Create consortium of industry-sponsored workforce training; Create NNMI & Centers of Excellence on platform development for therapeutic protein manufacturing
Discussion and Decisions

- **Gaps common among MTAs analyzed to date:**
  
  o Nomenclature and Ontology in new areas of Digital and Smart Manufacturing Platforms
    - Needs dedicated efforts to drive this with urgency

  o Standards- The development and usage of standards in many areas could accelerate deployment
    - Is there a common approach to solve this?

  o Interoperability – Incentives to promote interoperability within a given timeframe (1-2 years)
    - Is this a viable approach?

  o Information Security- A common and recurring theme on Digital, ASCPM and related threads.
    - How do we ensure all segments of the Digital Thread operate at the same level?

  o Workforce – Though needs are common, the requirements are different in each MTA.
    - Should specific programs be considered as part of technology letter reports?

- **Need to identify mechanisms for hand off for further analysis and implementation of AMP2.0 recommendations. This includes identifying appropriate and timely mechanisms for AMP2.0 input to NNMI topic development and scope.**